

# PLANNING COMMISSION MEETING MINUTES

Vancouver City Hall – Council Chambers – 415 W. Sixth Street  
PO Box 1995 – Vancouver, Washington 98668-1995  
[www.cityofvancouver.us](http://www.cityofvancouver.us)

Marjorie Ledell • Steve Schulte • Larry Blaufus • Zachary Pyle  
Nena Cavel • Patrick Adigweme • Melissa von Borstel

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## ***September 26, 2023***

### **REGULAR MEETING**

Vancouver City Hall - 415 W. Sixth Street, Vancouver WA

#### **CALL TO ORDER**

The September 26, 2023, meeting of the Planning Commission was called to order at 4:34 p.m. by Acting Chair Cavel.

#### **ROLL CALL**

**Present:** Patrick Adigweme, Nena Cavel, Larry Blaufus, and Steve Schulte

**Absent:** Marjorie Ledell, Zachary Pyle, and Melissa von Borstel

**Motion** by Commissioner Adigweme, second by Commissioner Schulte, and carried unanimously, to excuse the absences of Commissioners Ledell and Pyle.

#### **ADOPTION OF MINUTES**

**Motion** by Commissioner Schulte, second by Commissioner Adigweme, and carried unanimously to adopt the September 12, 2023, minutes.

### **WORKSHOP**

#### **URBAN FORESTRY MANAGEMENT PLAN**

Charles Ray, Urban Forester, Public Works Department

*Charles Ray introduced the workshop and presented background information on the project, the policy documents that influenced the draft of the plan, scope and timeline, status of the urban forest, tree inventory, public benefits of the urban forest, City and external engagement in drafting the plan, results of the urban forestry audit, canopy goals for 2047, and areas to prioritize planting. The draft plan has three main goals, with many actions to achieve those goals in the short and long term. Rebecca Kennedy also provided context for this presentation, as this plan will likely lead to code changes in Title 20 that will come before the Planning Commission for formal action in the future.*

#### **Commission Questions and Discussion**

- Define no-net-loss approach to tree canopy cover. Staff responded during the tree permit process, reviewing the types of trees and planning appropriate trees in locations to maximize the space. For example, if there is space for a large tree planting, replacing lost large trees with similar sized trees rather than a smaller ornamental tree.

- From 2011 to 2019, were there changes in the Vancouver Urban Growth Area (VUGA)? Staff responded there was one annexation during that time period- Van Mall North- and this area is likely more urbanized than other parts of the VUGA. Measurements of overall canopy change in the UFMP accounted for the boundary changes.
- Do the canopy goals for 2047 include land that will be annexed by that time? Staff responded the goals are based on the data from 2019 and the current and future canopy goals for each zoning designation. The goals do not take into account future annexation.
- Developing forestry standards with the increase in forest fires due to climate change. Staff responded they look to the Wildland Urban Interface (WUI) standards regarding ground cover, maintaining health trees, removing competing trees, and using less flammable building materials for a home or building to try to prevent fires near urban areas.
- Balance tree canopy coverage requirements with housing development.

## **TRANSPORTATION SYSTEM PLAN (TSP) OVERVIEW**

Kate Drennan, Principal Transportation Planner, Community Development Department

*Kate Drennan presented an overview of the Transportation System Plan, it's influence on policy and projects in other framework plans, and the process of developing this TSP. The TSP has eight chapters, covering outcomes and stakeholders, community engagement and input, vision for the plan, the organizing framework for policies, programs and projects, modal networks throughout the City, a prioritized list of capital projects, implementing projects and programs, and innovation and trends for the future. The draft Plan was released in mid-September, with a 60-day comment period, and adoption is anticipated in early 2024.*

## **Commission Questions and Discussion**

- How is regional connectivity defined in the values that shaped the TSP goals? Staff responded in the community engagement phase I summary included in the plan appendix this is defined as "Vancouver's transportation system connects seamlessly with nearby communities."
- Balance equitable investment with preventing displacement in those areas. For all projects, including the TSP, staff uses the City's equity index and displacement risk assessment maps to understand how investments will impact nearby community and what mitigations might be required. Reside Vancouver addresses involuntary displacement risk citywide through a comprehensive Strategy that includes things like workforce training, building affordable housing, and rental protections.
- Examples of performance measures and metrics for projects. Staff responded performance measures include things like measuring reduction in crashes for vulnerable users and amount of investment in equity areas of the City. They align with each of the goals.
- Where is the City leading in terms of future technology and innovation? Staff responded Council has directed us to lead in certain areas such as the transition to an electric vehicle fleet, in policy areas such as utilizing curb space for delivery and pickup, updating the concurrency policy and improving system performance.
- Changes to how the City conducted outreach for this plan compared with prior similar policy plans. Staff responded they have expanded the ways we are communicating with the public about this plan and there is a short video to explain what is included in the TSP. Generally, there has been a shift in how the City engages the community on a variety of projects, with a focus on



gathering information on values, aspirations for the future, and current challenges and applying these to all projects, while at the same time continuing to gather project or corridor specific information through more targeted outreach to community near the project area.

- Structures or triggers to make updates to the TSP. Staff responded that a minor update to the TSP will be updated after the Comprehensive Plan update is complete, to ensure they are aligned. Generally, most cities update a TSP with minor updates every 5 years, and broader updates every 10 years to align with GMA-required Comprehensive Plan Periodic Review, as the TSP serves as the transportation element of the Comprehensive Plan.
- How is safety defined for different users of the system? Staff responded they look to the NACTO standards to determine what types of facilities are appropriate based on volume and speed of traffic and adjacent land uses. There is also a perception of safety and comfort using different facilities. For pedestrians and small mobility users, there is a measure of stress for moving on a road. During a project, staff assess the current level of stress and determine what could change to lower the level, which is an important factor in attracting more users to non-drive alone modes.

### **COMMUNITY FORUM**

No members of the public were present to speak during Community Forum.

### **PUBLIC HEARING**

#### **HEIGHTS HX PLAN DISTRICT CHANGES**

Amy Zoltie, Real Estate Project Manager, Economic Prosperity & Housing

*Amy Zoltie presented a summary of the proposed HX code changes, including revision to the ground floor uses map and the definition of commercial frontage, increasing the maximum building height in the district gateway sub-district, minor code cleanup, and add a standard to regulate off-street parking access to limit conflict between vehicles and pedestrians and bicyclists.*

#### **Public Testimony**

There were no members of the public present to provide public testimony.

**Motion** by Commissioner Schulte, seconded by Commissioner Adigweme, to recommend City Council approval of the modifications to the HX Plan District as outlined in the staff report.

#### **Roll Call Vote**

|                       |     |
|-----------------------|-----|
| Commissioner Adigweme | Yes |
| Commissioner Cavel    | Yes |
| Commissioner Schulte  | Yes |
| Commissioner Blaufus  | Yes |

The motion carried unanimously.

**COMMUNICATIONS FROM CHAIR AND STAFF**

There were no communications from the Chair or staff.

**ADJOURNMENT 6:49 P.M.**

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Nena Cavel, Acting Chair

To request other formats, contact Julie Nischik, Community Development Department | 360-487-7813. WA Relay: 711 | [julie.nischik@cityofvancouver.us](mailto:julie.nischik@cityofvancouver.us)



# Fall 2023 Comprehensive Plan and Zoning Map and Text Amendments Vancouver Planning Commission Public Hearing October 24, 2023



**Bryan Snodgrass**  
Principal Planner  
City of Vancouver Community Development Department

# Presentation Overview

- Public hearing review of four Comprehensive Plan and zoning map designation change requests, two Comprehensive Plan text changes, and 14 zoning code text changes.
- Five separate opportunities for commission questions, applicant presentation, public testimony, and Commission deliberation and recommendation - after each of the four map change requests, and after the set of Comprehensive Plan and zoning code text change proposals.
- Previous Commission workshop review on July 25 and September 12, 2023. City Council workshop review on October 23, with follow up Council Communications on November 6 and if needed 13. Council first reading on December 4 and public hearing on December 18.

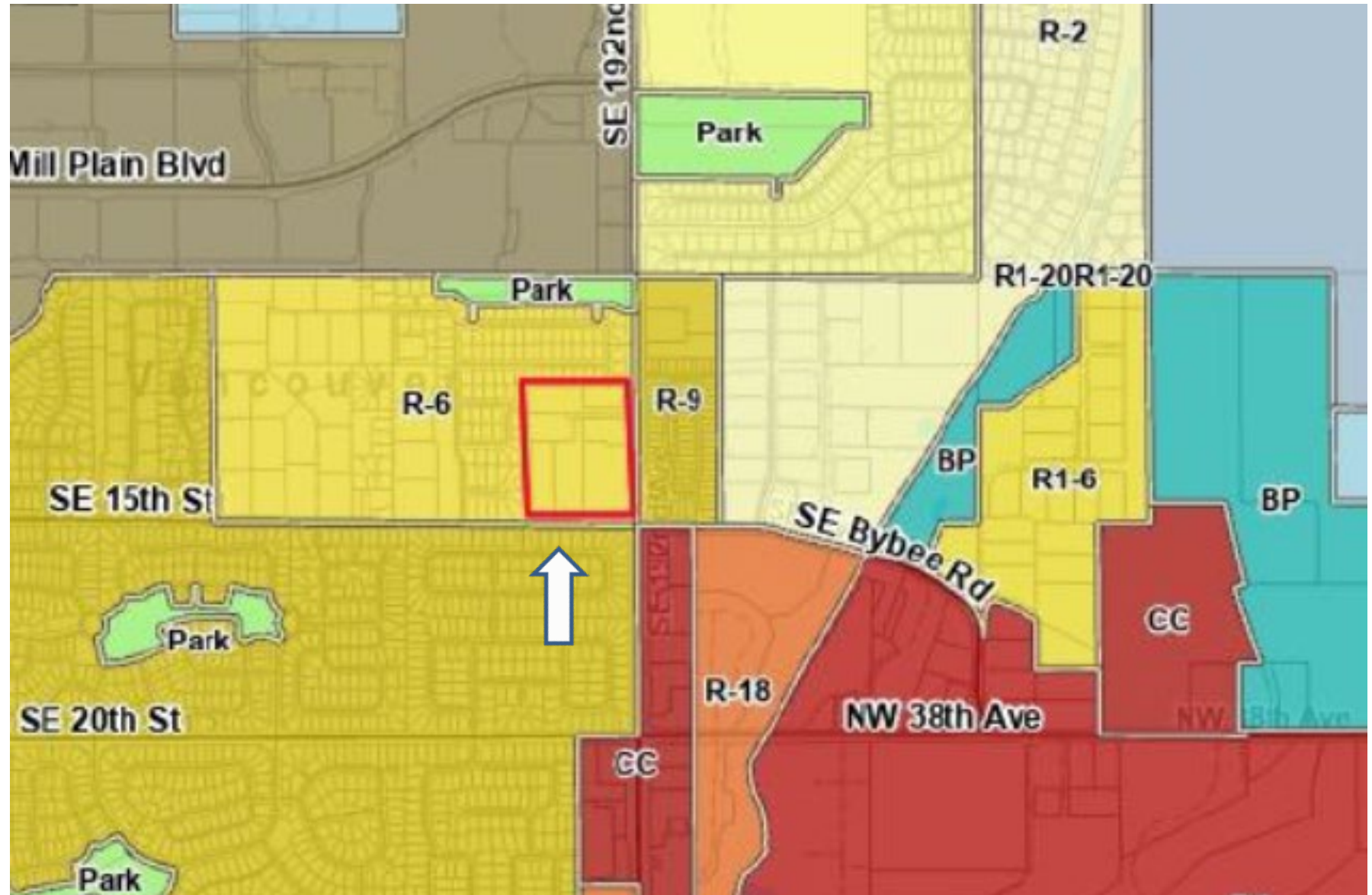


192<sup>nd</sup> Avenue  
Comprehensive  
Plan and zoning  
map change -  
UL/R-6 to UH/R-  
30 on 9.8 acres  
at the  
intersection of  
SE 192<sup>nd</sup> Avenue  
and 15<sup>th</sup> Street





# 192<sup>nd</sup> Avenue Comprehensive Plan and zoning map change – Regional zoning



192<sup>nd</sup> Avenue  
map change –  
Conceptual site  
plan for 210-223  
units, 5%  
affordable at  
80% AMI. Two  
and three story  
buildings and  
enhanced north  
and west  
buffering.





# 192<sup>nd</sup> Avenue map change – Analysis

- Rezone would contribute to local and citywide housing needed to help address affordable housing crisis and comply with new state laws, at a location along a major roadway very near shopping, employment, and public services including transit and a park.
- Housing needs remain acute throughout Vancouver and beyond.
  - The City approved various code text change in 2022 to facilitate more and smaller housing.
  - Local voters in 2023 renewed an affordable housing levy first approved in 2016.
  - Based on economic studies, the City has identified a target of producing an average of 2500 housing units citywide per year, including 800 below market units, for the next ten years as needed to address existing shortages.
- New state laws require Clark County jurisdictions to jointly demonstrate capacity to accommodate more than 100,000 additional total housing units, with set amounts in various income bands.
- Up to two ADUs must be allowed on single family lots. Vancouver, Camas and Washougal must effectively allow 4-6 unit plexes on almost all lots zoned for single family development.



# 192<sup>nd</sup> Avenue map change – Analysis (cont.)

- Applicant has adjusted proposal in response to community concerns, lowering proposed zoning, number of units, and building heights, while providing enhanced buffering and setbacks on the north and west site perimeter which immediately abuts existing homes
- Additional housing enabled by rezone would add to public service demand, but within capacities of existing systems
- City and applicant to enter into Development Agreement to ensure future development is consistent with conceptual site plan and affordable housing pledge, and to comply with City Interim Green Building Policy

# 192<sup>nd</sup> Avenue map change – Hearing pause and sample motion

- Pause for Commission questions, applicant presentation, public testimony, Commission deliberation and recommendation.
- Sample Motion: Based on the October 24, 2023 public hearing discussion and staff report findings, the Planning Commission recommends that the City Council approve the 192<sup>nd</sup> Avenue Comprehensive Plan and zoning map designation change as described from Urban Low Density/R-6 to Urban High Density/R-22

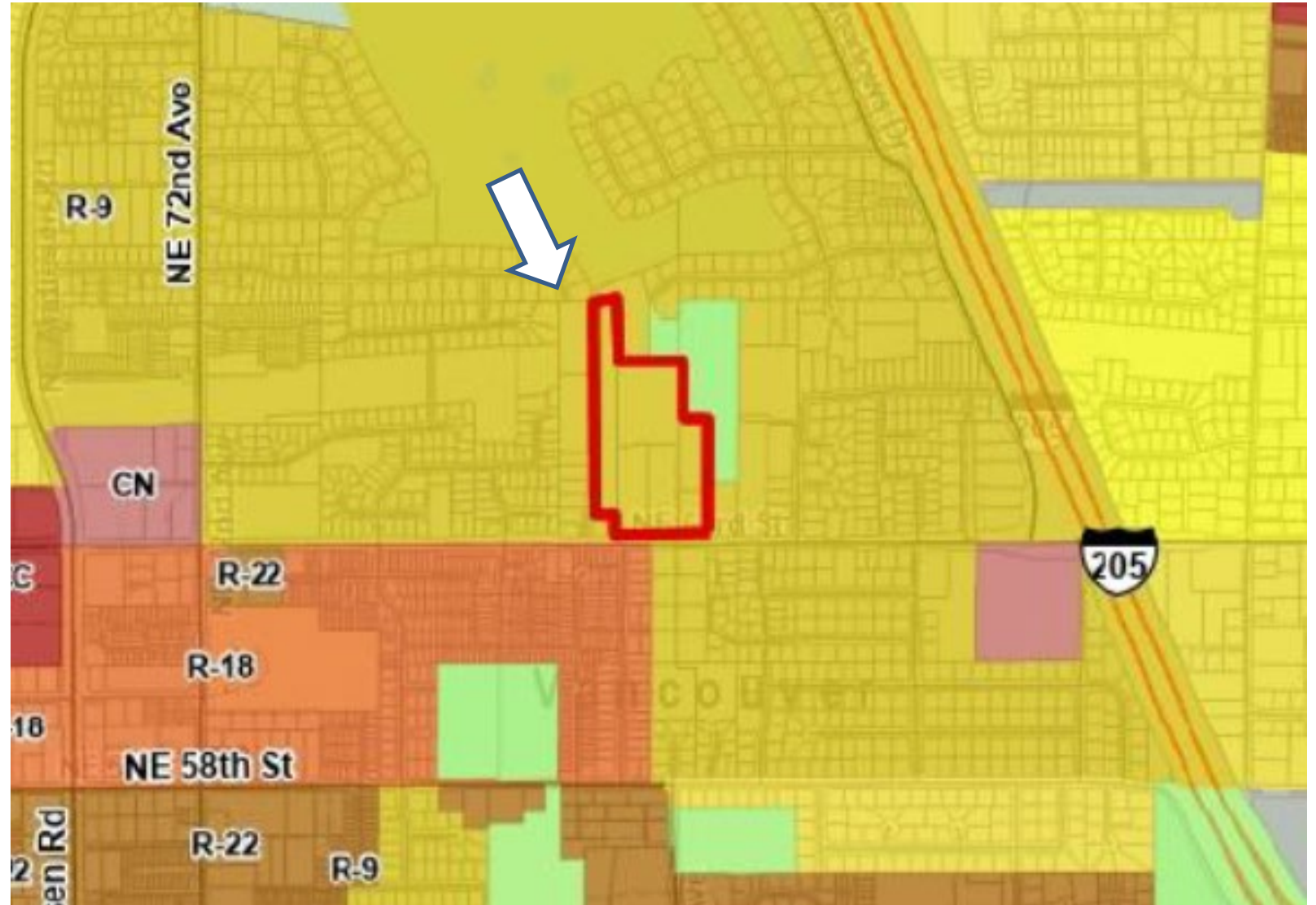


Wood Duck  
Springs  
Comprehensive  
Plan and zoning  
map change -  
UL/R-9 to UH/R-  
22 and  
Commercial/CC  
on 13 acres on  
63<sup>rd</sup> Street at  
82<sup>nd</sup> Court





# Wood Duck Springs map change – Regional zoning





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WASHINGTON



# Wood Duck Springs map change – Analysis

- Rezone adds housing needed to address the local shortage and comply with new state laws, includes a commercial component to support development of 15-minute neighborhoods, and is located along a major roadway adjacent to a park.
- Taller buildings proposed in center of site, with townhomes at edges. Wetlands at north end of site to remain undeveloped.
- Additional housing enabled by rezone would add to public service demand, but within capacities of existing systems.



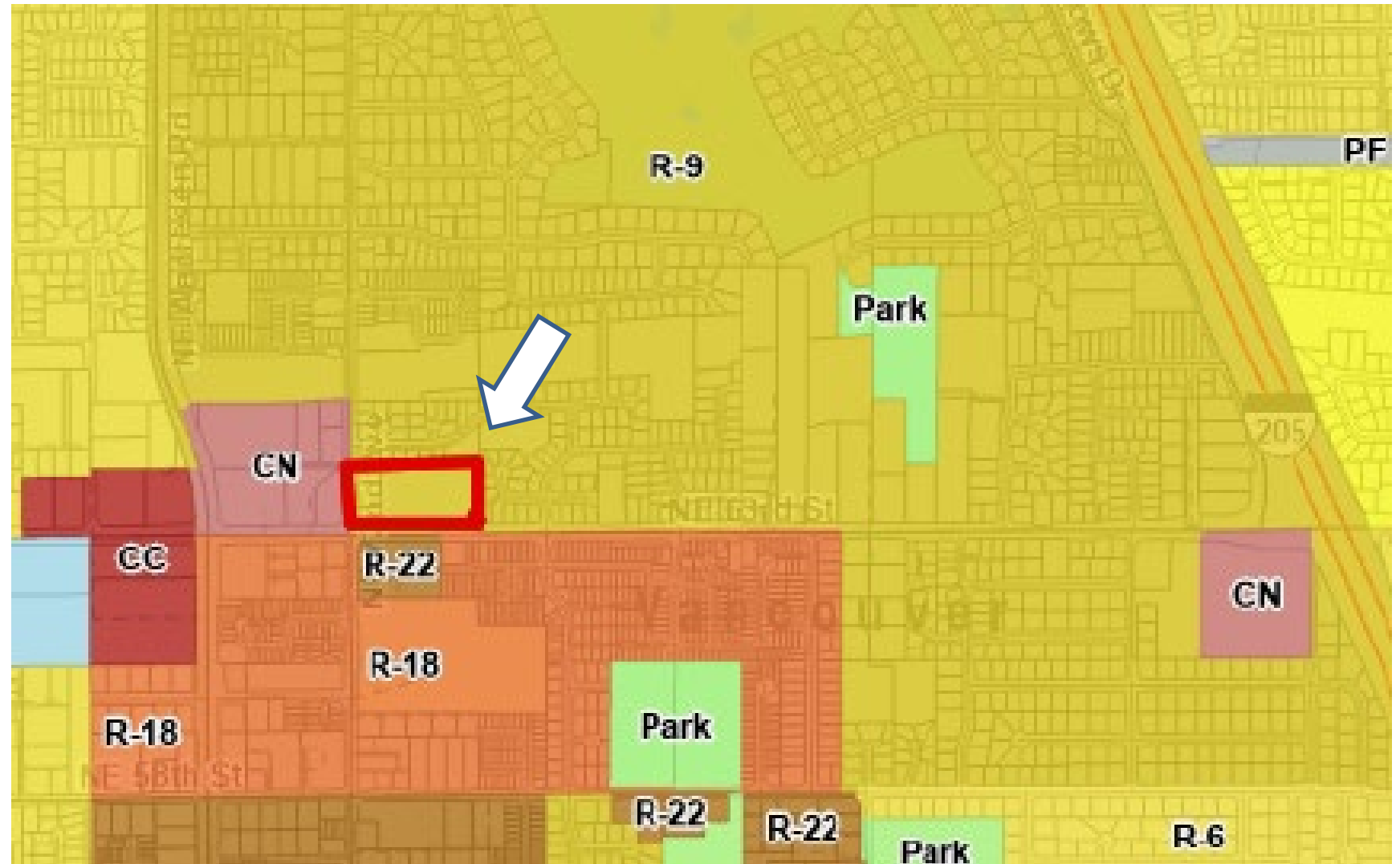
# Wood Duck Springs map change – Hearing pause and sample motion

- Pause for Commission questions, applicant presentation, public testimony, Commission deliberation and recommendation
- Sample Motion: Based on the October 24, 2023 public hearing discussion and staff report findings, the Planning Commission recommends that the City Council approve the Wood Duck Springs Comprehensive Plan and zoning map designation change as described from Urban Low Density/R-9 to Urban High Density/R-22 and Commercial/CC.

# Miller Comprehensive Plan and zoning map change - UL/R-9 to UH/R- 30 on 4 acres at 63<sup>rd</sup> Street and 72<sup>nd</sup> Avenue



# Miller map change— Regional zoning





**Miller map  
change—  
Conceptual  
Layout. 102 units  
envisioned in  
three apartment  
buildings at  
center of site,  
surrounded by  
parking.**



# Miller map change – Analysis

- Rezone would add affordable housing needed to address the housing shortage and comply with new state laws, at a location along a major roadway near commercial and public services to the west, including transit.
- Taller apartment buildings propose in center of site, with parking at edges. Indicated as likely to be similar in style to apartments now under construction on south side of 63<sup>rd</sup> Street across from rezone property. Site includes extensive wetlands, with City standards to be applied during future site plan review.
- Additional housing enabled by rezone would add to public service demand, but within capacities of existing systems. City review of applicant's traffic analysis estimates no Level-of- Service failures resulting from proposal.

# Miller map change – Hearing pause and sample motion

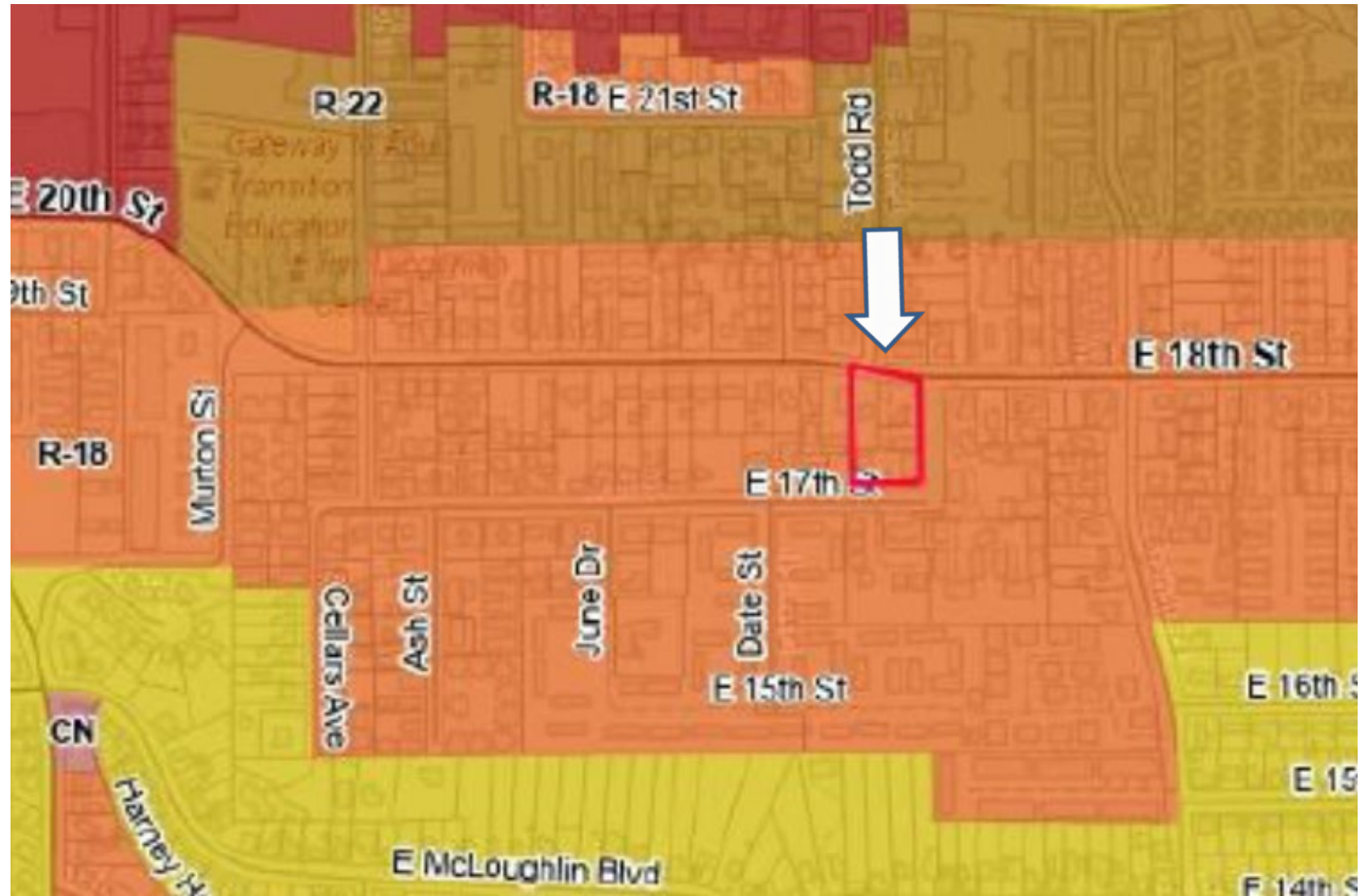
- Pause for Commission questions, applicant presentation, public testimony, Commission deliberation and recommendation
- Sample Motion: Based on the October 24, 2023 public hearing discussion and staff report findings, the Planning Commission recommends that the City Council approve the Miller Comprehensive Plan and zoning map designation change as described from Urban Low Density/R-9 to Urban High Density/R-30



Date Park  
zoning map  
change –  
R-18 to R-30 on  
1.2 acres south  
of Fourth Plain  
Blvd.

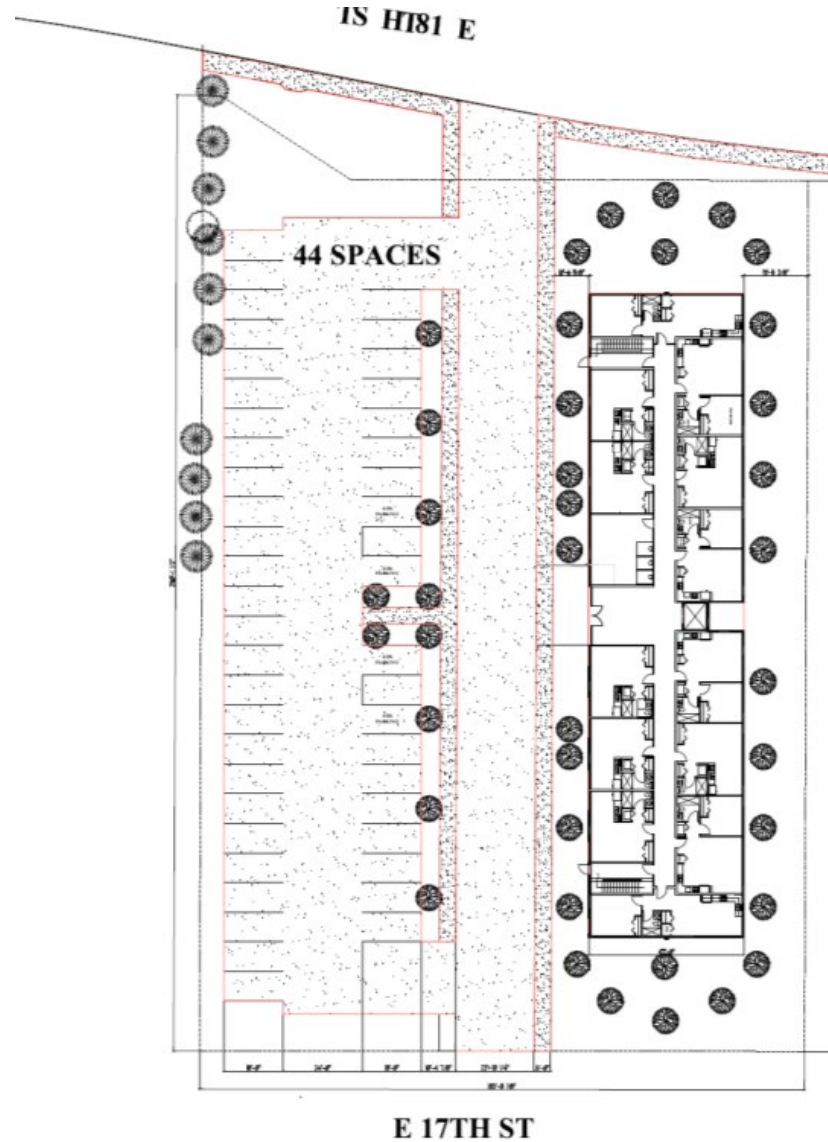


# Date Park zoning map change – Regional zoning





Date Park map  
change –  
Conceptual site  
plan for  
replacement of  
existing  
buildings with  
54 affordable  
housing units  
and parking





# Date Park map change – Analysis

- Rezone would add affordable housing needed to address the local housing shortage and comply with new state laws, at a location immediately adjacent to transit service and a park, and near commercial and services to the north on Fourth Plain Boulevard.
- Buildings proposed on east side of site adjacent to park, with parking on west side abutting existing homes. Additional housing enabled by rezone would add to public service demand, but within capacities of existing systems.

# Date Park map change – Hearing pause and sample motion

- Pause for Commission questions, applicant presentation, public testimony, Commission deliberation and recommendation
- Sample Motion: Based on the October 24, 2023 public hearing discussion and staff report findings, the Planning Commission recommends that the City Council approve the Date Park zoning map designation change as described from Urban High Density/R-18 to Urban High Density/R-30

# Comprehensive Plan and zoning code text changes

1. Comprehensive Plan capital project list - Add Library Square/Riverwest Parking Structure, and Downtown Parking Extension Project
2. Comprehensive Plan parks related changes – Update Chapter 5 discussion of parks service areas and capital facilities list, Appendix E list of documents adopted by reference, and latest Parks Comprehensive Plan
3. VMC 20.150 Definitions - Define breezeways linking structures (so that a second structure is not separate and accessory) to include a roof
4. VMC 20.160 Use Classifications
  - a. Move bus barns from the VMC 20.160.020.D.5 category of Warehouse/Freight Movement to the VMC 20.160.020.B.14 category of Transportation Facilities
  - b. Add associated fuel storage to VMC 20.160.020.B.14 category of Transportation Facilities to clarify that fuel storage associated with transportation facilities is an allowed use.
  - c. Add description of Temporary Use



## Text changes (cont.)

5. VMC 20.170 Measurements - Clarify width and depth for flag lots
6. VMC 20.180 Fees - Eliminate redundant reference to short subdivision
7. VMC 20.210 Type II (Administrative) provisions. Remove outdated requirement for notices to be through “regular” mail only
8. VMC 20.245 Conditional Use Permits - Clean up electronic submittal provisions
9. VMC 20.270 Site Plan Review - Include easement location and dimensions
10. VMC 20.330 Binding Site Plans - Fix links and require easements
11. VMC 20.410 Lower Density Residential Districts
  - a. Clarify that single family streetfront standards adopted as part of 2022 Housing Code Updates apply to land divisions submitted after the 7/27/22 ordinance adoption date
  - b. Clarify role of Planned Developments, Infill, and Clusters in maximum density calculations

## Text changes (cont.)

12. VMC 20.740 Critical Areas Protection— In response to new Flood Insurance Rate Maps (FIRM), update definitions and references, modify variance procedure for historic structures in floodplain.
13. VMC 20.790 SEPA - Pursuant to recent statutory changes, exempt mid to large size housing projects from requiring SEPA review unless critical lands or other factor are present to trigger review.
14. VMC 20.950 Cottage Clusters - Clarify definition of density bonus and common area. Address minimum lots sizes and frontages, and allowance for pre-existing homes exceeding cluster requirements.

# Text changes (cont.) - Updated language for proposed VMC 410 change – Staff report Attachment G

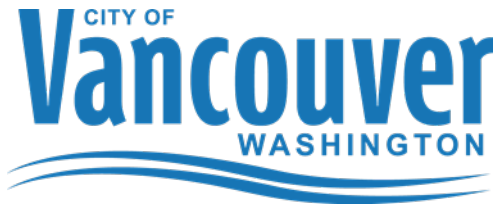
## VMC 20.410.050

*B. Development standards.* Development standards in low-density residential zoning districts are contained in Table 20.410.050-1. The development standards in 20.410.050.B.1 shall only apply to land divisions approved after the effective date (07/27/2022) of this ordinance (M-4377) . These apply to all primary dwellings and accessory buildings on the site. For additional regulations governing accessory buildings, see Chapter 20.902 VMC



## Text changes – Hearing pause and sample motion

- Pause for Commission questions, public testimony, Commission deliberation and recommendation
- Sample Motion: Based on the October 24, 2023 public hearing discussion and staff report findings, the Planning Commission recommends that the City Council approve the Comprehensive Plan and zoning code text changes as described.



## Planning Commission

**TO:** Chair Ledell and Planning Commission

**FROM:** Bryan Snodgrass, Principal Planner, [bryan.snodgrass@cityofvancouver.us](mailto:bryan.snodgrass@cityofvancouver.us), 360-487-7946

**SUBJECT:** Public hearing review of fall 2023 Comprehensive Plan and Vancouver Municipal Code (VMC) Title 20 zoning code map and text changes

**HEARING DATE:** 10/24/2023

**REPORT DATE:** 10/12/2023

**PROPOSERS:**

- 192<sup>nd</sup> Avenue Comprehensive Plan and Zoning Map Changes Urban Low/R-6 to Urban High/R-22 – Gary Vance, represented by Jessica Herseg of Dowl
- Miller Plan/Zone Comprehensive Plan and Zoning Map Changes Urban Low/R-9 to Urban High/R-30 – Sergei Cormanitchi, represented by Jayson Taylor of PLS Engineering
- Wood Duck Springs Comprehensive Plan and Zoning Map Changes Urban Low/R-9 to Urban High/R-22 and Commercial/General Commercial – Songbird Homes, represented by Jayson Taylor of PLS Engineering
- Datepark Zoning Map Change R-18 to R-30 – Datepark Condominiums, represented by Asha Prasad
- Comprehensive Plan and Zoning Code Text Changes - City of Vancouver Community Development Department

**LOCATION:** Comprehensive Plan and Zoning map changes apply to individual properties as indicated in this report. Text changes apply citywide.

**RECOMMENDATION:** Forward a recommendation of approval to the City Council of the map and text changes as described in this report.

### I. BACKGROUND AND REVIEW PROCESS:

The Growth Management Act requires Comprehensive Plan changes to be reviewed collectively and no more than once per year. Zoning changes not involving the Comprehensive Plan may be reviewed at any time and independent of one another if needed. This staff report addresses

three Comprehensive Plan and zoning map designation changes proposed by property owners as part of the Annual Review process, one proposed zoning map designation change not requiring an associated Comprehensive Plan map change, and two Comprehensive Plan text changes and 14 zoning code text changes proposed by City staff.<sup>1</sup> These items were reviewed by the Planning Commission at workshops on July 25 and September 12. The October 24 public hearing was rescheduled from October 10.

Notice of the October 24, 2023 Planning Commission public hearing was provided through publication in the *Columbian* newspaper. A SEPA Determination of Non-significance (DNS) was issued and published in the *Columbian* on September 21. Individual mailed notice was sent to property owners and occupants of lots located within 500 feet of the four proposed map changes, and the rezone sites were posted with signs. At report date only one formal comment has been received by staff on the proposed map or text changes. Informal inquiries and concerns in opposition have been raised by neighboring residents of the 192<sup>nd</sup> Street rezone.

The GMA requirement to review annual Comprehensive Plan changes concurrently is intended to allow for review of cumulative impacts. As indicated in below table, the five Comprehensive Plan changes proposed this year apply in different areas and are very small relative to citywide land supplies, and do not have significant impacts on each other.

Comprehensive Plan amendments (map or text) for cumulative assessment

| Comprehensive Plan Change Proposal                                                              | Applicable Area                |
|-------------------------------------------------------------------------------------------------|--------------------------------|
| 192 <sup>nd</sup> Avenue map change - UL/R-6 to UH/R-22                                         | 9.8 acres on in east Vancouver |
| Wood Duck Springs map change - UL/R-9 to UH/R-22 and C/CC                                       | 13 acres in northern Vancouver |
| Miller map change - UL/R-9 to UH/R-30                                                           | 4 acres in northern Vancouver  |
| Text change to capital facilities plan to add downtown capital projects                         | Downtown Vancouver             |
| Text change to parks section of Chapter 5 and adoption by reference of Parks Comprehensive Plan | Citywide                       |

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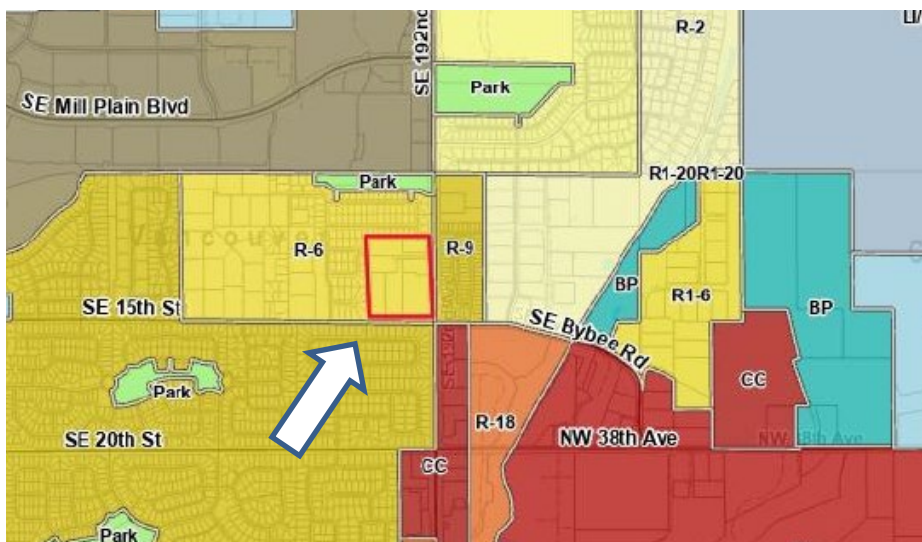
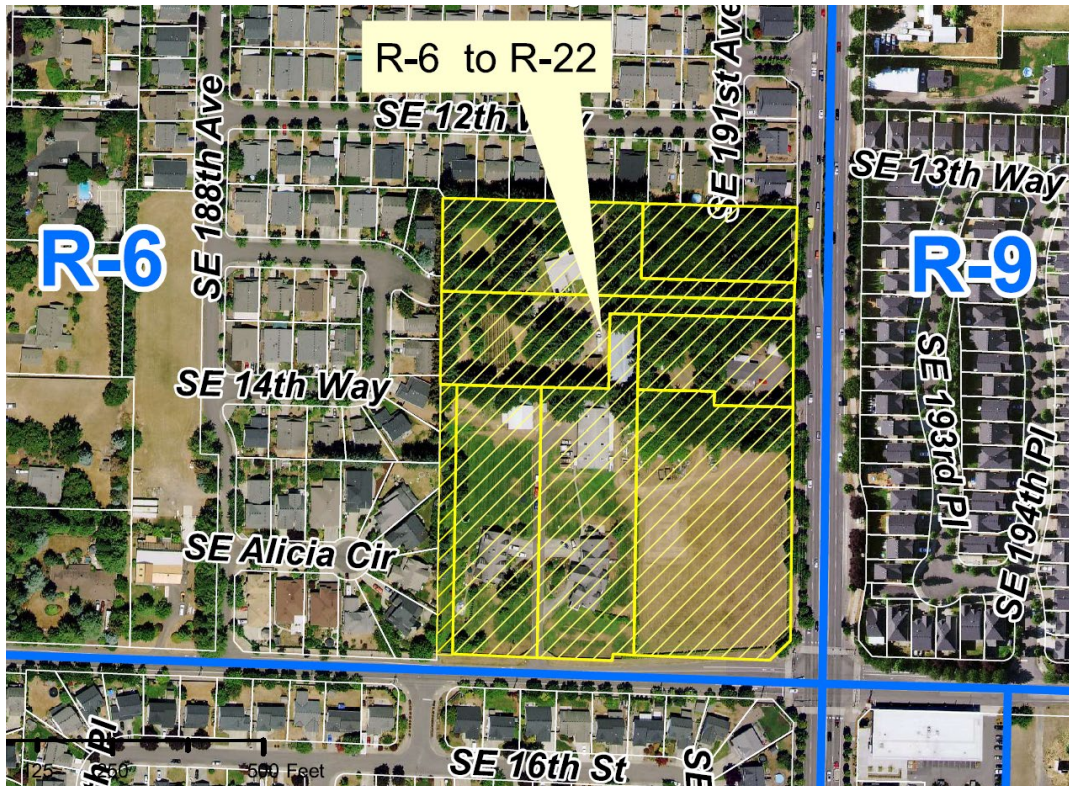
<sup>1</sup> As noted previously an additional proposed Comprehensive Plan and zoning change has not been included because of a dispute over its eligibility. A change from GC to R-30 is proposed on the west side of 143<sup>rd</sup> Avenue south of Fourth Plain Blvd. The property is subject to an existing development agreement which City legal staff believes precludes the City from changing to residential zoning without approval of area property owners who are also formal parties to the agreement. The applicant believes the City can do so, and has appealed the City staff determination that the rezone application is incomplete without a revised development agreement to the Hearings Examiner. If the Examiner rules in favor of the applicant, the proposal may be brought for Commission review.



## II. PROPOSALS AND RECOMMENDATIONS:

### A. Comprehensive Plan and zoning map changes

1. 192<sup>nd</sup> Avenue rezone – Urban Low Density/R-6 to Urban High Density/R-22 on 9.8 acres at the intersection 192<sup>nd</sup> Avenue and 15<sup>th</sup> Street



As indicated in the memorandum for the prior workshop, the site is in the Bennington Neighborhood and located in an area of detached single family homes to west and north zoned R-6, across 15<sup>th</sup> Street and 192<sup>nd</sup> Avenue to the south and east zoned R-9. On the diagonally opposite corner of the intersection 15<sup>th</sup> Street and 192<sup>nd</sup> Avenue are medical offices and restaurants zoned CC. Approximately 700 ft. north of the site is the Columbia Tech Center with a range of residential, commercial, and employment activities.

The original application proposed R-30 zoning, and envisioned 296 housing units in three and four story buildings with enhanced buffering and setbacks on the north and west perimeters directly abutting residential areas. In response to neighborhood concerns, the application has just recently been scaled down to R-22 zoning, with 210 to 223 units envisioned in two and three-story buildings. Setbacks of 35 feet are proposed for two-story buildings on the north and west sides of the property, with a 20-foot landscape buffer.

A pledge that five percent of the housing units will be affordable to households at 80% of Area Median Income (AMI) remains. The applicant is working with staff to finalize a Development Agreement to ensure that future development includes the proposed enhanced setbacks and approximate building placement, provides for affordable housing as indicated, and addresses the City Council [Interim Green Building Policy](#). A draft agreement is anticipated prior to the October 24 hearing.

An initial traffic analysis submitted with the application indicates that future development under proposed zoning would likely result in 1,457 more daily vehicle trips than development under the current zoning, and approximately 89 more trips in the evening peak hour. An expanded traffic study was provided by the applicant addressing trip distribution, which indicated that some of nearby intersections will experience incremental increases in delay times, but the Level of Service for each intersection will remain the same. These analyses were both conducted under the original proposal of R-30 zoning enabling approximately 296 housing units, so impacts should be lessened under the scaled down proposal of R-22 zoning enabling 210 to 223 units. An updated traffic analysis based on the R-22 zoning proposal is included separately with Planning Commission materials. Further traffic analysis will be undertaken at the development review stage.

The C-Tran #37 bus runs north and south along 192<sup>nd</sup> Avenue abutting the site, with service between downtown and the Fisher's Landing Transit Center, at generally 15-minute intervals.

The site is served by the Columbia Valley Elementary, Shahala Middle and Union High schools in the Evergreen School District. Information from the district on specific status of those schools is pending. Overall the district has faced a general decline in enrollment from pre-pandemic levels. District school impact fees are \$3,753 per multi-family unit. Full development of the site as envisioned if the rezone is approved would result in \$800,000 in impact fees towards District capital facilities. The Evergreen School District have indicated that the proposed rezone can be accommodated.

The applicant has initiated additional public outreach through door knocking, mailers and two community meetings in Hanna Acres park near the site, the most recent on September 28 attended by approximately 20 neighborhood residents, City staff, and the applicant team. Primary concerns raised were traffic impacts, particularly to 15<sup>th</sup> Street west of the site, and to

192<sup>nd</sup> Avenue. General concerns about neighborhood character, area growth, and public service impacts were also raised.

See Attachment A of this report for the original application narrative.

#### Analysis, findings, and recommendation

Staff finds that the proposed rezone complies with applicable criteria for Comprehensive Plan and zoning map changes of [VMC 20.285.050](#). It facilitates both market rate and affordable multi-family housing along a major transportation and transit corridor in very close proximity of commercial services, in an area of Vancouver generally lacking higher density multi-family housing. The need for housing, particularly denser and lower cost housing, is particularly acute presently, as the local, regional, and national housing affordability crisis continues. The City of Vancouver established an affordable housing task force in 2015, which issued recommendations in a 2016 report. Local voters approved an affordable housing levy in 2016, and renewed it in 2023. The City Council approved various zoning text changes to facilitate more and smaller housing through the Housing Code Updates project in 2022. The newly formed City Economic Prosperity and Housing department is leading the development of a citywide Housing Action Plan, and based on economic studies has identified a target of producing an average of 2500 housing units citywide per year, including 800 below market units, for the next ten years as needed to address existing local shortage of housing.

In the past two years the Washington legislature has passed a series of significant new housing laws. HB 1220 effectively requires local governments in Clark County to collectively demonstrate capacity in their upcoming 20-year Comprehensive Plans to accommodate more than 100,000 additional housing units, affordable at various income levels. Other statutory changes under HB 1110 require the cities of Vancouver, Camas and Washougal to effectively allow 4-6 unit plexes on almost all lots zoned for single family development, and under HB 1337 all local governments must allow two ADUs on single family zoned lots.

Staff finds that the proposal can assist in addressing local housing affordability needs and meeting new housing legal requirements. The proposed R-22 zoning is particularly needed to demonstrate compliance with new HB 1220 requirements to accommodate housing affordable at less than median income, which will likely be impossible to achieve citywide without higher density multi-family housing. The proposal site is an appropriate location, given the proximity of transportation and commercial services. Focusing developing in proximity to such services will also further climate objectives of the City of Vancouver, and new climate requirements in the Growth Management Act.

The applicant is also proposing mitigation measures to lessen impacts. In addition to voluntarily pledging that 5% of the units would be affordable at 80% of area median income, the applicant has scaled back the density and building heights of the original proposal in response to neighborhood concerns, while retaining enhanced setbacks and buffers on the north and west perimeters which immediately abut existing single family residences.

The proposed rezone would result in additional vehicle traffic in the vicinity, and additional children in local schools, but the additional demands on associated public facilities would be

partially offset by payment of school and traffic impact fees. Additional traffic would not result in level of service failures of local facilities.

The proposed rezone would enable likely development of two and three story buildings on the site, some of which would be taller than surrounding single family homes which are predominantly two stories. However, impacts will be mitigated by enhanced buffers and setbacks on the north and west perimeter of the site directly abutting existing residential areas, and the presence of 192<sup>nd</sup> Avenue and 15<sup>th</sup> Street providing separation from residential areas to the east and south. Both 192<sup>nd</sup> Avenue and 15<sup>th</sup> Street have substantial existing street trees which will also lessen visual impacts of the proposed development to most but not all surrounding properties south and east of the rezone site. In staff's view this difference in height represents a change, not a fundamental incompatibility.

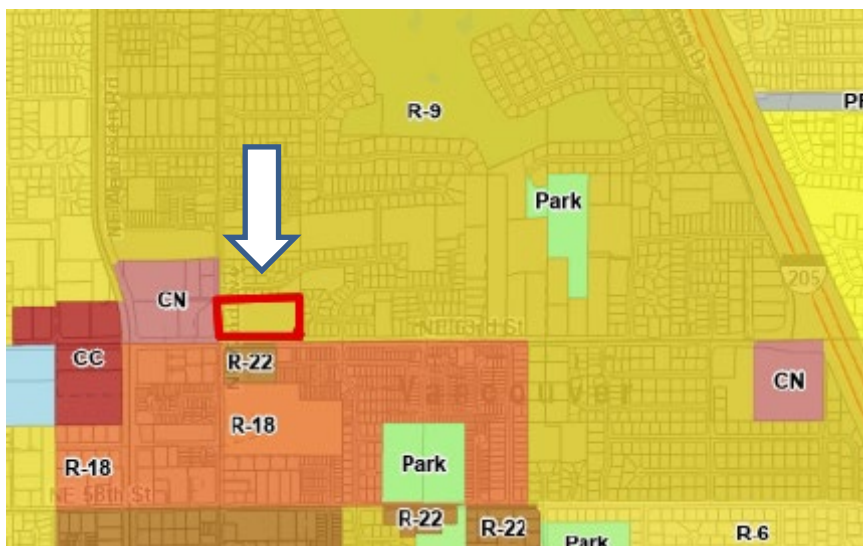
Focusing developing in proximity to such services will also further consistency with City of Vancouver [Climate Action Framework](#) adopted in 2022, and new climate requirements in the Growth Management Act.

Staff finds the proposal to be consistent with [Strategic Plan](#) focus areas of Housing and Human Needs and Vibrant and Distinct Neighborhoods. The proposal also complies with applicable [Comprehensive Plan](#) policies, particularly regarding housing options under Policy H-1, affordable housing under H-2, and housing placement near services and centers under H-5.

Staff recommends that the Planning Commission forward a recommendation of approval to the City Council.



2. **Miller – Urban Low Density/R-9 to Urban High Density/R-30 on 4.1 acres at 63<sup>rd</sup> Street and 72<sup>nd</sup> Avenue**



The proposal is located on the northeast corner of the intersection 63<sup>rd</sup> Street and 72<sup>nd</sup> Avenue. The rezone site contains several existing single-family homes, outbuildings, and vacant land. North and east of the rezone site are single family homes zoned R-9. West across 72<sup>nd</sup> Avenue is a City of Vancouver Fire Station and training facility. To the south across 63<sup>rd</sup> Street are newly constructed apartments (not shown in the above aerial) zoned R-22. The Miller rezone site is

approximately ¼ mile west of the proposed Wood Duck Springs rezone site also under review in 2023, and approximately 900 feet east of a major commercial center at the southwest corner of 63<sup>rd</sup> Street and Andresen.

The application envisions market rate apartments similar in style to those on the south side of 63<sup>rd</sup> if the rezone is approved. A conceptual layout included in Attachment B in this report along with the application narrative, envisions locating three apartment buildings in the center of the site, with parking along the west, north, and east perimeters. The site contains extensive wetlands, so future development likely will not be able to utilize all of the property, and may not be able to conform exactly to the conceptual layout. The maximum allowed height in the R-30 zone is 50 feet. Building locations, access points, conformance with City critical area requirements and other specifics will be determined at the time of site plan review.

Land to the south of the rezone site across 63<sup>rd</sup> Street was approved for rezone from R-18 to R-22 in 2021, with the same applicant and representative as the Miller rezone. The original applicant request and Planning Commission recommendation in that case was to R-30, which the City Council reduced to R-22 to better align with single family zoning north of 63<sup>rd</sup> Avenue.

The site is served by the Walnut Grove Elementary, Gaiser Middle and Fort Vancouver High schools in the Vancouver School District. Information from the district on specific current status of those schools is pending. Overall the district has faced a general decline in enrollment from pre-pandemic levels. District school impact fees are \$2,486 per multi-family unit.

The C-Tran #32 bus runs north and south along Andresen Road approximately 900 feet west of the site, with service between downtown and the Vancouver Mall Transit Center, at generally 30 minute intervals.

#### Analysis, findings, and recommendation

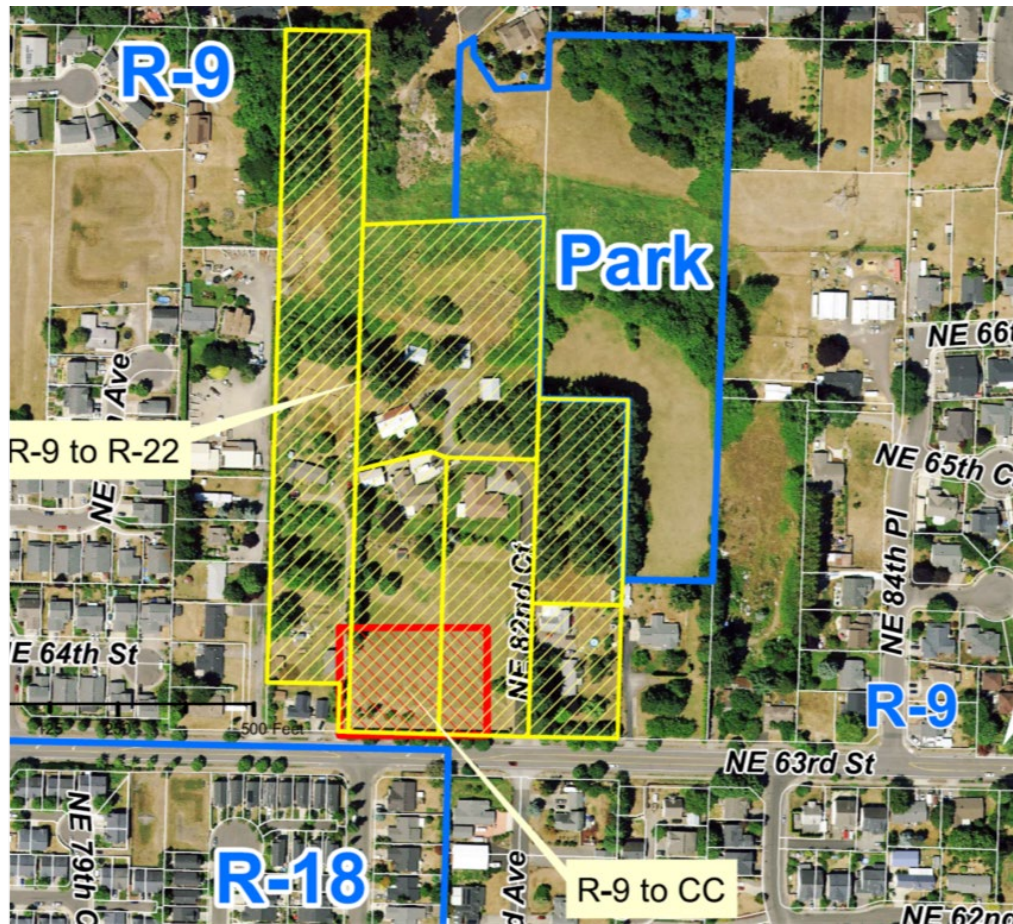
Staff finds that the Miller rezone proposal complies with applicable criteria for Comprehensive Plan and zoning map changes of [VMC 20.285.050](#). It facilitates market rate multi-family housing along a major roadway in very close proximity to transit and commercial services, in an area of Vancouver generally lacking higher density multi-family housing. As noted previously in this staff report, the need for housing, particularly denser and lower cost housing, is particularly acute presently, and has been the subject of recent local initiatives as well as new state mandates. Focusing developing in proximity to such services will also further consistency with City of Vancouver [Climate Action Framework](#) adopted in 2022, and new climate requirements in the Growth Management Act.

Staff finds the proposal to be consistent with [Strategic Plan](#) focus areas of Housing and Human Needs, Vibrant and Distinct Neighborhoods, and Climate and Natural Systems. The proposal also complies with applicable [Comprehensive Plan](#) policies, particularly regarding housing options under Policy H-1, and housing placement near services and centers under H-5.

Staff recommends the Planning Commission forward a recommendation of approval to the City Council.



3. Wood Duck Springs – Urban Low Density/R-9 to Urban High Density/R-22 and Commercial/CC on 13 acres at 63<sup>rd</sup> Street and 82<sup>nd</sup> Court



The proposal is located on the north side of 63<sup>rd</sup> Street approximately one mile north of Vancouver Mall. The rezone site contains several existing single-family homes, outbuildings, and vacant land. North and east of the rezone site is Kelly Meadows Park, zoned R-9. East and west along 63<sup>rd</sup> Street are large lot single family homesites also zoned R-9. To the south across 63<sup>rd</sup> Street are smaller single- family homes zoned R-18 and R-9.

The application envisions likely development of the site with a mix of up to 283 housing units, primarily new market rate apartments and townhomes, and retention of two of the existing single family homes. The application indicates townhomes are envisioned on the western portion of the site. The application estimates development envisioned if the rezone is approved would result in approximately 35% more daily trips than likely development under the current zoning. The north central portion of the site contains wetland mapping indicators, which may reduce overall site development slightly, to be determined at the time of development review.

The site is served by the Walnut Grove Elementary, Gaiser Middle and Fort Vancouver High schools in the Vancouver School District. Information from the district on specific current status of those schools is pending. Overall the district has faced a general decline in enrollment from pre-pandemic levels. District school impact fees are \$2,486 per multi-family unit.

The C-Tran #32 bus runs north and south along Andresen Road approximately ½ mile west of the site, with service between downtown and the Vancouver Mall Transit Center, at generally 30-minute intervals.

See Attachment C in this report for the application narrative.

#### Analysis, findings, and recommendation

Staff finds that the Wood Duck Springs rezone proposal complies with applicable criteria for Comprehensive Plan and zoning map changes of [VMC 20.285.050](#). The rezone would facilitate significant market rate multi-family housing along a major roadway, and the commercial component of the rezone could potentially provide close by shopping and employment opportunities for residents in the development and surrounding residential areas.

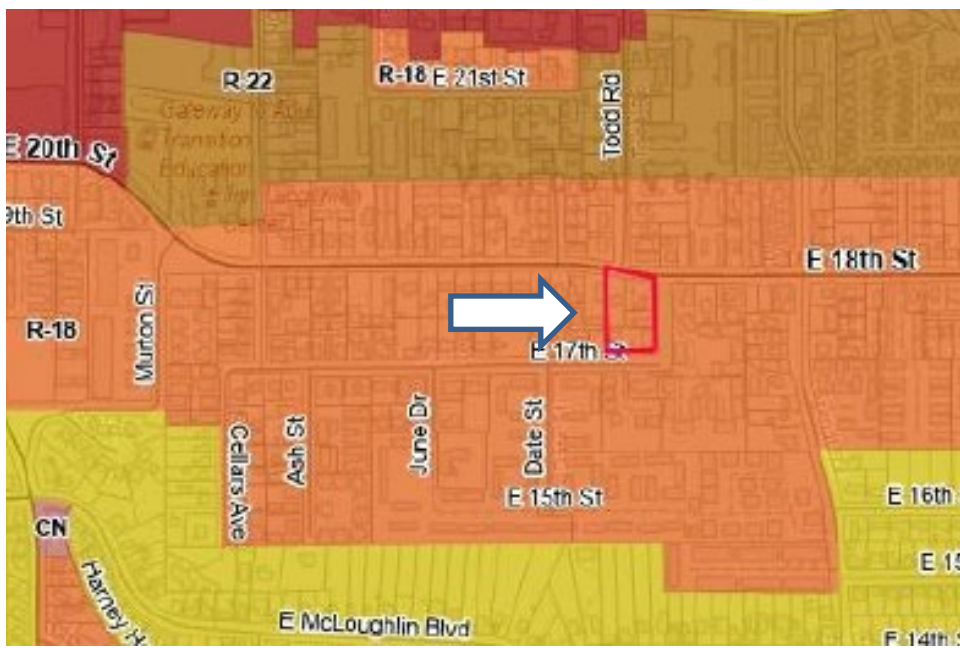
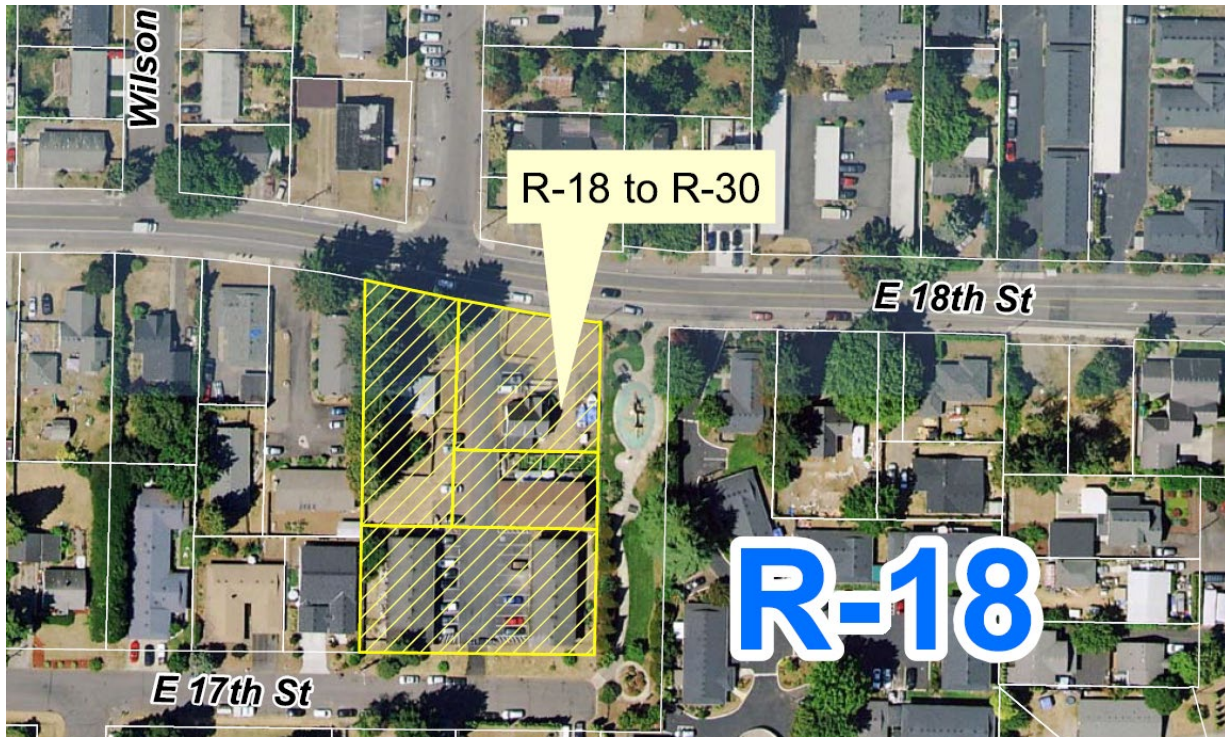
Staff finds the proposal to be consistent with [Strategic Plan](#) focus areas of Vibrant and Distinct Neighborhoods, and Climate and Natural Systems. The proposal is also consistent with [Comprehensive Plan](#) policies H-1, Housing Options; H-5, Housing Placement near Services and Centers; CD-5, Mixed Use; CD-10, Complimentary Uses; CD-14, Connected and Integrated Communities; and CD 16, Sustainability.

Staff recommends the Planning Commission forward a recommendation of approval to the City Council.



## 1. Zoning map change

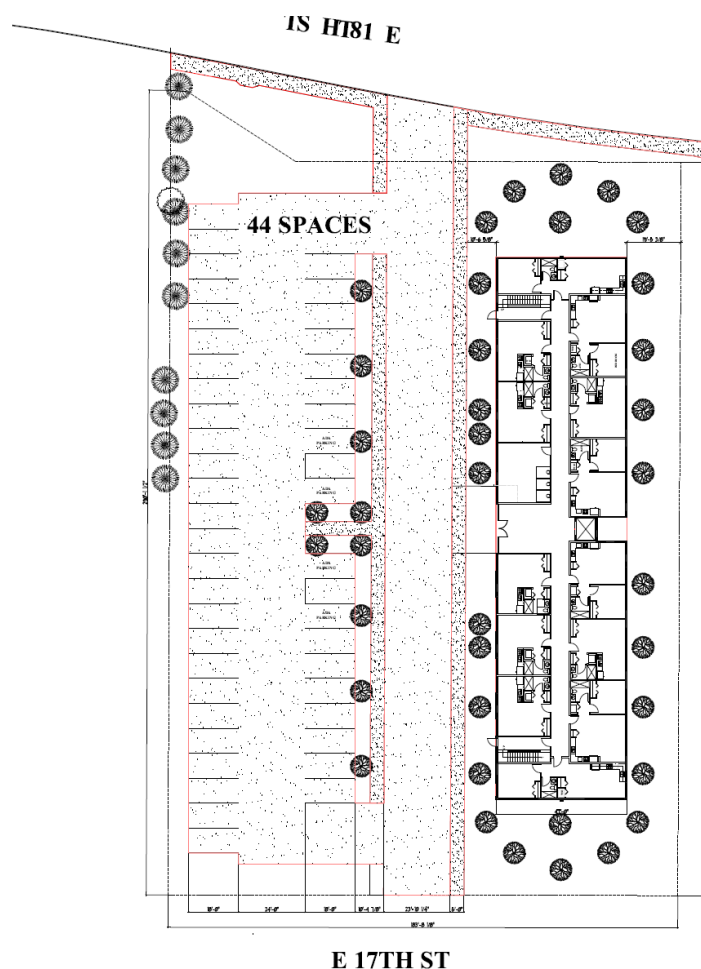
- a. Date Park – R-18 to R-30 on 1.2 acres on SE 18<sup>th</sup> Street at Todd Road in the Maplewood Neighborhood Association approximately 1000 feet south of Fourth Plain Boulevard



The proposal is located in an older residential area with a mix of housing types zoned R-18. North of the site across E. 18<sup>th</sup> Street at the intersection with Todd Road is a small apartment building and a single-family home. West of the rezone site is a single-family home and a duplex. South across E 17<sup>th</sup> Street is a single-family home and small apartment. East is MyPark, a narrow park owned and operated by the City of Vancouver.

The site contains two existing homes and 13 Second Chance rental units, owned by the rezone applicant Datepark Condominiums, a small affordable housing provider. If the rezone is approved, the application proposes to replace all of the existing structures with four buildings providing 54 affordable housing units consisting of 24 studios and 30 one-bedroom units. The City of Vancouver Community Development Department is co-sponsoring the application, consistent with existing CDD policy in support of rezone applications which staff finds are consistent with rezone criteria, and facilitate housing projects where at least 40% of units will be affordable to households earning 60% or less of Area Median Income. See Attachment D in this report for more information.

The applicant has provided a conceptual site plan indicating the buildings are proposed on the east end of the site adjacent to the park, with parking on the west side.



The applicant has provided a traffic analysis projecting development of the site as proposed under R-30 zoning would result in 327 daily vehicle trips, in comparison to 197 daily trips under buildout under the current R-18 zoning.

The site is directly served by the C-Tran #30 bus, with service on 18<sup>th</sup> Street at 30 minutes intervals.

The applicant is working with staff to finalize a Development Agreement to ensure that future development follows the conceptual site plan including its enhanced setbacks and approximate building placement, provides for affordable housing as indicated, and addresses the City Council [Interim Green Building Policy](#). A draft will be provided in advance of the October 24 hearing.

#### Analysis, findings, and recommendation

Staff finds that the Datepark rezone proposal complies with applicable criteria for Comprehensive Plan and zoning map changes of VMC [20.285.060](#). The proposal would allow for subsequent development of 54 units of affordable housing immediately adjacent to transit service. As noted previously in this staff report, the need for housing, particularly affordable housing, is particularly acute presently, and has been the subject of recent local initiatives as well as new state mandates. Staff finds the proposal to be consistent with [Strategic Plan](#) focus areas of Housing and Human Needs, Vibrant and Distinct Neighborhoods, and Climate and Natural Systems. The proposal also complies with applicable [Comprehensive Plan](#) policies, particularly regarding housing options under Policy H-1, affordable housing under H-2, and housing placement near services and centers under H-5. The affordable housing crisis and related recent new state housing mandates is the most relevant change in circumstances since establishment of the current zoning.

Staff recommends that the Planning Commission forward a recommendation of approval to the City Council.

## B. Comprehensive Plan and Zoning Code Text Changes

| Comprehensive Plan Section                                                                                            | Recommended Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Comprehensive Plan Capital Facilities Project list (separate document adopted by reference into Comprehensive Pan) | Add two capital parking projects to citywide capital project list, Library Square/Riverwest Parking Structure, and Downtown Parking Extension Project.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 2. <a href="#">Comprehensive Plan</a> Chapter 5, Public Facilities and Services, Appendix E, and                      | <ul style="list-style-type: none"> <li>-Amend Comprehensive Plan text on page 5-33 to clarify parks service areas as being within 1.5 miles of public access points</li> <li>- Amend Comprehensive Plan text on page 5-38, replacing outdated Table 5-15, the 2011-16 Parks Capital Facilities Plan, with new 2023-32 Capital Facilities Plan.</li> <li>- Amend Comprehensive Plan Appendix E, Documents adopted by reference, to include updated parks document references <a href="#">See Attachment E1</a></li> <li>- Amend Vancouver Parks, Recreation &amp; Cultural Services Comprehensive Plan (2022-2031) to update capital facilities plans, service area provisions, and other provisions. <a href="#">See Attachment E2</a></li> </ul>                                                                                                                                                                                                                                                                                                                    |
| Zoning Code Section                                                                                                   | Issue/Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 3. Zoning Code Definitions, Breezeway, VMC <a href="#">20.150.040.A</a>                                               | <p>Require breezeways linking structures (so that a second structure is not separate and accessory) to include a roof.</p> <p><b>Breezeway.</b> A <a href="#">roofed</a> structure for the principal purpose of connecting the main building or buildings on a property with other main buildings or accessory buildings.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 4. Use Classifications. VMC <a href="#">20.160.020</a>                                                                | <p>Delete bus barns from the VMC 20.160.020.D.5 category of Warehouse/Freight Movement as its already covered under VMC 20.160.020.B.14 under bus facilities. Add associated fuel storage to the VMC 20.160.020.B.14 category of Transportation Facilities to clarify it is an allowed use. Add a definition for temporary uses, which are currently undefined.</p> <p><i>D.5. Warehouse/Freight Movement. Uses involved in the storage and movement of large quantities of materials or products indoors and/or outdoors; associated with significant truck and/or rail traffic. Examples include freestanding warehouses associated with retail furniture or appliance outlets; household moving and general freight storage; food banks; cold storage plants/frozen food lockers; weapon and ammunition storage; major wholesale distribution centers; truck, marine and air freight terminals and dispatch centers; <a href="#">bus barns</a>; grain terminals; and stockpiling of sand, gravel, bark dust or other aggregate and landscaping materials.</i></p> |



|                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                   |                                   |  |           |                                                         |                   |
|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------------------------|--|-----------|---------------------------------------------------------|-------------------|
|                                                                                        | <p>B.14. Transportation Facilities. Bus, trolley, streetcar, light and heavy rail transit stops, <del>and</del> stations <u>and other facilities</u>; water taxi and ferry stations; and accessory bicycle parking. <u>Includes associated fuel storage</u>. Excludes airports (see subsection (E)(2) of this section, Airports/Airparks); public streets and sidewalks; and heavy and light rail maintenance/switching yards (see subsection (D)(3) of this section, Railroad Yards); and heliports (see subsection (E)(7) of this section, Heliports). Such a facility that has regional or state-wide significance is classified as an essential public facility by the provisions of the Growth Management Act.</p> <p>E.10. Temporary Uses. <u>Includes uses that are temporary or interim in nature that are not subject to full compliance with the development standards for the applicable zoning district, or by which the city may allow seasonal or transient uses not otherwise permitted. Uses may include seasonal or special events involving tents, canopies, membrane structures or storage containers. Situations caused by an unforeseen event deemed by the planning official to be an emergency situation or a temporary trailer or prefabricated building for use on any commercial or industrial zoned property as temporary commercial or industrial office or space associated with the primary use.</u></p> |                   |                                   |  |           |                                                         |                   |
| 5. Measuring Lot Widths and Depths, VMC <a href="#">20.170.070</a>                     | <p>Clarify width and depth for flag lots</p> <p><u>B. Criteria for measuring flag lot widths and depths. Flag lot widths and depths are measured from the midpoints of opposite lot lines of the flag portion of the lot, excluding the access stem.</u></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                   |                                   |  |           |                                                         |                   |
| 6. Planning Fees, VMC <a href="#">20.180.060</a> 37.A (2-9 lots)                       | <p>Delete 'short subdivision' reference which is addressed elsewhere in the fee code</p> <table><tr><td><b>37.</b></td><td colspan="2"><b>Subdivisions – Preliminary</b></td></tr><tr><td><b>A.</b></td><td><u>2—9 lots (not qualifying as a short subdivision)</u></td><td><b>\$8,220.00</b></td></tr></table>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>37.</b>        | <b>Subdivisions – Preliminary</b> |  | <b>A.</b> | <u>2—9 lots (not qualifying as a short subdivision)</u> | <b>\$8,220.00</b> |
| <b>37.</b>                                                                             | <b>Subdivisions – Preliminary</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                   |                                   |  |           |                                                         |                   |
| <b>A.</b>                                                                              | <u>2—9 lots (not qualifying as a short subdivision)</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>\$8,220.00</b> |                                   |  |           |                                                         |                   |
| 7. Decision Making Procedures for Type II Applications, VMC <a href="#">20.210.050</a> | <p>Remove outdated requirement that notices be through “regular” mail only, which eliminates option of notice via email, including to parties that have already commented through email.</p> <p><i>F. Distribution of Notice of Application. The Notice of Application shall be published in a newspaper of local circulation and sent to the following persons by <u>regular</u> mail:</i></p> <p><i>J. Distribution of the Final Decision. The planning official shall provide an affidavit of mailing of the Final Decision as part of the file. The Final Decision shall indicate the date the Final Decision was mailed and demonstrate that the required Final Decision was mailed to the necessary parties in a timely manner. A Final Decision shall be sent by <u>regular</u> mail to:</i></p> <p><i>L. Distribution of Notice of Decision. The planning official shall provide an affidavit of mailing of the Notice of Decision as part of the file. The Notice of Decision shall indicate the date the notice was mailed and demonstrate that the required notice was mailed to the necessary parties in a timely manner. A Notice of Decision shall be sent on the same day as the Final Decision by <u>regular</u> mail to:</i></p>                                                                                                                                                                                      |                   |                                   |  |           |                                                         |                   |
| 8. Conditional Use Permits Submission                                                  | Clean up submittal requirements for electronic submittals                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                   |                                   |  |           |                                                         |                   |

|                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Requirements, VMC<br><a href="#">20.245.030</a>                                                  | <p><del>10. Pre-application conference summary or approved pre-application waiver, as well as additional information required in the summary.</del></p> <p><del>11. One set 8 1/2" X 11" plans.</del></p> <p><del>120. One copy of a Completed</del> SEPA (State Environmental Policy Act) checklist (as required), on City provided form. Include SEPA processing fee, pursuant to Chapter <a href="#">20.180</a> VMC, Fees.</p> <p><del>131.</del> Required processing fee for Conditional Use Permit (See Chapter <a href="#">20.180</a> VMC).</p> <p><del>142.</del> Concurrency letter, addressed to Transportation Manager, with summary of project with projected traffic impacts, <del>8 1/2" X 11" site map</del> with appropriate fee. (See <a href="#">20.180</a> VMC).</p> |
| 9. Site Plan Review Submission<br>Requirements, VMC<br><a href="#">20.270.040.C</a>              | <p>Include location and dimensions of easements</p> <p>C. Proposed site development plan. The proposed site plan shall be drawn at the same scale as the existing conditions plan and shall include the following information:</p> <p><u>5. Location, dimension, and purpose of existing easements.</u></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 10. Binding Site Plans, VMC <a href="#">20.330</a>                                               | Fix broken links, add requirement for binding site plans to show easements with dimensions – <a href="#">See Attachment F</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 11. Lower Density Residential Districts, VMC <a href="#">20.410.050</a><br>Development Standards | Clarify that single family streetfront standards adopted as part of 2022 Housing Code Updates apply to land divisions submitted after the 7/27/22 ordinance adoption date; Clarify role of Planned Developments, Infill, and Clusters in maximum density calculations<br><a href="#">See Attachment G</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 12. Critical Areas Protection, VMC <a href="#">20.740</a>                                        | In response to new federal Flood Insurance Rate Maps (FIRM) going into effect in November, update local definitions, add reference to new FIRM maps, and modify the variance process for historic structures in the floodplain. <a href="#">See Attachment H</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 13. SEPA Categorical Exemptions, VMC <a href="#">20.790.200</a>                                  | <p>Pursuant to recent statutory changes allowing greater residential exemptions to facilitate housing, exempt apartments with fewer than 200 units from requiring SEPA review unless critical lands or other factors are present to trigger review</p> <p><u>1. Residential projects : those containing <del>20</del> 200 multi-family dwelling units or fewer, 30 single family units or fewer, or 100 single family units or fewer on lots less than 1500 square feet in size</u></p>                                                                                                                                                                                                                                                                                                |
| 14. Cottage Clusters, VMC <a href="#">20.950</a>                                                 | Clarify definition of density bonus and common area. Address minimum lots sizes and frontages, and allowance for pre-existing homes exceeding cluster requirements. <a href="#">See Attachment I</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

### Analysis, findings, and recommendation

Staff finds the proposed Comprehensive plan and zoning code text amendments are consistent with applicable approval criteria of [VMC 20.285.070](#)

Proposed Comprehensive Plan changes are necessary to update existing project lists, and recognize the latest Parks, Recreation & Cultural Services Comprehensive Plan. Proposed zoning

code changes are primarily for updates, clarifications, and corrections. Updates to Vancouver zoning code SEPA provisions are to utilize recent allowances in state law to no longer automatically require SEPA review for small and mid-scale residential projects simply on the basis of the number of units involved, although review would still be required if other environmental factors are present.

Staff recommends that the Planning Commission forward a recommendation of approval of the proposed text changes to the City Council.

#### **ATTACHMENTS:**

- A. 192<sup>nd</sup> Avenue rezone application narrative
- B. Miller rezone application narrative
- C. Wood Duck Springs rezone application narrative
- D. Datepark rezone application narrative
- E1. Parks related changes to Vancouver Comprehensive Plan, 2011-2030
- E2. Changes to [Vancouver Parks, Recreation & Cultural Services Comprehensive Plan \( 2022-2031\)](#)
- F. VMC 20.330, Binding Site Plans
- G. VMC 20.410, Single Family Residential District
- H. VMC 20.740.120 Frequently Flooded Areas
- I. VMC 20.950 Cottage Cluster Developments

The site plan illustrates the proposed development layout. Key features include:

- Buildings:** Eight buildings are shown, numbered 1 through 8. Buildings 1, 2, 3, 4, 5, 6, 7, and 8 are all 2 or 3 stories high. Building 1 is a 2-story building. Buildings 2, 3, 4, 5, 6, 7, and 8 are 3-story buildings.
- Parking:** A central parking area contains 30 stalls, labeled "PARKING GARAGES 30 STALLS".
- Recreation:** A "PLAYGROUND" is located near the center, and an "OUTDOOR AMENITY AREA" is situated to the right of the playground.
- Amenities:** A "POTENTIAL STORM-WATER FACILITY" is located near the outdoor amenity area. A "SPA" and "POOL" are located near the bottom center of the site.
- Access and Egress:** "FULL ACCESS" is indicated at the bottom. "EMERGENCY EXIT GATE (TYP.) NO PEDESTRIAN ACCESS THROUGH GATES, UNLESS REQUIRED BY CODE" is noted at the top right. "RIGHT IN / RIGHT OUT" is indicated near the top right.
- Setbacks and Buffers:** "35' SETBACK" is shown on the left. "20' LANDSCAPE BUFFER" is shown on the left. "27' PROPOSED ROW VACATION" is shown on the left. "27' LANDSCAPE BUFFER" is shown on the right. "27' SETBACK" is shown on the right. "27' LANDSCAPE BUFFER" is shown on the bottom left.
- Other Features:** "EXISTING SINGLE FAMILY RESIDENCE WILL BE RETAINED AND USED CONVERTED INTO 2 RENTAL UNITS" is noted near building 1. "EXISTING SINGLE FAMILY RESIDENCE WILL BE DEMOLISHED OR RETAINED AND CONVERTED TO INCLUDE RESIDENTIAL UNITS (UP TO 4) AND COMMUNITY SPACE" is noted near building 2.



## 2.0 PROJECT SUMMARY

### 2.1 Existing Conditions

#### Description of Original Requested Amendment

On behalf of the applicant, Vance Development, DOWL prepared a request for a Comprehensive Plan Amendment and concurrent Zone Change (CPA/ZC) for a group of parcels located northwest of SE 192<sup>nd</sup> Avenue and SE 15<sup>th</sup> Street intersection in East Vancouver, submitted in June of 2023. The request included a Comprehensive Plan Map change from Urban Low-Density (UL) to Urban High-Density (UH) and a corresponding Zone Change from Urban Low-Density Residential, R-6 (6 dwelling units (du) per acre) to Urban High-Density Residential, R-30 (30 du per acre). The request was supplemented with various supporting documents identified as Exhibits A-E, listed on Page 1 of this narrative. Following initial submittal of the application, a full Transportation Impact Analysis, prepared by Kittelson and Associates, Inc. and a draft Development Agreement prepared by Jordan Ramis, PC, were also submitted to the city in support of the requested amendment, these documents were submitted after the initial application and have been identified as Exhibits F and G, respectively.

#### Neighborhood and Public Outreach

The applicant began outreach efforts with neighbors within the vicinity of the site in early May and has continued through October. Initial contact was focused on individual property owners directly abutting the CPA/ZC site to the north and west. The applicant informed neighbors of the proposal and discussed site design commitments being proposed to address compatibility of the higher density zone with the existing neighborhood.

The applicant also organized and held two public meetings at Hanna Acres Park, on September 13<sup>th</sup> and September 28<sup>th</sup>, where he and representatives from DOWL and KAI participated in an informal presentation about the requested CPA/ZC and answered questions by attendants of the meetings.

Below is a table outlining most of the comments received during the neighborhood meetings as well as the applicant's response to those comments.

| Comments from Neighbors                                                                     | Applicant Response                                                                                                                                                                                                                                                                     |
|---------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Concern over the type, scale and density of housing anticipated on the site.                | Changed request from R-30, (296 units in 3-4 story buildings) to R-22, (210-223 units in 2-3 story buildings).                                                                                                                                                                         |
| Avoiding pedestrian and vehicle activity on existing neighborhood streets.                  | Gates and fencing at SE 191 <sup>st</sup> Avenue and SE 13 <sup>th</sup> Street will limit vehicular and pedestrian access to emergency access.                                                                                                                                        |
| Parking demand and potential for future residents to park on adjacent neighborhood streets. | Target on-site parking ratio will exceed the minimum required by code to provide sufficient parking on site. Further, pedestrian access from neighborhoods to north and west will be blocked with fence and emergency access gate, which will discourage parking in the neighborhoods. |
| Traffic congestion along SE 15 <sup>th</sup> Street and SE 192 <sup>nd</sup> Avenue.        | A TIA was completed to evaluate traffic impacts associated with the current and proposed zoning. As reflected in the study,                                                                                                                                                            |

|                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                    | included as Exhibit H, all study intersections will operate at an acceptable level of service under the proposed R-22 zoning.                                                                                                                                                                                                                                                                                                                                        |
| Pedestrian and bicycle safety along SE 15 <sup>th</sup> Street.                    | A future development project on the subject site will include constructing sidewalks and bike lanes along the north side of SE 15 <sup>th</sup> Street adjacent to the property. The City of Vancouver should investigate additional safety concerns along SE 15 <sup>th</sup> Street.                                                                                                                                                                               |
| Preserving trees and views along the edges of the property.                        | <ul style="list-style-type: none"> <li>Existing trees along the west and north property lines will be preserved to the extent practical.</li> <li>Two-story buildings are planned adjacent to existing neighborhoods to the west and north.</li> <li>Applicant will preserve the two existing homes, if practical.</li> <li>Buildings will be two and three stories, which is similar to the predominantly two-story homes in the adjacent neighborhoods.</li> </ul> |
| Providing fencing adjacent to properties to the north where none currently exists. | The applicant will ensure that there is a fence between the subject property and the neighboring properties.                                                                                                                                                                                                                                                                                                                                                         |
| No “low-income” housing.                                                           | <p>No low-income housing is proposed at the property (defined as households earning 60% or 30% of Area Median Income (AMI)).</p> <p>The project will produce between 210-223 middle-housing units which are in high demand and short supply in the market.</p> <ul style="list-style-type: none"> <li>5% of units will be leased to residents earning no more than 80% of AMI.</li> <li>95% of the apartments will be “market rate” apartments.</li> </ul>           |
| Concern about overcrowding of schools.                                             | According to the Evergreen School District, enrollment is down at nearby schools and the schools can accommodate additional students from this rezone application. Any future development will be required to pay school impact fees as prescribed by the Evergreen School District Capital Facilities Plan.                                                                                                                                                         |

### Description of Revised Requested Amendment

In response to neighborhood concerns, the applicant has elected to revise the application to request a Zone Change to Urban High-Density Residential, R-22 (22 du per acre), the prior

Comprehensive Plan Map Amendment request from UL to UH is unchanged from the original request. This narrative as well as a revised Transportation Impact Analysis (TIA), prepared by Kittelson and Associates, evaluating the traffic impacts of the requested change to Urban High-Density Residential, R-22, have been provided to support the requested change to R-22. The revised TIA is included as Exhibit H. No development requests are included with this CPA/ZC application; however, a conceptual site plan has been prepared (Exhibit I) and is discussed briefly with the CPA/ZC narrative to provide context for a future development scenario which could follow approval of this CPA/ZC request.

### Existing Site Conditions

The project site consists of tax lots 177224000, 177224005, 177224010, together with a 27-foot-wide by approximately 445-foot-long unimproved right-of-way (ROW), further identified as Lots 1, 2, and 3 in the Nielsen Short Plat (Book 2, Page 634), and tax lots 177240000, 177242000, 177238000, and 177239000. The property is approximately 10 acres. Portions of the project are developed with single-family houses and appurtenant structures including carports, garages, decks, well(s), and on-site sewage facilities. There are no mapped indicators of critical areas on the project site. The project site is also relatively flat, with slopes typically ranging between 0-5 percent. A summary of the site is provided in Table 1 below. The assemblage sits northwest of the intersection of SE 192<sup>nd</sup> Avenue and SE 15<sup>th</sup> Street as reflected in the Site Vicinity Map, Figure 1, below, developed from Clark County Maps Online.

*Table 1: Site Summary*

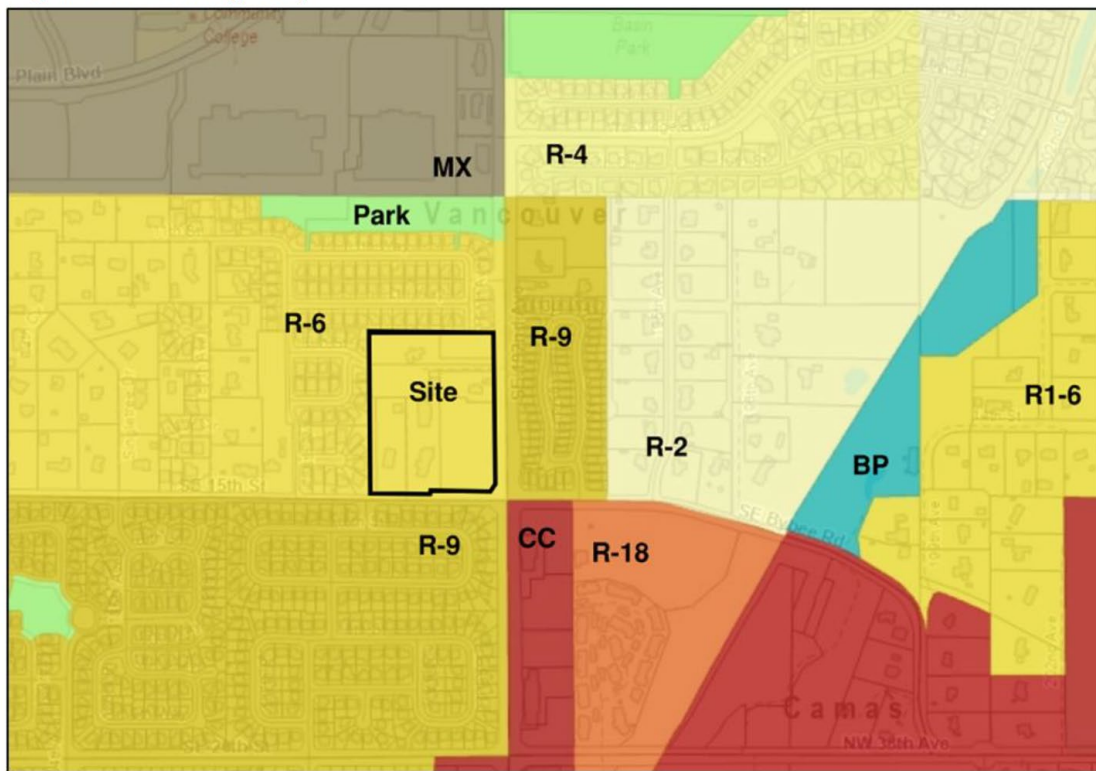
| Parcel ID      | Zoning | Critical Areas        | Use                       | Acreage      |
|----------------|--------|-----------------------|---------------------------|--------------|
| 177224000      | R-6    | No mapping indicators | Single-Family Residential | 1.43         |
| 177224005      | R-6    | No mapping indicators | Single-Family Residential | 1.74         |
| 177224010      | R-6    | No mapping indicators | Vacant                    | 2.52         |
| 177240000      | R-6    | No mapping indicators | Single-Family Residential | 0.82         |
| 177242000      | R-6    | No mapping indicators | Vacant                    | 0.79         |
| 177238000      | R-6    | No mapping indicators | Vacant                    | 1.21         |
| 177239000      | R-6    | No mapping indicators | Single-Family Residential | 1.36         |
| Unimproved ROW | R-6    | No mapping indicators | Vacant                    | 0.28         |
| <b>Total:</b>  |        |                       |                           | <b>10.15</b> |

The site is bordered to the north and west by single-family dwellings, to the south by SE 15<sup>th</sup> Street and to the east by SE 192<sup>nd</sup> Avenue. Adjacent uses and underlying zoning of the land is identified in Table 2 below. Zoning in the vicinity of the project site is depicted on Figure 2, obtained from Clark County Maps Online.

|       | Zoning | Use                       |
|-------|--------|---------------------------|
| North | R-6    | Single-Family Residential |
| South | R-9    | Single-Family Residential |
| East  | R-9    | Single-Family Residential |
| West  | R-6    | Single-Family Residential |



**Figure 2: Zoning Map**



#### **Public Infrastructure Projects**

There are no known public infrastructure projects planned within proximity of the CPA/Rezone property on the City's current six-year Transportation Improvement Program (TIP) or Capital Improvement Program (CIP).

#### **Development Agreement**

A draft Development Agreement (DA) was submitted to the city on September 8, 2023, proposing site development commitments related to the R-30 request. The city provided comments on the DA on October 11, 2023. The applicant is reviewing the comments and will submit a revised draft which aligns with the revised request to rezone the site to R-22 and addresses staff comments. The DA will include a commitment to affordable housing, green building goals, and other voluntary site development commitments provided the R-22 zone change request is approved.

#### **Related Land Use Activity**

A pre-application conference request for the subject CPA/ZC was submitted and processed in 2023 (PIR 83420). A copy of the pre-application conference notes issued by City staff were provided as Exhibit B with the original application request. Additionally, the requested amendment is subject to regulation under the State Environmental Policy Act (SEPA). A Non-Project Checklist was submitted as Exhibit C with the original application. The City issued a SEPA Determination of Non-Significance for the original CPA/ZC request on September 21, 2023. The applicant's request to change the proposal from a zoning of R-30 to R-22 will result in fewer housing units, and less vehicle trips associated with the rezone and as such city staff, acting as lead agency,

has determined that the original SEPA checklist and subsequent determination has adequately addressed impacts.

No development requests are included with this CPA/ZC request. However, a conceptual site plan for the R-22 zoning is provided with this request as Exhibit I and discussed briefly within the context of the CPA/ZC to provide an example of a potential development scenario for the site following approval of the requested change.

A review of the revised CPA/ZC request and its consistency with elements of the City's Comprehensive Plan, Draft Housing Action Plan, Strategic Plan and applicable sections of the City's Municipal Code, and state law is offered within this narrative and supplemented by the exhibits included with the application packet.

- (3) Transportation. Encourage efficient multimodal transportation systems that are based on regional priorities and coordinated with county and city comprehensive plans.**

**Response:** As stated above, the CPA/ZC site is located in the northwest corner of the intersection of SE 192<sup>nd</sup> Avenue, a principal arterial, and SE 15<sup>th</sup> Street, a minor arterial. SE 192<sup>nd</sup> Avenue consists of two northbound and two southbound lanes a center median which is converted to a turn lane at intersections. The roadway includes detached sidewalks and striped bike lanes on each side. SE 15<sup>th</sup> Avenue is a variable width minor arterial with one travel lane in the east and one travel lane in the west direction. The road includes striped bike lanes and detached sidewalks along the south side of the roadway adjacent to the site. The requested CPA/ZC will not impact existing multi-modal facilities present along either roadway. Frontage improvements to SE 15<sup>th</sup> Avenue, including the installation of curb, gutter, sidewalk and the continuation of bike lanes would be expected for any future development of the site whether under the existing or proposed zoning. C-Tran Route 37, referred to as the Mill Plain/Fishers Route runs along SE 192<sup>nd</sup> Avenue between Mill Plain and SE 34<sup>th</sup> Street before heading west to connect with SE 164<sup>th</sup> Avenue and the Fisher's Landing Transit Center and eventually tying back in with Mill Plain. The route continues down Mill Plain and connects with Downtown Vancouver. The proximity to public transportation as well as multi-modal facilities including sidewalks and bike lanes make the subject site an ideal location for increased density to better meet other policy goals while also supporting and eventually enhancing multi-modal facilities by constructing a missing segment of public sidewalk along SE 15<sup>th</sup> Avenue adjacent to the site.

- (4) Housing. Plan for and accommodate housing affordable to all economic segments of the population of this state, promote a variety of residential densities and housing types, and encourage preservation of existing housing stock.**

**Response:** The requested CPA/ZC will convert land currently zoned primarily for detached single family residential development to high-density residential which allows a much wider variety of housing types which can serve more diverse economic segments of the population. The implementation of the R-22 zone at the site will set a new density range of 18.1 units (minimum) to 22 units (maximum) and will likely result in the development of multi-family units, a product type which is not widely available in the immediate vicinity. Further, the applicant will voluntarily commit to offering 5% of units to be leased at 80% of area median income (AMI). It is likely that some or all of the existing single-family homes within the site could be removed at the time of redevelopment, however the net increase in housing inventory, and the inclusion of some units at 80% AMI that would occur with future development responds to current shortages in the market for all housing, especially middle housing and affordable housing.

- (5) Economic development. Encourage economic development throughout the state that is consistent with adopted comprehensive plans, promote economic opportunity for all citizens of this state, especially for unemployed and for disadvantaged persons, promote the retention and expansion of existing businesses and recruitment of new businesses, recognize regional differences impacting economic development opportunities, and encourage growth in areas experiencing insufficient economic**

### 3.0 REVISED CODE OF WASHINGTON (RCW)

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The applicable code provisions are set forth below with responses demonstrating the project's consistency with these provisions.

#### ***Planning Goals (RCW 36.70A.020)***

The following goals are adopted to guide the development and adoption of comprehensive plans and development regulations of those counties and cities that are required or choose to plan under RCW 36.70A.040. The following goals are not listed in order of priority and shall be used exclusively for the purpose of guiding the development of comprehensive plans and development regulations:

- (1) **Urban growth. Encourage development in urban areas where adequate public facilities and services exist or can be provided in an efficient manner.**

**Response:** The project site is located within the Vancouver city limits in an area currently served by public facilities and services. More specifically, water, sewer, stormwater, and franchise utilities are located along the entire project frontage on SE 192<sup>nd</sup> Avenue and along portions of the project frontage on SE 15<sup>th</sup> Street. As such, the applicant anticipates that the proposed R-22 zoning designation could be accommodated by existing urban services and that laterals to provide service to the site could be identified and addressed at the time of site development in the future. A TIA was completed to evaluate traffic impacts associated with the current and proposed zoning. As reflected in the study, included as Exhibit H, all study intersections will operate at an acceptable level of service under the proposed R-22 zoning. The study indicated that the existing eastbound left-turn lane at SE 192<sup>nd</sup> Avenue and SE 15<sup>th</sup> Street is expected to exceed the currently available storage length under future five-year conditions for both the current and proposed zoning and, as such, additional queuing storage would likely be required at the time of site development. The study further stated that the exact length of the eastbound left turn lane would be determined at the time of a future site development proposal and would be based upon the proposed density of the future project. The study did not identify any safety-based mitigation requirements.

- (2) **Reduce sprawl. Reduce the inappropriate conversion of undeveloped land into sprawling, low-density development.**

**Response:** The project site is underdeveloped and consists of single-family structures interspersed with vacant lots. Under the proposed CPA/ZC, land would be converted from low-density residential R-6 to the high-density residential R-22 zoning designation. The proposed conversion encourages higher density housing in an urban area within close proximity to employment opportunities, as well as personal and professional services located at the southeast corner of the intersection of SE 192<sup>nd</sup> Avenue and SE 15<sup>th</sup> Street. Additionally, public parks, schools and significant retail and employment opportunities are present within ½ mile of the site in either direction along SE 192<sup>nd</sup> Avenue, a major transportation corridor which is served by public transportation.



**growth, all within the capacities of the state's natural resources, public services, and public facilities.**

**Response:** The requested zone change permits the development of high-density residential uses which will add to the diversity of housing types and price points. The infusion of additional housing in the area will bring additional residents to the area and will reinforce economic vitality for existing and aspiring businesses within the immediate vicinity and in East Vancouver.

**(9) Open space and recreation. Retain open space, enhance recreational opportunities, conserve fish and wildlife habitat, increase access to natural resource lands and water, and develop parks and recreation facilities.**

**Response:** The project site has mature trees clustered along the northern and western property lines that contribute to the unique character and aesthetic of the project site. The requested CPA/ZC does not prohibit the retention of open space or passive recreational activity and the applicant intends to preserve mature trees located within a 20-foot-wide landscape buffer along the western and northern site boundaries. The preservation of mature trees along the west and north property boundary provides a substantial benefit to the site and the existing neighborhoods. While the buffer may not provide active recreation opportunities, it will enhance aesthetics and provide shade, both of which are of public benefit. A Conceptual Site Plan has been provided to illustrate a possible development scenario for the site assuming a development of 210 to 223 dwelling units. The plan incorporates the aforementioned buffer to illustrate the value it could provide to both existing residents adjacent to the site as well as future residents of this site following redevelopment. The Conceptual Site Plan R-22 Alternative is included with this request as Exhibit I.

**(11) Citizen participation and coordination. Encourage the involvement of citizens in the planning process and ensure coordination between communities and jurisdictions to reconcile conflicts.**

**Response:** The review of this proposal is anticipated to follow the procedural requirements for a Type IV legislative review, including public notice and consideration by both Planning Commission and City Council. Citizen participation and coordination are encouraged through soliciting public comments and attendance at public hearings, consistent with this planning goal.

The applicant has worked diligently to meet with neighbors in the vicinity of the CPA/ZC site to discuss the request. The applicant attempted to meet in person with all neighbors sharing a property line with the project site and was able to talk with all but one. Additionally, two public meetings were organized and held at Hanna Acres Park September 13<sup>th</sup> and 28<sup>th</sup>. The applicant and representatives from DOWL and KAI were present at the meeting to discuss the project and answer questions. The applicant has also responded to comments and questions submitted by the public via email.

**(12) Public facilities and services. Ensure that those public facilities and services necessary to support development shall be adequate to serve the development at the**

**time the development is available for occupancy and use without decreasing current service levels below locally established minimum standards.**

**Response:** The proposed CPA/ZC will result in an increase in density at the site, and thus higher demand on utilities than the current zoning. However, public facilities and services including water, sewer, stormwater, and franchise utilities are located along the entire project frontage on SE 192nd Avenue and along portions of the project frontage on SE 15th Street. The extension of utilities to serve development is likely and would occur at the time of site development. This, coupled with the payment of applicable impact fees and system development charges for public utilities and facilities including, schools, traffic, parks, fire, water, sewer and stormwater, will ensure that services are adequate to serve a higher density development.

The revised TIA prepared by KAI, and included as Exhibit H, evaluated traffic impacts of the proposed CPA/ZC under existing R-6 zoning and proposed R-22 zoning. The study assumed that the entire site, 10.15 acres, which includes 0.28 acres of unimproved ROW, would be rezoned and subsequently developed to the maximum density, or 223 units. The findings and recommendations outlined on pages 1 and 2 of the TIA are excerpted below:

#### Findings

- All of the study intersections were found to operate acceptably under opening year (2027) and five-year horizon (2032) traffic conditions with reasonable worst-case development of the site under both the existing (R-6) and proposed (R-22) zoning.
- The eastbound left-turn queues at SE 192nd Avenue / SE 15th Street are anticipated to exceed the currently available storage length under future five-year 2032 background (existing zoning) and total (proposed zoning) traffic conditions during the AM and PM peak hours assuming reasonable worst-case development of the site under both the existing (R-6) and proposed (R-22) zoning.
  - Subject to City of Vancouver direction and the specific traffic impacts of potential future site development, the eastbound left-turn lane at SE 192nd Avenue / SE 15th Street may need to be extended to provide up to 175 feet of storage based on the projections in this study.
  - The actual turn lane storage length needs will depend in part on the density of site development that is proposed in the future and can be best assessed at the time of site plan application as required by the Vancouver Municipal Code (VMC, Reference 1).
  - No safety-based mitigation needs were identified based on review of historic crash data at the study intersections.
- Washington State Department of Transportation (WSDOT) volume-based criteria for providing turn lanes at the anticipated site driveways on SE 192nd Avenue and SE 15th Street are not met under either weekday AM or PM peak hour traffic conditions. Southbound volumes on SE 192nd Avenue do meet the criteria for considering a right-turn pocket or taper;

however, installation of tapers is not recommended given the presence of the bicycle lane and intersection sight distance considerations. Potential turn lane needs at the site access driveways can be revisited at the time of a future site development application.

#### Recommendations

- Subject to City of Vancouver direction and per standard City development review practice, future site development applications for the study site (as well as other development in the area) should continue to assess the need for additional eastbound left-turn lane queue storage on SE 15th Street at SE 192nd Avenue. The City of Vancouver can monitor turn lane storage length needs through the City's development review process and require an extension of the turn lane in conjunction with a future site plan application based on the documented turn lane storage needs at the time of site plan application in accordance with the VMC.

## **4.0 WASHINGTON ADMINISTRATIVE CODE (WAC)**

### **4.1 Urban Density. (WAC 365-196-300)**

- (2) How the urban density requirements in the act are interrelated. The act involves a consideration of density in three contexts:
- (a) **Allowed densities:** The density, expressed in dwelling units per acre, allowed under a county's or city's development regulations when considering the combined effects of all applicable development regulations.
  - (b) **Assumed densities:** The density at which future development is expected to occur as specified in the land capacity analysis or the future land use element. Assumed densities are also referred to in RCW 36.70A.110 as densities sufficient to permit the urban growth that is projected to occur.
  - (c) **Achieved density:** The density at which new development occurred in the period preceding the analysis required in either RCW 36.70A.130(3) or 36.70A.215.

**Response:** According to the 2022 Buildable Lands Inventory (BLI) prepared by Clark County, the City of Vancouver had an observed residential density of 18.3 dwelling units per acre, between 2016-2020, which exceeds the assumed residential density target of eight (8) dwelling units per acre (Clark County BLI, Figure 9).

Despite the residential density achieved in the study period outlined in the BLI, housing production in the city, and county as a whole, is not keeping up with population growth resulting in a deficit in housing supply. In a Housing Strategies Workshop presentation prepared by City staff and delivered to City Council in July of 2022, staff indicated that home production has not kept up with growth and demand for housing. It was determined that the County had a deficit of 13,500 units through 2019, and of that deficit, 5,670 units (42%) of the underproduction was within the City of Vancouver. Staff estimated that the City would need to produce at least 2,500 housing units annually in order to keep pace with population projections and eliminate the housing deficit within 10 years. Housing strategies were identified to help the city close the gap, including:

- Land Use: use regulatory tools to upzone land in support of more housing development at greater densities;
- Direct Investment: invest public funds into development of income-based housing not otherwise provided by the market;
- Incentives: tax and fee incentives as well as regulatory flexibility to encourage development of new additional housing and density.
- Process: development regulations and review processes that are clear, consistent, fair and efficient.

The presentation concluded with recommended short- and medium-term actions to address the housing supply deficit including re-evaluation of density goals and strategies and updates to single family zoning to achieve naturally affordable housing.

The applicant's request implements the identified "Land Use" strategy by utilizing an existing regulatory process (annual comprehensive plan amendment and concurrent zone change) to upzone the site from R-6, a low-density residential zone with a net density range of 4.5 to 5.8 units per acre, to R-22, a high-density residential zone with a net density range of 18.1 -22 units per acre. The CPA/ZC request better meets the current direction of staff and the City Council to address the housing shortage in an urbanized area of the city.

## 4.2 Land Use Element. (WAC 365-196-405)

(2) Recommendations for meeting requirements. The land use assumptions in the land use element form the basis for all growth-related planning functions in the comprehensive plan, including transportation, housing, capital facilities, and, for counties, the rural element. Preparing the land use element is an iterative process. Linking all plan elements to the land use assumptions in the land use element helps meet the act's requirement for internal consistency. The following steps are recommended in preparing the land use element:

- (f) Counties and cities must obtain twenty-year population allocations for their planning area as part of a county-wide process described in WAC 365-196-305(4) and 365-196-310. Using information from the housing needs analysis, identify the amount of land suitable for development at a variety of densities consistent with the number and type of residential units likely to be needed over the planning period. At a minimum, cities must plan for the population allocated to them, but may plan for additional population within incorporated areas.
- (i) Counties and cities should select land use designations and implement zoning. Select appropriate commercial, industrial, and residential densities and their distribution based on the total analysis of land features, population to be supported, implementation of regional planning strategies, and needed capital facilities.

**Response:** As stated previously, the 2022 BLI suggests that sufficient land capacity is available to support the forecasted population across the city through 2035, however, the BLI is applying the observed density of 18.3 dwelling units uniformly



- (a) Housing goals and policies.
- (iii) Housing goals and policies should address at least the following:
  - (A) Affordable housing;
  - (B) Preservation of neighborhood character; and
  - (C) Provision of a variety of housing types along with a variety of densities.

**Response:** The property is currently zoned low-density residential (R-6) which permits a maximum net density of 5.8 dwelling units per acre and a minimum net density of 4.5 dwelling units per acre in accordance with VMC Table 20.410.040-1. Housing on site and in the vicinity is predominately single family and thus are not attainable to persons at all income levels. The applicant requests a CPA/ZC to upzone the site to R-22, high-density residential, which has a minimum of 18.1 and a maximum of 22 dwelling units per net acre. The R-22 zone permits a variety of housing types, including townhouses and apartments which customarily have lower rents than single family homes.

If approved, the site could provide an opportunity to infuse the market with up to 223 dwelling units, a potential net increase of as many as 166 units over the existing zone. It will also likely result in development of apartments, a housing type that is not widely available in this area. Market rate units will likely have a lower monthly rental rate compared to single family detached units in the area thus offering up more options to a wider range of income levels. Finally, the applicant will commit to leasing 5% of the future housing units at 80% of AMI. The draft development agreement (Exhibit G) outlines the applicant's affordable housing commitments.

#### **4.4 Transportation Element (WAC 365-196-430)**

**(1) Requirements.** Each comprehensive plan shall include a transportation element that implements, and is consistent with, the land use element. The transportation element shall contain at least the following sub elements:

- (a) Land use assumptions used in estimating travel;
- (b) Estimated traffic impacts to state-owned transportation facilities resulting from land use assumptions to assist the department of transportation in monitoring the performance of state facilities, to plan improvements for the facilities, and to assess the impact of land-use decisions on state-owned transportation facilities;
- (g) Pedestrian and bicycle component to include collaborative efforts to identify and designate planned improvements for pedestrian and bicycle facilities and corridors that address and encourage enhanced community access and promote healthy lifestyles;

**Response:** As previously discussed, following a request from City staff, the applicant retained KAI to prepare a full TIA to evaluate traffic impacts under the current zoning and proposed zoning scenarios. The original TIA submitted August 3, 2023, evaluated development under the base zone assumption as well as the R-30 alternative (Exhibit F). The TIA was subsequently revised to compare development under the

across all residential land in the city, including lands zoned for lower density which could overstate the residential land capacity based upon established zoning and related density standards.

Recent research conducted by the city indicates that there is a deficit of housing within the city and across the county. The city is developing housing strategies to not only look at opportunities to reduce the gap, but also provide for population growth through 2035, which could exceed the projections from the current Vancouver Comprehensive Plan. Actions outlined in the strategy include, upzoning of existing residential land, revision to the Multifamily Tax Exemption (MFTE) program, code updates to remove barriers to density and more diverse housing typologies, refinement of the land use review process to increase efficiency, etc. The requested CPA/ZC will convert property zoned for detached single family residential to high density residential in an urban area with sufficient public and transportation facilities, thus presenting an opportunity for the site to develop consistent with the housing strategy.

**(j) Wherever possible, counties and cities should consider urban planning approaches that promote physical activity. Urban planning approaches that promote physical activity may include:**

**(i) Higher intensity residential or mixed-use land use designations to support walkable and diverse urban, town and neighborhood centers.**

**(ii) Transit-oriented districts around public transportation transfer facilities, rail stations, or higher intensity development along a corridor served by high quality transit service.**

**Response:** Increasing the density of the site would result in more efficient development of housing in a highly urbanized area with both employment and services. The construction of frontage improvements, including restriping of bicycle lanes and addition of sidewalks along SE 15<sup>th</sup> Street at the time of site development will connect with existing facilities on SE 192<sup>nd</sup> Avenue and will promote walkability to adjacent commercial and institutional uses in the vicinity and in particular along the SE 192<sup>nd</sup> Avenue corridor. Additionally, C-TRAN Route 37 runs north/south on SE 192<sup>nd</sup> Avenue and loops from Mill Plain to the Fisher's Landing Transit Center on SE 164<sup>th</sup> Avenue and from there, direct, and convenient access to Portland. Other significant transit facilities served by the relevant C-TRAN line include Clark College, the Vancouver Clinic, and shopping centers. The proximity of high-density residential to these significant transportation and urban service centers will reinforce economic vitality in the area.

### **4.3 Housing Element. (WAC 365-196-410)**

**(2) Recommendations for meeting requirements. The housing element shows how a county or city will accommodate anticipated growth, provide a variety of housing types at a variety of densities, provide opportunities for affordable housing for all economic segments of the community, and ensure the vitality of established residential neighborhoods. The following components should appear in the housing element:**

current zone with development under the R-22 scenario assuming a total of 223 housing units. The revised TIA is included as Exhibit H. As discussed earlier in this narrative, the study found that study intersections would operate at an acceptable level of service under the R-22 alternative, and no safety mitigation measures were identified. The study does indicate that additional eastbound left-turn storage at the SE 192<sup>nd</sup> Avenue and SE 15<sup>th</sup> Street intersection will likely be necessary in the future following development of the site under existing and proposed zoning scenarios. A more targeted review should be completed at the time of future site development and should be based upon proposed density of the future project.

As previously discussed, C-TRAN Route 37 runs north/south on SE 192<sup>nd</sup> Avenue and loops from Mill Plain to the Fisher's Landing Transit Center on SE 164<sup>th</sup> Avenue and from there, direct, and convenient access to Portland. Other significant transit facilities served by the relevant C-TRAN line include Clark College, the Vancouver Clinic, and shopping centers.

This proposal does not include a request for development. However, at the time of development, frontage improvements will occur consistent with the design standards for Principal Arterials (SE 192<sup>nd</sup> Avenue) and Collector Arterials (SE 15<sup>th</sup> Street), which include sidewalks and bicycle lanes consistent with this element.

## 5.0 VANCOUVER COMPREHENSIVE PLAN

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### 5.1 Community Development (Chapter 1)

#### Community Development Policies

The City of Vancouver adopts the following policies to guide land use and development in the city over the next 20 years. These policies are consistent with and implement Policy Sections 1.0, 2.0, and 12.0 of the Community Framework Plan, adopted by Clark County and local jurisdictions, and planning policies 36.70.A.020(1), (2) and (13) of the Washington Growth Management Act (see Appendix A).

#### CD-1 Citywide land supplies.

**Establish land supplies and density allowances that are sufficient to accommodate adopted long-term City of Vancouver population and employment forecast allocations.**

**Response:** The Vancouver Comprehensive Plan projects that the city's population will reach 202,300 persons and have an estimated 139,200 jobs by 2030. However, the April 1, 2022, Population of Cities, Towns and Counties annual report issued by the Office of Financial Management reported that the population estimate for the City of Vancouver reached 197,600 people in 2022. The rapid population growth coupled with underproduction of housing in the area has led to a housing deficit of approximately 5,670 units at the end of 2019 as reported by City staff during the Housing Strategies Workshop in July of 2022. The requested CPA/ZC will

CPA/ZC would permit development of multi-family housing in a neighborhood that currently lacks multi-family housing options and within proximity of existing commercial development centers with stores, restaurants and other personal and professional services, public and higher education facilities and various public parks and recreational facilities which are connected by pedestrian sidewalks and bicycle paths along SE 192<sup>nd</sup> Avenue and served by C-Tran Route #37.

**CD-9 Compatible uses.**

**Facilitate development that minimizes adverse impacts to adjacent areas, particularly neighborhoods.**

**Response:** Zoning designations adjacent to the project site consist of R-6 to the north and west and R-9 located across public roads to the south and east. The requested CPA/ZC would permit a higher density than those adjacent uses. In an effort to ensure compatibility with adjacent uses and to minimize any impact, the applicant is proposing to implement the following design requirements:

- Buildings adjacent to the west and north property lines will be setback at least 35 feet from the property line and will be limited to two stories;
- Buildings adjacent to SE 15<sup>th</sup> Street and SE 192<sup>nd</sup> Avenue will be limited to three stories;
- Any three-story building will be setback at least 120 feet from the north and west property line;
- A 20-foot-wide landscape buffer will be provided along the north and west property lines and will consist of existing mature trees to the extent practical.

As discussed above, the applicant submitted a draft development agreement to the city on September 8, 2023, reflecting site development considerations for the original R-30 proposal. The City of Vancouver and the applicant have been reviewing language and discussing changes to the document related to affordable housing and integration of the Interim Green Building Policy goals. The applicant has generally agreed to the revisions outlined by the city and will further revise the DA to align with compatibility-related design standards proposed for the R-22 alternative.

The request is for a CPA/ZC, and therefore a formal development plan has not yet been developed. However, a conceptual plan has been included with this application to illustrate a possible development scenario under the proposed CPA/AC. The Conceptual Site Plan R-22 Alternative, included as Exhibit I, implements the setbacks, building height and buffer standards detailed within this section and demonstrates how thoughtful site planning can produce a high-density residential development that is compatible with adjacent low density residential.

**CD-10 Complementary uses.**

**Locate complementary land uses near one another to maximize opportunities for people to work or shop nearer to where they live.**

**Response:** As discussed, the requested CPA/ZC would permit multi-family housing in an area currently lacking housing variety. The addition of multi-family housing offers more



diversity in housing options to broader economic segments of the population in an urbanized area with adjacent commercial and institutional uses, connected by public sidewalks, bicycle lanes and a public transit line.

## 5.2 Housing (Chapter 3)

### Housing Policies

The City of Vancouver adopts the following policies to ensure an adequate supply of housing for all economic segments of the community. These policies are consistent with and implement Policy Section 2.0 of the Community Framework Plan, adopted by Clark County and local jurisdictions, and planning policy 36.70.A.020(4) of the Washington Growth Management Act (see Appendix A).

**H-1 Housing options. Provide for a range of housing types and densities for all economic segments of the population. Encourage equal and fair access to housing for renters and homeowners.**

**H-4 Innovative zoning. Encourage innovative housing policies that provide for affordable housing and maintain neighborhood character.**

**Response:** The subject property is located at the intersection of two major roadways within the city, SE 192<sup>nd</sup> Avenue (Major Arterial) and SE 15<sup>th</sup> Street (Minor Arterial) with existing residential development primarily consisting of single family detached homes. Major retail, business and service centers are located along the SE 192<sup>nd</sup> Avenue to serve east Vancouver residents. Development of the site following approval of the requested CPA/ZC will result in a significantly higher yield of housing units, will introduce a housing type not broadly available in the immediate area and will provide a combination of market rate rental units and affordable rental units (80% of AMI) which will serve broader economic segments of the population and will help address an immediate housing need identified by the city.

**H-5 Housing placement near services and centers. Facilitate siting of higher density housing near public transportation facilities and in designated centers and corridors.**

**Response:** The requested CPA/ZC will result in higher density housing in an area with adequate public transportation facilities including SE 192<sup>nd</sup> Avenue, which is improved with sidewalks, bicycle lanes and is served by public transportation. Further, at the time of redevelopment, it is anticipated that frontage improvements would be completed along SE 15<sup>th</sup> Street, including the installation of sidewalks and restriping of bicycle lanes currently present within the road. Consistent with the Transportation System Plan, the subject site is located within the "Special Transit Service Area", a designated center, thereby consistent with these policies.

## 5.3 Public Facilities and Services (Chapter 5)

### Transportation

The Vancouver Transportation Plan Vision establishes the framework for improving the city's transportation system and is supplemented by the updated Transportation Analysis

(2011) and regionally coordinated with the MTP and Clark County Transportation Resource Document (2002). The Transportation Analysis (2011) and reference plans provide extensive information about the transportation system conditions, forecast travel demands and patterns, and corresponding transportation system improvement needs.

**PFS-1 Service availability.** Consider water, sewer, police, transportation, fire, schools, storm water management, and parks as necessary facilities and services. Ensure that facilities are sufficient to support planned development.

**PFS-2 Service standards.** Establish service standards or planning assumptions for estimating needed public facilities, based on service capabilities, local land use designations and nationally recognized standards. Use LOS standards to encourage growth in designated centers and corridors

**PFS-4 Transportation system.** Develop and maintain an interconnected and overlapping transportation system grid of pedestrian walkways, bicycle facilities, roadways for automobiles and freight, transit and high-capacity transit service. Include support programs such as traffic operations, transportation demand management, neighborhood traffic management, and the regional trails program. Work towards completing and sustaining individual components and programs to ensure success of the entire system.

**Response:** A Revised Transportation Impact Study has been prepared and is included with this request as Exhibit H. The TIA evaluated anticipated traffic volumes under the existing and proposed zoning designations. As reflected in the study and discussed throughout this narrative, the TIA found that all study intersections would operate at an acceptable level of service under the opening year and five-year horizon (2023) for both development under the current and proposed zoning scenarios. Further, no safety-based mitigation improvements were identified based upon a review of historic crash data and the study intersections. The study did reveal that the eastbound left-turn lane at the SE 192<sup>nd</sup> Avenue and SE 15<sup>th</sup> Street would likely require additional queueing storage at the time of site development under either the current or proposed zoning. Review at the time of future site development to determine the exact storage needs was recommended.

This proposal does not include a request for development. However, at the time of development, frontage improvements will occur consistent with the design standards for Principal Arterials (SE 192<sup>nd</sup> Avenue) and Collector Arterials (SE 15<sup>th</sup> Street) adopted by the City. The completion of frontage improvements advances the policies of the Comprehensive Plan by completing a missing segment of the public sidewalk along the roadway and improving the roadway to meet standards.

## **6.0 VANCOUVER STRATEGIC PLAN**

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### **6.1 Goal 1**

**Ensure our built urban environment is one of the safest, most environmentally responsible and well maintained in the Pacific Northwest.**

establish a significantly higher minimum and maximum density on the subject property which can provide some relief for the housing shortage in the short term as the city looks to update their Comprehensive Plan and incorporate housing strategies to comply with state law and to address housing insecurities in the city.

**CD-2 Efficient development patterns.**

**Encourage efficient development throughout Vancouver to ensure achievement of average density of 8 units per acre set by countywide planning policies. Encourage higher density and more intense development in areas that are more extensively served by facilities, particularly transportation and transit services.**

**Response:** As discussed, the property is currently zoned low-density residential (R-6) which permits a maximum density of 5.8 dwelling units per net acre and a minimum of 4.5 dwelling units per net acre as stated in VMC Table 20.410.040-1. The requested CPA/ZC will convert the site to high-density residential use and establish a minimum of 18.1 and a maximum density of 22 units per net acre in accordance with VMC Table 20.429.040-1. Higher density residential use within the site will introduce greater variety in housing density and types within an established area of the city with urban services, including a C-Tran bus route which serves the Fisher's Landing Transit Facility and downtown Vancouver.

As discussed, adequate public utilities and transportation facilities exist on the project site or can be extended to serve future development. Additionally, higher density development will result in additional payment of applicable impact fees and system development charge, both of which will ensure that development pays for the necessary capital improvements outlined in the adopted facility plans.

**CD-3 Infill and redevelopment.**

**Where compatible with surrounding uses, efficiently use urban land by facilitating infill of undeveloped properties, and redevelopment of underutilized and developed properties. Allow for conversion of single to multi-family housing where designed to be compatible with surrounding uses.**

**Response:** The retention of the existing low-density residential zoning designation will result in the site remaining underdeveloped in an area with a surplus of single-family homes. The proposed CPA/ZC will permit high-density development in an urban area and lead to desired infill development, consistent with the desired effect of this policy.

**CD-6 Neighborhood livability.**

**Maintain and facilitate development of stable, multi-use neighborhoods that contain a compatible mix of housing, jobs, stores, and open and public spaces in a well-planned, safe pedestrian environment.**

**Response:** Existing neighborhoods primarily consists of single-family homes with little variability in housing types and homogenous development patterns. Businesses are located along the SE 192<sup>nd</sup> Avenue corridor to the north and south of the site. The requested CPA/ZC offers a transition between the adjacent low-density residential (R-6) to the north and west and the major arterial roadways located south and east of the site. Within the context of the immediate area, the requested

### **Objective 1.1**

**Develop and maintain a safe, balanced and innovative transportation system that will meet the needs of future generations.**

**Response:** As specified earlier in this response, the applicant has provided a TIA which evaluates traffic impacts associated with site development under the existing and proposed zoning. The analysis concluded that all study intersections would operate at acceptable levels of service following development of the site under either current or proposed zoning. No safety-based mitigation was identified.

This proposal does not include a request for development. However, at the time of development, frontage improvements will occur consistent with the design standards for Principal Arterials (SE 192nd Avenue) and Collector Arterials (SE 15th Street), thus presenting an opportunity for the site to develop consistent with these policies including the extension of sidewalks and bicycle lanes on SE 15<sup>th</sup> Street. Further, as recommended in the revised TIA, at the time of site development a review of the eastbound left-turn lane storage at the intersection of SE 192<sup>nd</sup> Avenue and SE 15<sup>th</sup> Street should be evaluated and expanded if deemed necessary based upon the scope and scale of the proposed development.

## **6.2 Goal 6**

**Facilitate the creation of neighborhoods where residents can walk or bike to essential amenities and services — “20-minute neighborhoods”.**

### **Objective 6.1**

**Support a strong, active neighborhood program that enhances livability and community connections.**

**Response:** The proposed R-22 zoning designation will permit high-density residential development, create diversity of housing options within a largely homogenous housing area, and will be immediately adjacent to commercial and employment uses. The prevalence of high-density residential in an urban environment well served with public community services is consistent with the intent of this policy.

## **7.0 VANCOUVER MUNICIPAL CODE**

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### **7.1 Text and Map Amendments (Chapter 20.285)**

#### **7.1.1 Applicability (20.285.020)**

**A. Types of proposals.** The following types of proposals are reviewed under this chapter:

- 1. Map amendments to the comprehensive plan or to VMC Title 20 zoning designations applying to one or more properties.**
- 2. Development agreements that are included with property specific comprehensive plan or zoning map changes being reviewed under this chapter.**



Based on the information provided, the pre-application conference is intended to provide for a discussion of major issues and concerns and possible staff recommendation. Staff will provide a written summary within 14 days following the conference. Pre-application conferences are nonbinding, and do not vest the development rights of the proposals involved. Pre-application conferences shall not be required for city-initiated map amendments, or text amendments initiated by any party.

**Response:** A Pre-application Conference for this CPA/ZC was submitted and processed in 2023 (PIR 83420). A copy of the final comments issued by City staff was previously provided as Exhibit B.

#### **7.1.4 Approval Criteria – Comprehensive Plan and Concurrent Zoning Map Amendments (20.285.050)**

**A. Overall proposed map amendments reviewed under this chapter shall be approved only if demonstrated by the proponent to be in the public interest, as based on a review of all applicable principals from the following:**

- 1. How the proposal is more consistent than the existing designation with applicable policies of the Vancouver strategic plan and comprehensive plan.**

**Response:** Similar to the R-30 zoning designation previously requested, the proposed R-22 alternative permits high-density residential use in an urban environment lacking variety in housing, both in terms of affordability and type. The addition of housing units in the area is consistent with recent studies which reflect a significant housing deficit across Clark County and within the City of Vancouver. Development of the site following approval of the requested CPA/ZC will result in a higher yield of housing units, will introduce a housing type not broadly available in the immediate area and will provide a combination of market rate rental units and affordable rental units (80% of AMI) which serve broader economic segments of the population. Further, the request is consistent with actions outlined in the city's Housing Strategies presentation before the City Council in July of 2022 which included upzoning land to increase density.

As detailed in prior sections of this narrative, the request is consistent with Community Development, Housing and Public Facilities elements of the Comprehensive Plan in that it facilitates dense residential development in an urban area with adequate public services, including utilities, and is adjacent to employment and personal services such as grocery, restaurant and leisure. Redevelopment of the site is expected to include the completion of frontage improvements, which will likely include reconstruction of bicycle lanes and the addition of sidewalks on SE 15<sup>th</sup> Street which will improve multi-modal connectivity in the neighborhood. As reflected in the revised TIA, the eastbound left-turn queues at SE 192<sup>nd</sup> Avenue and SE 15<sup>th</sup> Street are expected to exceed the storage length currently provided on the roadway and, as such, the applicant anticipates that an extension of this turn lane will be required at the time of site redevelopment. Finally, the incorporation of specific site development compatibility considerations will facilitate integration with the existing neighborhood.

**Response:** This modified request is for a Comprehensive Plan Amendment from Urban Low-Density (UL) to Urban High-Density (UH) and a corresponding Zone Change from Urban Low-Density Residential, R-6 (6 DU/Acre) to Urban High-Density Residential, R-22 (22 DU/Acre).

In an effort to ensure compatibility with adjacent uses and to minimize any impact, the applicant is proposing to implement the following design requirements:

- Buildings adjacent to the west and north property lines will be setback at least 35 feet from the property line and will be limited to two stories.
- Buildings adjacent to SE 15<sup>th</sup> Street and SE 192<sup>nd</sup> Avenue will be limited to three stories.
- Any three-story building will be setback at least 120 feet from the north and west property line;
- A 20-foot-wide landscape buffer will be provided along the north and west property lines and will consist of existing mature trees to the extent practical.

In an effort to ensure compatibility with adjacent uses and to minimize any impact, the applicant is proposing to implement certain site design requirements to achieve compatibility with adjacent uses. The draft DA (Exhibit G) will be revised to reflect the R-22 alternative zone change request and associated site design commitments as noted above. The DA will also address the applicant's commitment to affordable housing as well as green building goals for new buildings within the site. A revised draft is anticipated in advance of the City Council Public Hearing.

#### **7.1.2 Initiation (20.285.030)**

**A. Proposals reviewed under this chapter may be initiated by property owners or their representatives, the city of Vancouver, or private citizens or groups as follows:**

- 1. Map Changes. Property owners or any individual, group or organization may initiate comprehensive plan and associated zoning map designation changes applying to one or more properties, through submittal of an annual review application and associated fees specified in Chapter 20.180 VMC. Standalone zoning changes not requiring a comprehensive plan change shall be subject to zone change application and associated fees per Chapter 20.180 VMC**

**Response:** A CPA/ZC was submitted by DOWL on behalf of the client for review by the City, consistent with this provision. This modified request is being submitted following feedback from the public on the original proposal as discussed previously in this narrative. The applicant and consultant team has coordinated with city staff to produce supplemental materials to support the requested adjustment to R-22.

#### **7.1.3 Review Process (20.285.040)**

**B. Pre-Application. Comprehensive plan or zoning map amendments proposed by private parties shall require a pre-application conference. The conference shall be scheduled upon receipt of a complete Map Amendment Pre-application Form.**

**c. Provide development which is compatible and integrated with surrounding uses in terms of scale, orientation, pedestrian enhancements, and landscaping;**

**Response:** The greatest difference in terms of development scale between the existing and proposed zoning designations is likely the maximum building height. Whereas the existing R-6 zone allows buildings of up to 35 feet in height, the proposed R-22 zone allows buildings of up to 50 feet in height. Site design considerations can be implemented to reduce the affect the change in building height could have on adjacent uses. A Conceptual Site Plan R-22 Alternative is included with this request as Exhibit I. The plan reflects a range of between 210 to 223-unit multi-family residential development. All multi-family buildings adjacent to the north and west site boundary lines will be limited to two stories in height, generally consistent with most homes in the adjacent neighborhoods, which have a maximum building height of 35 feet, and building heights within the site will transition to three-story buildings farther to the east. Buildings adjacent to the north and west site boundaries will be setback a minimum of 35 feet, exceeding the typical side yard setback of 5 feet required by the zone. The self-imposed building height limits and increased setbacks adjacent to the north and west property lines will help ensure compatibility with surrounding uses and reduce visual impacts of the three-story structures anticipated elsewhere in the site. Maintaining consistency with the adjacent neighborhoods and commercial buildings diagonal from the project site will be achieved through a combination of orientation and siting requirements and screening by the mature tree canopy along the northern and western property boundaries. As stated previously, the applicant has agreed to enter into a development agreement to memorialize site design standards which restrict building heights and setbacks relative to the east and north property lines to achieve compatibility and integrate with the existing neighborhood. The applicant is reviewing initial comments from staff regarding DA language and will submit a revised draft which aligns with the revised request to rezone the site to R-22 and addresses staff comments. The DA will include a commitment to affordable housing, green building goals, and other voluntary site development commitments provided the R-22 zone change request is approved.

**d. Conserve or enhance significant natural or historical features;**

**Response:** There are no mapped indicators on or immediately adjacent the project site to suggest the presence of significant natural or historical features. While not identified as a significant natural feature, the applicant intends to preserve the mature tree canopy along the northern and western property boundaries to the extent practicable. The mature trees will serve as a natural buffer between the adjacent R-6 zoning designation and the proposed R-22 zoning designation, while providing privacy and visual enhancement of the site.

**e. Provide adequate provision of transportation, water, sewer, and other public services;**

**Response:** The project site is located in an area with existing public facilities, including road, water, sewer, and other public services. Additionally, a revised TIA was prepared to evaluate the impacts of the requested comprehensive plan amendment and

Similarly, the request is consistent with both neighborhood development and transportation goals outlined within the Vancouver Strategic Plan in that it seeks to site dense residential development within an existing urban area interconnected with roads, sidewalks, bicycle lanes and public transportation routes. Further, the proximity to personal and professional services as well as employment and educational opportunities along the SE 192<sup>nd</sup> Avenue corridor reinforces connectivity within the existing neighborhood.

**2. How the proposal is more consistent than the existing designation with each of the following objectives as applicable:**

- a. Encourage more intensive development to locate in major urban centers and corridors, particularly downtown Vancouver. Encourage development of distinct neighborhoods served by commercial nodes, and discourage urban sprawl and strip commercial development;**

**Response:** The project site is located in an urban area adjacent to developed neighborhoods, and the SE 192<sup>nd</sup> Avenue corridor which has significant retail, commercial, employment, education and public uses. Under the proposed CPA/ZC, the land would be converted from low-density residential R-6 (UL) to high-density residential R-22 (UH). The proposed conversion encourages higher density in the immediate area, in close proximity to areas of employment (commercial zoning to the southeast and mixed-use institutional zoning farther north and south) with adequate urban services. It also supports new housing strategies which are in development by the city to address a significant deficit in housing inventory within the city.

- b. Provide development of uses which are functionally integrated with surrounding areas and neighborhoods in terms of local shopping, employment, recreational or other opportunities;**

**Response:** The retention of the existing low-density residential zoning designation will result in the site remaining underdeveloped in an area with a surplus of single-family homes. The requested zone change permits the development of high-density residential uses which will add to the diversity of both housing variety and associated rental costs. The site is located at the intersection of SE 192<sup>nd</sup> Avenue and SE 15<sup>th</sup> Street and is within close proximity to retail, services, and employment, including the commercial development at SE Mill Plain Boulevard and SE 192<sup>nd</sup> Avenue. The area also includes a variety of educational facilities including Columbia Valley Elementary School, Illahee Elementary School and Shahala Middle School and Union High School as well as the Columbia Tech Center Campus of Clark College, all within 1.5 miles of the site. Public recreational areas including Fisher Basin Community Park, Hannah Acres Park and Columbia Tech Center Park are also within approximately 1 mile of the site. The area is also served by a multi-modal transportation network consisting of sidewalks, bicycle lanes and public transit which connect with many of the service, education and recreational amenities outlined above.



zone change request to UH with a zone of R-22. The study concluded that the system could accommodate the requested change but noted that the eastbound left-turn queue length at the SE 192<sup>nd</sup> Avenue and SE 15<sup>th</sup> Street intersection is anticipated to be exceeded in the future five-year 2032 background (existing zoning) and total (proposed zoning) traffic conditions and, as such, indicates that an increase in queue length will likely be necessary. KAI recommends that this be further analyzed at the time of site development review based upon the actual proposed density of development, consistent with the VMC. The Revised TIA is included as Exhibit H.

**f. Provide significant family wage employment opportunities and broadening of the Vancouver economy;**

**Response:** Development of the project will create permanent property management/leasing and maintenance jobs, as well as temporary design, engineering, and construction jobs for the community. No commercial or industrial uses are proposed with this project.

**g. Provide for the formation and enhancement of neighborhoods and communities; and**

**Response:** The requested zone change permits the development of high-density residential uses which will add to the diversity of both housing variety and a broader range of economic groups. The increased density in the area will further support existing and new businesses in the area thus strengthening the neighborhood. The resulting development permitted under the proposed zoning designation would reduce sprawl and develop the site to its best use. The applicant also anticipates the project site will provide new pedestrian amenities that enhance walkability along public roadways and between adjacent neighborhoods.

**h. Provide affordable or below-market-rate housing opportunities.**

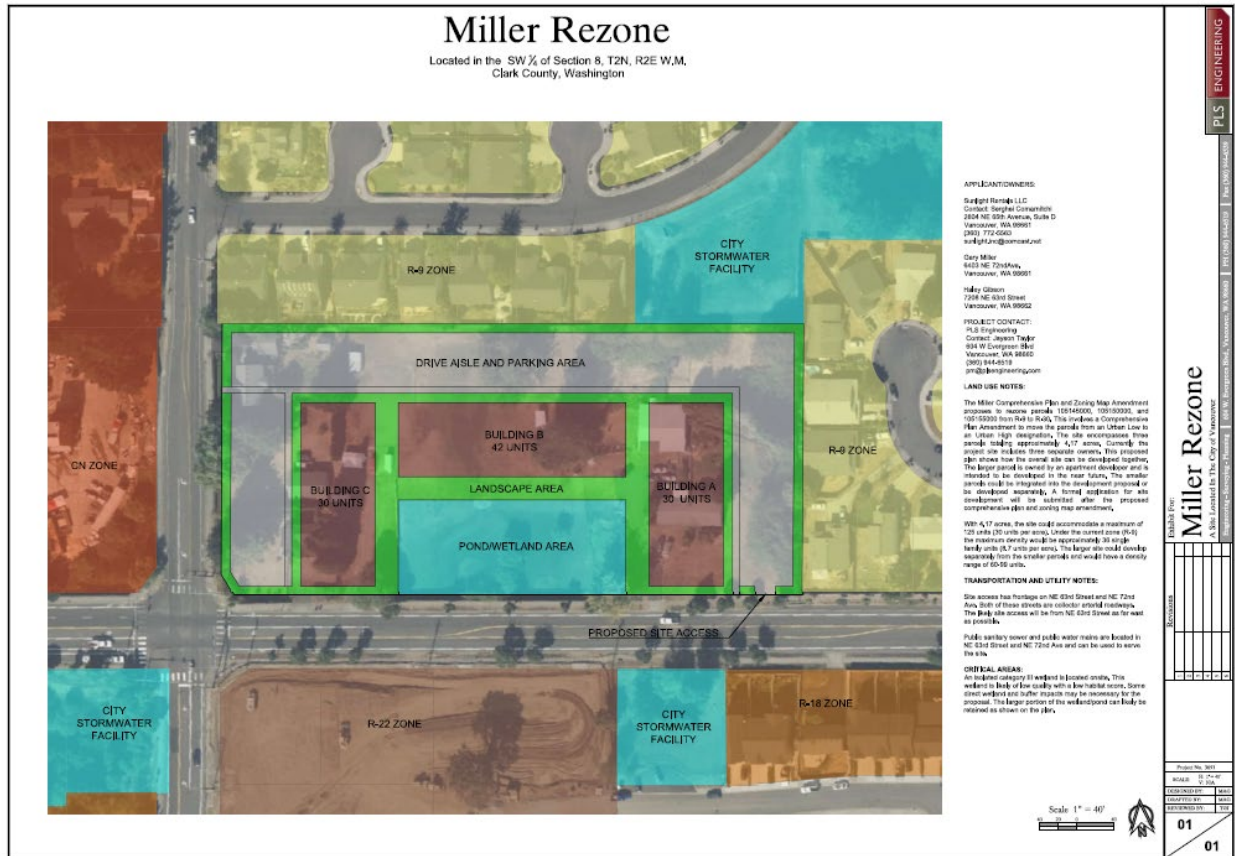
**Response:** The implementation of the R-22 zone at the site will set a new density range of 18.1 units (minimum) to 22 units (maximum) and will likely result in the development of multi-family units, a product type which is not widely available in the immediate vicinity and is more affordable to broader economic groups. Additionally, the applicant will voluntarily commit to offering 5% of units to be leased at 80% of AMI through the forthcoming DA.

## **8.0 CONCLUSION**

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As evidenced through this narrative and associated documents, the applicant's revised CPA/ZC request is consistent with long-range policies and regulations governing the allowance of these requests. Further, the modified request directly responds to comments and concerns raised by neighbors during the process, reducing the site's overall density allowance and limiting building heights to provide a softer transition with existing neighborhoods directly abutting the site to the north of west. Furthermore, the increase in housing yield and density is consistent with recent studies and policy discussions led by the City related to housing availability, diversity and affordability and directly implements an identified strategy to upzone land to encourage housing development. It is for these reasons and others outlined within this narrative that the applicant respectfully requests the City of Vancouver's approval of this application.

# Attachment B – Miller rezone conceptual layout and application narrative



## Project Description

The Miller Comprehensive Plan and Zoning Map Amendment proposes to rezone parcels 105145000, 105150000, and 105155000 from R-9 to R-30. This involves a Comprehensive Plan Amendment to move the parcels from an Urban Low to an Urban High designation. The site encompasses three parcels totaling approximately 4.17 acres. Currently the project site includes three separate owners. There is not a current plan for the development of all three parcels at this time. The larger parcel is being purchased by a developer and would be developed in the near future. The smaller parcels could be integrated into the development proposal or be developed separately. A formal application for site development will be submitted after the proposed comprehensive plan and zoning map amendment.

### **Density:**

With 4.17 acres, the site could accommodate a maximum of 125 units (30 units per acre). Under the current zone (R-9) the maximum density would be approximately 36 single family units (8.7 units per acre). The larger site could develop separately from the spaller parcels and would have a density range of 60-99 units. The existing constraints of the site have not been studied to the extent that a reliable future unit count can be provided. It would be best to assume the maximum density when evaluating potential impacts of the proposed rezone.

### **Traffic Impacts:**

Apartment buildings generate 6.74 average daily trips (ADT) per unit and single-family homes generate approximately 10 ADT per unit according to the ITE trip generation manual. The maximum possible development could generate up to 842.5 ADT, and development under the current zone would likely generate 360 ADT. The proposed rezone could result in a 57% increase in trips that would have otherwise been planned for in this area. A traffic study specific to the future development will be completed to ensure that the existing street system has adequate capacity for the increase in trips.

## Comprehensive Plan and Zoning Map Amendment Approval Criteria

### **VMC 20.285.050**

The following discusses the criteria that must be addressed for a comprehensive plan and zoning map amendment, and how this proposal complies:

*A. Overall proposed map amendments reviewed under this chapter shall be approved only if demonstrated by the proponent to be in the public interest, as based on a review of all applicable principals from the following:*

*1. How the proposal is more consistent than the existing designation with applicable policies of the Vancouver strategic plan and comprehensive plan.*

**Response:** The request is consistent with Objective 6.2.1 of the Vancouver Strategic Plan: “Develop a broader range of housing choices through incentives, changes in regulations and implementation of the Affordable Housing Task Force recommendations.” The intent of this amendment would be to allow zoning that would increase the overall supply of housing in the city, which would result in lower purchase prices and rental costs. While this does not provide “affordable housing” it goes a long way to make housing more affordable. Since the adoption of the strategic plan housing prices have continued to soar. This is partly due to a high demand for housing in the Vancouver region that far outpaces the new housing supply. Apartment units will provide additional housing at a lower price point.

*2. How the proposal is more consistent than the existing designation with each of the following objectives as applicable:*

*a. Encourage more intensive development to locate in major urban centers and corridors, particularly downtown Vancouver. Encourage development of distinct neighborhoods served by commercial nodes, and discourage urban sprawl and strip commercial development;*

**Response:** The site is within 0.25 miles of NE Andresen Rd. and approximately 2 miles from the nearest access to I-205, both major corridors in the area. Higher density residential development in this area would discourage urban sprawl.

*b. Provide development of uses which are functionally integrated with surrounding areas and neighborhoods in terms of local shopping, employment, recreational or other opportunities;*

**Response:** The site is within 0.5 miles of Raymond E. Shaffer Community Park and 1.5 miles from Orchards Community Park, providing ample recreational opportunities. Vancouver Mall, Costco and Home Depot are nearby providing employment and local shopping opportunities. A higher density multi-family residential development would integrate well with these areas.

*c. Provide development which is compatible and integrated with surrounding uses in terms of scale, orientation, pedestrian enhancements, and landscaping;*

**Response:** The south end of the site is bounded by NE 63<sup>rd</sup> Street, a collector arterial. South of the street are existing townhome and apartment developments. West of the site is a fire station. North and east of the site are existing single-family residences. This site is well positioned to be developed with a higher intensity use that will not have a significant effect on the existing neighboring uses. The site will have direct access to NE 63<sup>rd</sup> street and will not take access from the existing single-family residential streets.

*d. Conserve or enhance significant natural or historical features;*



**Response:** The applicant will hire a biologist to delineate any possible critical areas onsite and will work to avoid or minimize impacts where feasible.

*e. Provide adequate provision of transportation, water, sewer, and other public services;*

**Response:** Site access will be provided directly from NE 63<sup>rd</sup> Street. Water mains are located in NE 63<sup>rd</sup> Street NE 72<sup>nd</sup> Avenue adjacent to the site. CRWWD will be the sanitary sewer purveyor. Sanitary sewer lines run along both NE 63<sup>rd</sup> Street and NE 72<sup>nd</sup> Avenue.

*f. Provide significant family wage employment opportunities and broadening of the Vancouver economy;*

**Response:** Not applicable, this is a proposal for residential zoned property.

*g. Provide for the formation and enhancement of neighborhoods and communities; and*

**Response:** The redevelopment of these parcels will result in an attractive development at the corner of two arterial streets.

*h. Provide affordable or below-market-rate housing opportunities.*

**Response:** The proposal does not include affordable or below-market-rate housing, but the increase in housing supply will help make housing more affordable in the area. Apartments are an attractive affordable alternative in today's market.

*3. Scope of review. Review and evaluation of proposed comprehensive plan or zoning map changes shall consider both the likely and possible future use of the site and associated impacts.*

**Response:** The applicant intends to provide apartment units after the comprehensive plan and zoning map change approval. The request is a change from a lower density to a higher density, however it is still a residential zone so only residences will be proposed. Impacts created would be those of a higher density residential development, with typical impacts to local schools, emergency services and streets. Impact fees will be required to be paid to offset these impacts.

*4. Cumulative Impacts.* The review of individual comprehensive plan map or policy amendments, other than exceptions noted in VMC [20.285.040](#), shall also consider the cumulative transportation, land supply, and environmental impacts of other plan amendments proposed within the same annual cycle. (Ord. M-3922 § 13, 07/06/2009; Ord. M-3701 § 9, 05/02/2005; Ord. M-3643, 01/26/2004)

**Response:** The impacts of this development will need to be reviewed in conjunction with the other plan amendments within this review cycle.

## ZONING MAP AMENDMENT APPROVAL CRITERIA

VMC 20.285.060.A. sets out the applicable zoning map amendment approval criteria not involving associated comprehensive plan map amendments.

This proposal is required to demonstrate the following:

1. How the proposal is more consistent with applicable policies of the Vancouver strategic plan and comprehensive plan than the existing designation; and
2. That a change in circumstances has occurred since the existing designation was established.

### A. Consistency with Vancouver Strategic Plan

The City adopted a 2016-2021 Strategic Plan, and updated it in November 2018. The city is currently working on a new Strategic Plan, but it has not yet been adopted.

The request is consistent with Objective 6.2.1:

6.2.1 Develop a broader range of housing choices through incentives, changes in regulations and implementation of the Affordable Housing Task Force recommendations. Page 23.

In the final 2016 report the Affordable Housing Task Force discussed potential tools and programs to increase the supply of affordable housing units in the city. One of the high priority items discussed amending zoning/development regulations to encourage affordable housing options.

| Option for Council Consideration                                              | Description                                                                                                                                                                                                                                                                                                                                                                     | Estimated Time for Staff to Develop and Present to Council | City Direct Costs/ Staff Time | Cost to Property Owner/ Developer | Potential to Increase Affordable Units | Considerations and Details<br>Additional information to follow based on Council guidance and staff analysis.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Task Force Priority |
|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|-------------------------------|-----------------------------------|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| <b>EXPAND SUPPLY OF AFFORDABLE HOUSING</b>                                    |                                                                                                                                                                                                                                                                                                                                                                                 |                                                            |                               |                                   |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                     |
| Amend zoning/ development regulations to encourage affordable housing options | <ul style="list-style-type: none"> <li>• Allow/promote alternative housing, e.g.: <ul style="list-style-type: none"> <li>○ Cluster/corridor housing</li> <li>○ Corner-lot duplexes</li> <li>○ Micro-housing and single room occupancy (SRO) housing</li> <li>○ Shared housing, including rooming/boarding houses</li> </ul> </li> <li>• Reduced parking requirements</li> </ul> | Medium to Long                                             | \$\$                          | \$                                | Medium                                 | <p><b>Details:</b></p> <ul style="list-style-type: none"> <li>• May be effective at increasing overall supply over a long period of time, but affordability not guaranteed</li> <li>• Marketing incentives/opportunities to property owners and developers</li> <li>• Can use current staff, but may be contracted out</li> </ul> <p><b>Questions:</b></p> <ul style="list-style-type: none"> <li>• Requires determination of priorities among several options</li> <li>• Need to determine appropriate level of incentives</li> </ul> <p><b>Task Force comments:</b> Support for allowing a wider variety of housing types and sizes. This option may also provide low-income homeownership units, an opportunity to address affordable housing apart from rentals.</p> | High                |

The intent of the option would be to increase overall supply of housing in the city which would result in lower purchase prices and rental costs. While this does not provide “affordable housing” it goes a long way to make housing more affordable. Since the adoption of the strategic plan housing prices have continued to soar. This is partly due to a high demand for housing in the Vancouver region that far outpaces the new housing supply.

In response to the strategic plan and the Affordable Housing Task Force recommendations, the City Council studied and approved housing code updates. The Housing Code Updates webpage states the following as a purpose of the update:

“Vancouver, like many communities, is facing a housing crisis. As the city continues to grow, there is a desire and need for new types of housing that would allow residents to live more affordably while also maintaining neighborhood livability. However, current city zoning rules prohibit many of these

**Table 1-5. Vancouver comprehensive plan land use designations**

| Comprehensive Plan designation | Corresponding Zoning       | General Intent                                                                                                                                                            |
|--------------------------------|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Residential</b>             |                            |                                                                                                                                                                           |
| Urban Lower Density            | R-2, R-4, R-6, R-9         | Predominantly single-family detached residential development, with some allowances for duplexes, townhouses, and single-family homes on small lots using infill standards |
| Urban Higher Density           | R-18, R-22, R-30, R-35, MX | Predominantly apartments and condominiums, with some allowance for attached housing (such as duplexes, townhouses, and small-lot single-family homes) and mixed use       |

This request furthers the Community Development policies on page 1-14 to 1-15 of the Comprehensive Plan:

*CD-2 Efficient development patterns Encourage efficient development throughout Vancouver to ensure achievement of average density of 8 units per acre set by countywide planning policies. Encourage higher density and more intense development in areas that are more extensively served by facilities, particularly transportation and transit services.*

Response:

- The site is near a full-service grocery store/commercial area, elementary school, community park, and C-Tran Bus route 78 on NE Andresen Rd.
  - Safeway and Walgreens are both approximately 1/4 mile from the site. This is approximately a 5-minute walk. There is also a Starbucks (inside Safeway), Chase Bank, State Farm Insurance, The UPS Store, Sprint Store, Great Clips, Nail Salon, Drive through Coffee, and Subway.
  - Walnut Grove Elementary is south of the site.
  - Raymond E Shaffer Community Park is located approximately 1/4 mile to the southeast. This is a 10-acre park that connects to another 7-acre park to the south.
  - C-Tran Bus route 78 stops at NE Andresen Rd and NE 63<sup>rd</sup> Street. This is less than a 1/2 mile from the site.
    - The northbound and southbound busses arrive every 30 min from 6:00am to 9:00am and 3:00pm to 6pm
    - The northbound and southbound busses arrive every 60 min from 9:00am to 3:00pm and 6:00pm to 10pm

*CD-3 Infill and redevelopment- Where compatible with surrounding uses, efficiently use urban land by facilitating infill of undeveloped properties, and redevelopment of underutilized and developed properties. Allow for conversion of single to multi-family housing where designed to be compatible with surrounding uses.*

Response:

- This is a relatively small infill project, where the intent is to convert the existing underutilized land into an apartment housing project.

In addition, the request fulfills both CD-9, facilitating compatible uses adjacent to each other, and CD-10, placing housing near services (complementary land uses).

housing options. Changes to the development code can create opportunities for the private sector to deliver a more diverse, affordable housing stock.”

The project goals of the housing update are stated as the following:

“The goal of the project is to update City codes to allow for different, smaller and more affordable types of housing choices. Many are recommended in the Affordable Housing Task Force report (2016) and many are similar to what is allowed in Clark County and other Washington cities nearby and statewide.”

The specific goals include:

- Allowing for the development of diverse housing types to meet changing demographic needs and consumer preferences
- Expanding market rate, middle income, and affordable housing choices
- Maintaining neighborhood livability with incremental, rather than wholesale, change
- Providing more opportunities for people to live near where they work and attend school, and reduce costly commutes
- Facilitating development in areas with full existing public services

The current proposal is consistent with this plan and will help meet the City’s goals. The general proposal associated with the zone change will accomplish the following:

- The Miller Rezone project will add diversity to the housing options in the immediate vicinity of the site.
- The rezone will not have a large effect on adjacent homes as the proposed access is directly from an arterial street.
- The future project would match the style of apartments to the south and could result in an attractive development at the corner of two arterial streets.
- The site is located near schools, stores, and public transport that has the potential to reduce costly commutes.
- The project is in an area with full existing public services.

## **B. Consistency with the Comprehensive Plan**

The applicant is requesting a concurrent change in the Comprehensive Plan designation. The current and proposed plan designations are residential and are compatible. The proposed plan results in a higher density, but can be designed to have less of an impact on the neighboring lower density community.



Chapter 3 of the Comprehensive Plan contains the City's Housing element. The Plan recognizes the need for diverse housing:

*As the baby boom generation ages over the next 20 years, there is likely to be a greater need and demand for smaller units, retirement homes, and assisted living.*  
Page 3-3.

The plan notes that most residential housing is single-family housing (57%). *Id.* Housing affordability is also a City concern:

*The Growth Management Act requires local jurisdictions to demonstrate that regulations allow and encourage housing for all economic segments of the community. Table 3-3 provides a breakdown of local households by income ranges, and the general share of Vancouver housing they can afford to buy or rent without having to spend more than 30% of their income.*

There are several policies that would be furthered by this request, including:

*H-1 Housing options*  
*Provide for a range of housing types and densities for all economic segments of the population. Encourage equal and fair access to housing for renters and homeowners.*

*H-2 Affordability*  
*Provide affordable housing by formulating innovative policies, regulations and practices, and establishing secure funding mechanisms. Target affordability programs toward households with incomes below the median.*

### **C. Change in Circumstances**

The proposed zone change is in response to the current housing shortage and affordability crisis that is currently occurring in SW Washington. This shortage of housing within the area that the subject property lies represents a change in conditions or circumstances since the zoning designation was established. The proposed zone change will result in additional housing units that will increase the housing supply in the area and contribute to improving housing affordability.

According to the 2016 Affordable Housing Task Force Report issued by the City of Vancouver, it was noted that:

*Vancouver, Washington and the surrounding communities are experiencing an unprecedented demand for rental units. In June 2015, the vacancy rate in Vancouver was just below 2%, down from 3.8% at the end of 2010.<sup>1</sup> The tightening market has led to a dramatic increase in rents. Between October 2014 and October 2015, the increase in median rent for a 2-bedroom, 1-bath unit in Vancouver was the highest in the nation at 15.6% (a jump from \$900 to \$1,040 per month). Page 2.*

While this report was issued in 2016, conditions have not improved in recent years. This report recognizes that higher densities can promote more affordable housing.

## **CONCLUSION**

Approval of this application would result in a development that can be served by existing urban public services and will provide more flexibility in density and housing types, resulting in more affordable housing.

## Attachment C – Wood Duck Springs updated conceptual site plan and original rezone application narrative



## **Project Discussion**

The Wood Duck Springs Comprehensive Plan and Zoning Map Amendment proposes to rezone parcels 105241000, 105242000, 105190005, 105190010, 105190000, 986042813 from R-9 to R-18. This involves a Comprehensive Plan Amendment to move the parcels from an Urban Low to an Urban High designation. The site encompasses six parcels totaling approximately 13.89 acres. Currently the project site includes a mix of existing single-family residences and vacant land. Future development plans for the site would likely retain two of the existing homes as an office or amenity space with the remainder of the site developed with apartments and condo/townhomes in a variety of densities. The applicant intends to provide a diversity of unit types and unit styles so that a wider range of housing needs may be met. This would include apartment units ranging from 1 to 3 bedrooms, townhouse style units that are 2 stories without garages and townhouse style units that are larger and have garages. The applicant is desirous of creating homes for sale at the bottom portion of the ownership market as they believe that the first step to wealth creation is a long-term controlled housing costs created via a 30-year mortgage. But the applicant is concerned about the negative legal environment for condominiums in Washington State at this time and would most likely create rentals for those units. One of the options that the applicant is reviewing is to build larger 3-bedroom units that could be condo converted at a later date if the liability laws become more favorable. The current applicant would likely also be the one to develop the site including site and building construction. A formal application for site development will be submitted after the proposed comprehensive plan and zoning map amendment.

### **Neighborhood Layout –**

The applicant would propose that the 2 story tall townhouse style units would be built along the western side of the project in an attempt to build into the existing neighborhood. This is the only section of the abutting property that is expected to remain nearly the same for the foreseeable future due to the small existing lots as well as a long term commercial business; all of which are served by the existing private road that directly abuts to the projects west side. The applicant would also look at placing more townhouse units along a portion of the east side in an attempt to blend into the neighborhood as the parcel to the east with an existing house would be large enough for some infill redevelopment in the future.

The project north and a portion of the east abuts to City of Vancouver open space that is an undeveloped park. The applicant has already had discussions with the City of Vancouver Parks department in efforts to understand future park (Kelly Meadows) development plans as well as how the projects could benefit each other through better planning. This discussion included being able to generate better open space utilization, reducing expected parks impact on wetlands by moving a planned path from parks land to the applicant land, options for recreation along the trails, exploring build/PIF credits, trail connectivity, donations, trail materials within wetland buffers, land donation and overall planning and timing.

### **Density:**

With 13.89 acres, the site could accommodate a maximum of 250 units (18 units per acre). With potential roadway dedications the net site area may be less, and the maximum unit count could be



around 235 units. Under the current zone (R-9) the maximum density would be approximately half of the proposed plan or 125 single family units.

#### **Traffic Impacts:**

Apartment buildings generate 6.74 average daily trips (ADT) per unit and single-family homes generate approximately 10 ADT per unit according to the ITE trip generation manual. Development under the proposed plan would generate 1685 ADT, and development under the current zone would likely generate 1250 ADT. The proposed rezone would result in a 35% increase in trips that would have otherwise been planned for in this area. Based on previous projects and traffic studies in the area, we do not believe the additional traffic will cause any capacity issues on NE 63<sup>rd</sup> Street. A traffic study specific to the proposed development will be completed to ensure that the existing street system has adequate capacity for the proposed development.

Additionally, this project solves a major issue around intersection spacing along 63<sup>rd</sup> by moving the access portion of this project to its east boundary directly opposite the intersection that is one of the major direct routes to the south.

### **Comprehensive Plan Map Amendment Approval Criteria**

#### **VMC 20.285.050**

The following discusses the criteria that must be addressed for a comprehensive plan and zoning map amendment, and how this proposal complies:

*A. Overall proposed map amendments reviewed under this chapter shall be approved only if demonstrated by the proponent to be in the public interest, as based on a review of all applicable principals from the following:*

*1. How the proposal is more consistent than the existing designation with applicable policies of the Vancouver strategic plan and comprehensive plan.*

**Response:** The request is consistent with Objective 6.2.1 of the Vancouver Strategic Plan: “Develop a broader range of housing choices through incentives, changes in regulations and implementation of the Affordable Housing Task Force recommendations.” The intent of this amendment would be to allow zoning that would increase the overall supply of housing in the city, which would result in lower purchase prices and rental costs. While this does not provide “affordable housing” it goes a long way to make housing more affordable. The applicant has a great deal of experience in townhouse construction and has ideas that can create even more affordable products in the for-sale market. Unfortunately, within the existing codes this would require a condominium development which currently has significant issues due to current laws and insurance issues. In the event that laws change and the project can be converted into condominiums, the site would allow for home ownership at a relatively low price point. Since the adoption of the strategic plan housing prices have continued to soar. This is partly due to a high demand for housing in the Vancouver region that far outpaces the new housing supply. The first step to increasing affordability is to increase supply so that the basic tenants of the Econ 101 supply demand curve can be followed.

2. *How the proposal is more consistent than the existing designation with each of the following objectives as applicable:*

a. *Encourage more intensive development to locate in major urban centers and corridors, particularly downtown Vancouver. Encourage development of distinct neighborhoods served by commercial nodes, and discourage urban sprawl and strip commercial development;*

**Response:** The site is within 0.5 miles of NE Andresen Rd. and approximately 1.5 miles from the nearest access to I-205, both major corridors in the area. Higher density residential development in this area would discourage urban sprawl. NE 63<sup>rd</sup> Ave is an arterial that crosses I-205 and should be expected to be even more of a corridor as redevelopment happens.

b. *Provide development of uses which are functionally integrated with surrounding areas and neighborhoods in terms of local shopping, employment, recreational or other opportunities;*

**Response:** The site is adjacent to Kelley Meadows Park and very near to Green Meadows Golf Course, providing ample recreational opportunities. Vancouver Mall, Costco and Home Depot are nearby providing employment and local shopping opportunities. A higher density residential development would integrate well with these areas. The applicant is also willing to work with the City of Vancouver Parks department on the development and integration of recreation required by the development and advantageous to the Park and the neighborhood.

c. *Provide development which is compatible and integrated with surrounding uses in terms of scale, orientation, pedestrian enhancements, and landscaping;*

**Response:** The north end of the site includes a wetland area that will create a buffer between the site and the uses to the north, directly north of that wetland area is Green Meadows Golf Course. To the east is a city park along a majority of the shared property line. At the SE corner there is a single-family residence adjacent to the site. The south end of the site is bounded by NE 63<sup>rd</sup> Street, a collector arterial. On the west end of the site the applicant is proposing to 2 story townhomes that will blend in better to the neighborhood and will abut the existing private road to the west. This site is well positioned to be developed with a higher intensity use that will not have a significant effect on the existing neighboring uses. The site will have direct access to NE 63<sup>rd</sup> street and will only be directly adjacent to one single-family home that also has redevelopment potential.

To the SW of the proposed area is an area that was developed under R-18 code while that land was under Clark County jurisdiction.

d. *Conserve or enhance significant natural or historical features;*

**Response:** The applicant will retain the existing wetland and buffer areas located on the north end of the site. Additionally, the applicant is willing to work with the City Parks department to move planned park trails out of the wetland area and onto adjoining lands, thus reducing wetland impacts. The applicant has also demonstrated unique design features in the past in an effort to enhance wetland function. If possible, they will seek to duplicate this demonstrated success.

## **Project Discussion**

The Wood Duck Springs Comprehensive Plan and Zoning Map Amendment proposes to rezone parcels 105241000, 105242000, 105190005, 105190010, 105190000, 986042813 from R-9 to R-18. This involves a Comprehensive Plan Amendment to move the parcels from an Urban Low to an Urban High designation. The site encompasses six parcels totaling approximately 13.89 acres. Currently the project site includes a mix of existing single-family residences and vacant land. Future development plans for the site would likely retain two of the existing homes as an office or amenity space with the remainder of the site developed with apartments and condo/townhomes in a variety of densities. The applicant intends to provide a diversity of unit types and unit styles so that a wider range of housing needs may be met. This would include apartment units ranging from 1 to 3 bedrooms, townhouse style units that are 2 stories without garages and townhouse style units that are larger and have garages. The applicant is desirous of creating homes for sale at the bottom portion of the ownership market as they believe that the first step to wealth creation is a long-term controlled housing costs created via a 30-year mortgage. But the applicant is concerned about the negative legal environment for condominiums in Washington State at this time and would most likely create rentals for those units. One of the options that the applicant is reviewing is to build larger 3-bedroom units that could be condo converted at a later date if the liability laws become more favorable. The current applicant would likely also be the one to develop the site including site and building construction. A formal application for site development will be submitted after the proposed comprehensive plan and zoning map amendment.

### **Neighborhood Layout –**

The applicant would propose that the 2 story tall townhouse style units would be built along the western side of the project in an attempt to build into the existing neighborhood. This is the only section of the abutting property that is expected to remain nearly the same for the foreseeable future due to the small existing lots as well as a long term commercial business; all of which are served by the existing private road that directly abuts to the projects west side. The applicant would also look at placing more townhouse units along a portion of the east side in an attempt to blend into the neighborhood as the parcel to the east with an existing house would be large enough for some infill redevelopment in the future.

The project north and a portion of the east abuts to City of Vancouver open space that is an undeveloped park. The applicant has already had discussions with the City of Vancouver Parks department in efforts to understand future park (Kelly Meadows) development plans as well as how the projects could benefit each other through better planning. This discussion included being able to generate better open space utilization, reducing expected parks impact on wetlands by moving a planned path from parks land to the applicant land, options for recreation along the trails, exploring build/PIF credits, trail connectivity, donations, trail materials within wetland buffers, land donation and overall planning and timing.

### **Density:**

With 13.89 acres, the site could accommodate a maximum of 250 units (18 units per acre). With potential roadway dedications the net site area may be less, and the maximum unit count could be

The applicant would also explore solar systems atop parking lot covers as well as on top of southerly facing apartment roofs. The applicant has used innovative hot water systems, lighting, appliances and design elements to reduce energy usage and would use these as well as others to reduce the carbon footprint of this development.

*e. Provide adequate provision of transportation, water, sewer, and other public services;*

**Response:** Site access will be provided directly from NE 63<sup>rd</sup> Street with access across from the existing 81<sup>st</sup> Ave intersection. A water main is located in NE 63<sup>rd</sup> Street and CRWWD will be the sanitary sewer purveyor. The site can be served with sanitary sewer with the development of parcel 105210000, and a potential easement from the park property (105240000) as well as a portion of it from sanitary sewer located within NE 63<sup>rd</sup> Street.

*f. Provide significant family wage employment opportunities and broadening of the Vancouver economy;*

**Response:** Not applicable, this is a proposal for residential zoned property. The applicant is investigating commercial uses that are appropriate to the area and development and is open to having 5% of the gross floor space being commercial use.

*g. Provide for the formation and enhancement of neighborhoods and communities; and*

**Response:** The redevelopment of these parcels will result in an attractive development, with improved public roadways that will be designed to build in with the nearby neighborhood.

*h. Provide affordable or below-market-rate housing opportunities.*

**Response:** The proposal does not include affordable or below-market-rate housing, but the increase in housing supply will help make housing more affordable in the area. Apartments are an attractive affordable alternative in today's market. If laws changed at the State of Washington level the applicant would be interested in developing smaller units that would most commonly be sold as a condominium.

*3. Scope of review. Review and evaluation of proposed comprehensive plan or zoning map changes shall consider both the likely and possible future use of the site and associated impacts.*

**Response:** The applicant intends to provide typical apartment units within the central portion of the project after the comprehensive plan and zoning map change approval and blend into the neighborhood with 2 story townhouse units along the west side. The request is a change from a lower density to a higher density, however it is still a residential zone so only residences will be proposed. Impacts created would be those of a higher density residential development, with typical impacts to local schools, emergency services and streets. Impact fees will be required to be paid to offset these impacts.

*4. Cumulative Impacts.* The review of individual comprehensive plan map or policy amendments, other than exceptions noted in VMC [20.285.040](#), shall also consider the cumulative transportation, land supply, and environmental impacts of other plan amendments proposed within the same



purpose of the update:

“Vancouver, like many communities, is facing a housing crisis. As the city continues to grow, there is a desire and need for new types of housing that would allow residents to live more affordably while also maintaining neighborhood livability. However, current city zoning rules prohibit many of these housing options. Changes to the development code can create opportunities for the private sector to deliver a more diverse, affordable housing stock.”

The project goals of the housing update are stated as the following:

“The goal of the project is to update City codes to allow for different, smaller and more affordable types of housing choices. Many are recommended in the Affordable Housing Task Force report (2016) and many are similar to what is allowed in Clark County and other Washington cities nearby and statewide.”

The specific goals include:

- Allowing for the development of diverse housing types to meet changing demographic needs and consumer preferences
- Expanding market rate, middle income, and affordable housing choices
- Maintaining neighborhood livability with incremental, rather than wholesale, change
- Providing more opportunities for people to live near where they work and attend school, and reduce costly commutes
- Facilitating development in areas with full existing public services

The current proposal is consistent with this plan and will help meet the City’s goals. The general proposal associated with the zone change will accomplish the following:

- The Wood Ducks Springs Rezone project will add diversity to the housing options in the immediate vicinity of the site.
- The rezone will not have a large effect on adjacent homes as the proposed access is directly from an arterial street.
- The future project would blend into the existing neighborhood as it would place 2 story townhomes on the west side by existing small lots, place apartments within the center and north portions of the project. This would also match the streetscape to the west in the R-18 zones.
- The site is located near schools, stores, and public transport that has the potential to reduce costly commutes.
- The project is in an area with full existing public services.

## **B. Consistency with the Comprehensive Plan**

The applicant is requesting a concurrent change in the Comprehensive Plan designation. The current and proposed plan designations are residential and are compatible. The proposed plan results in a higher density but can be designed to have less of an impact on the neighboring lower density community.

annual cycle. (Ord. M-3922 § 13, 07/06/2009; Ord. M-3701 § 9, 05/02/2005; Ord. M-3643, 01/26/2004)

**Response:** The impacts of this development will need to be reviewed in conjunction with the other plan amendments within this review cycle.

## ZONING MAP AMENDMENT APPROVAL CRITERIA

VMC 20.285.060.A. sets out the applicable zoning map amendment approval criteria not involving associated comprehensive plan map amendments.

This proposal is required to demonstrate the following:

1. How the proposal is more consistent with applicable policies of the Vancouver strategic plan and comprehensive plan than the existing designation; and
2. That a change in circumstances has occurred since the existing designation was established.

### A. Consistency with Vancouver Strategic Plan

The City adopted a 2016-2021 Strategic Plan, and updated it in November 2018.

The request is consistent with Objective 6.2.1:

6.2.1 Develop a broader range of housing choices through incentives, changes in regulations and implementation of the Affordable Housing Task Force recommendations. Page 23.

In the final 2016 report the Affordable Housing Task Force discussed potential tools and programs to increase the supply of affordable housing units in the city. One of the high priority items discussed was amending zoning/development regulations to encourage affordable housing options.

| Option for Council Consideration                                              | Description                                                                                                                                                                                                                                                                                                                                                                      | Estimated Time for Staff to Develop and Present to Council | City Direct Costs/ Staff Time | Cost to Property Owner/ Developer | Potential to Increase Affordable Units | Considerations and Details<br>Additional information to follow based on Council guidance and staff analysis.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Task Force Priority |
|-------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|-------------------------------|-----------------------------------|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| <b>EXPAND SUPPLY OF AFFORDABLE HOUSING</b>                                    |                                                                                                                                                                                                                                                                                                                                                                                  |                                                            |                               |                                   |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                     |
| Amend zoning/ development regulations to encourage affordable housing options | <ul style="list-style-type: none"> <li>Allow/promote alternative housing, e.g.:               <ul style="list-style-type: none"> <li>Cluster/cottage housing</li> <li>Corner-lot duplexes</li> <li>Micro-housing and single room occupancy (SRO) housing</li> <li>Shared housing, including rooming/boarding houses</li> </ul> </li> <li>Reduced parking requirements</li> </ul> | Medium to Long                                             | \$\$                          | \$                                | Medium                                 | <b>Details:</b> <ul style="list-style-type: none"> <li>May be effective at increasing overall supply over a long period of time, but affordability not guaranteed</li> <li>Marketing incentives/opportunities to property owners and developers</li> <li>Can use current staff, but may be contracted out</li> </ul> <b>Questions:</b> <ul style="list-style-type: none"> <li>Requires determination of priorities among several options</li> <li>Need to determine appropriate level of incentives</li> </ul> <b>Task Force comments:</b> Support for allowing a wider variety of housing types and sizes. This option may also provide low-income homeownership units, an opportunity to address affordable housing apart from rentals. | High                |

The intent of the option would be to increase the overall supply of housing in the city which would result in lower purchase prices and rental costs. While this does not provide “affordable housing” it goes a long way to make housing more affordable. Since the adoption of the strategic plan housing prices have continued to soar. This is partly due to a high demand for housing in the Vancouver region that far outpaces the new housing supply.

In response to the strategic plan and the Affordable Housing Task Force recommendations, the City Council studied and approved housing code updates. The Housing Code Updates webpage states the following as a

**Table 1-5. Vancouver comprehensive plan land use designations**

| Comprehensive Plan designation | Corresponding Zoning       | General Intent                                                                                                                                                            |
|--------------------------------|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Residential</b>             |                            |                                                                                                                                                                           |
| Urban Lower Density            | R-2, R-4, R-6, R-9         | Predominantly single-family detached residential development, with some allowances for duplexes, townhouses, and single-family homes on small lots using infill standards |
| Urban Higher Density           | R-18, R-22, R-30, R-35, MX | Predominantly apartments and condominiums, with some allowance for attached housing (such as duplexes, townhouses, and small-lot single-family homes) and mixed use       |

This request furthers the Community Development policies on page 1-14 to 1-15 of the Comprehensive Plan:

*CD-2 Efficient development patterns Encourage efficient development throughout Vancouver to ensure achievement of average density of 8 units per acre set by countywide planning policies. Encourage higher density and more intense development in areas that are more extensively served by facilities, particularly transportation and transit services.*

Response:

- The site is near a full-service grocery store/commercial area, elementary school, community park, and C-Tran Bus route 78 on NE Andresen Rd.
  - Safeway and Walgreens are both approximately 1/4 mile from the site. This is approximately a 5-minute walk. There is also a Starbucks (inside Safeway), Chase Bank, State Farm Insurance, The UPS Store, Sprint Store, Great Clips, Nail Salon, Drive through Coffee, and Subway.
  - Walnut Grove Elementary is south of the site.
  - Raymond E Shaffer Community Park is located approximately 1/4 mile to the southeast. This is a 10-acre park that connects to another 7-acre park to the south.
  - C-Tran Bus route 78 stops at NE Andresen Rd and NE 63<sup>rd</sup> Street. This is less than a 1/2 mile from the site.
    - The northbound and southbound busses arrive every 30 min from 6:00am to 9:00am and 3:00pm to 6pm
    - The northbound and southbound busses arrive every 60 min from 9:00am to 3:00pm and 6:00pm to 10pm

*CD-3 Infill and redevelopment- Where compatible with surrounding uses, efficiently use urban land by facilitating infill of undeveloped properties, and redevelopment of underutilized and developed properties. Allow for conversion of single to multi-family housing where designed to be compatible with surrounding uses.*

Response:

- This is a relatively small infill project, where the intent is to convert the existing underutilized land into an apartment housing project.

In addition, the request fulfills both CD-9, facilitating compatible uses adjacent to each other, and CD-10, placing housing near services (complementary land uses).

Chapter 3 of the Comprehensive Plan contains the City's Housing element. The Plan recognizes the need for diverse housing:

*As the baby boom generation ages over the next 20 years, there is likely to be a greater need and demand for smaller units, retirement homes, and assisted living.*  
Page 3-3.

The plan notes that most residential housing is single-family housing (57%). *Id.* Housing affordability is also a City concern:

*The Growth Management Act requires local jurisdictions to demonstrate that regulations allow and encourage housing for all economic segments of the community. Table 3-3 provides a breakdown of local households by income ranges, and the general share of Vancouver housing they can afford to buy or rent without having to spend more than 30% of their income.*

There are several policies that would be furthered by this request, including:

*H-1 Housing options*

*Provide for a range of housing types and densities for all economic segments of the population. Encourage equal and fair access to housing for renters and homeowners.*

*H-2 Affordability*

*Provide affordable housing by formulating innovative policies, regulations and practices, and establishing secure funding mechanisms. Target affordability programs toward households with incomes below the median.*

**C. Change in Circumstances**

The proposed zone change is in response to the current housing shortage and affordability crisis that is currently occurring in SW Washington. This shortage of housing within the area that the subject property lies represents a change in conditions or circumstances since the zoning designation was established. The proposed zone change will result in additional housing units that will increase the housing supply in the area and contribute to improving housing affordability.

According to the 2016 Affordable Housing Task Force Report issued by the City of Vancouver, it was noted that:

*Vancouver, Washington and the surrounding communities are experiencing an unprecedented demand for rental units. In June 2015, the vacancy rate in Vancouver was just below 2%, down from 3.8% at the end of 2010.<sup>1</sup> The tightening market has led to a dramatic increase in rents. Between October 2014 and October 2015, the increase in median rent for a 2-bedroom, 1-bath unit in Vancouver was the highest in the nation at 15.6% (a jump from \$900 to \$1,040 per month). Page 2.*

While this report was issued in 2016, conditions have not improved in recent years. This report recognizes that higher densities can promote more affordable housing.

**CONCLUSION**

Approval of this application would result in a development that can be served by existing urban public services and will provide more flexibility in density and housing types, resulting in more affordable housing.



## **Attachment D – Datepark rezone application narrative**

### **Datepark Residence Re-zoning Narrative:**

Datepark Condominium Inc is an organization that provides “Second Chance” housing to help members of our community since 2005. This organization provides sustainable housing to low-income tenants in Clark County, City of Vancouver, City of Battleground, City of Camas, and other surrounding areas. We provide affordable housing for individuals who have barriers that prevent them from meeting common rental qualifications to obtain housing elsewhere in our community.

Our organization pertains of 4 female board members, with three of the four being East Indian. We have a combined experience of over 25 years in different fields that correlate to this project, including general construction and site development, property management, and real estate. Some past projects our board members have completed are a 45-mixed use apartment complex in Gresham, Oregon and a 31-unit apartment complex in NE Portland, Oregon. We have also remodeled and updated 7 Burger King locations throughout the Portland area.

In addition to that, we have 18 years of experience operating second chance housing complexes, and pride ourselves in serving our community and helping individuals in need to have a safe and stable place to call home. Our vision for Datepark is to provide a larger number of affordable rental units to our community. We intend to develop this property, while maintaining ownership. We will then maintain control of the complex and will be operating as the owners and property management team. We do not have any plans or intention to sell the complex at any point after this development is complete.

The property is located at 3607,3701 and 3701 ½ E 18th St Vancouver, WA 98661. It has been operating as a second chance housing complex since we acquired it in 2005. It currently has 13 rental units and two houses on four parcels of land. We will be tearing down all existing buildings to construct a 4-story, 54-unit complex on the property. We are very excited about this project. This new complex will stay a second chance housing complex and be financially affordable for all. We hope to help fill the need for low-income housing, and to maximize the amount of community members we can help in having a safe and secure place to call home.

Our plan is to develop Datepark Residence into an affordable housing complex. The land is subdivided into four parcels currently zoned at R-18 making our ability to help make an impact with the housing crisis severely limited. The existing houses and townhomes are older, with a large parking lot in the middle. There is some basic existing landscaping, but aesthetically the way the property is, it will need some maintenance. The property currently has a 20-unit parking lot, which will be increased to a total of 44 parking units. We are delighted to be able to move forward with building a beautiful new complex that will also be visually pleasing to the neighborhood and community. We are currently working with our architects and engineers to ensure the complex is functional, visually attractive and appealing on all sides of the property. We realize that a view of a beautiful building is better than a plain building, an aging building, and we want all our neighbors to be happy with their new view and the changes.

Sadly, housing is a comfort many individuals in our community do not have. A home is a safe space that provides stability and security to all families and individuals. High housing costs can cause individuals and families to spend less on basic needs such as food, clothing, and health

care. In addition, everyday many individuals in our community experience mental health crises. If they had a safe haven, it would build a sense of security, and help them with a better future.

This development is in the Fourth Plain International District. Residents will have access to local city parks, major department stores, shopping, and retail commerce. This project goes hand-in-hand with Fourth Plain Forward. Increased residents in the neighborhood will directly impact the local economy by bringing in more funds spent at local surrounding businesses in the International District.

In addition to potentially lessening the impact of the financial burden of a large homeless populace, we will be adding greater value to our local economy. As stated above, our property is in the Fourth Plain International District. We are also close to cultural centers, community centers, shopping and businesses, the VA Hospital, and many other healthcare facilities. We are located on a bus line to assist our residents in visiting locations that are not within walking distance, and to help individuals travel to and from work. Our tenants will shop locally, visit, and utilize these local resources, work in our community and even help ease the “lack of workers” many businesses are struggling with.

From our years of experience, we have a rich understanding of how to assist individuals in our community who face challenges such as mental health concerns, homelessness, addiction, and other struggles. We are not only seen as landlords to these families and individuals, but they also see us as counselors, friends, and most importantly, as someone who is willing to “take a chance on them” and help provide them with stability. This project will continue to build upon our past efforts and allow us to be a better benefit and invaluable resource to our community.

Each parcel is currently zoned at R-18. Rather than developing up to four smaller buildings on each parcel, we want to group the parcels and rezone all four lots to R-30. We intend on applying for the “affordable housing density bonus”. This will double the zoning and allow us to build one 54-unit complex. The main purpose for rezoning the site is to allow us to consolidate all units into one complex. The city has approved rezoning in the past to help increase affordable housing; we are hoping to utilize this practice and apply this policy to our property. We need the city’s help to achieve our dream of becoming a beneficial resource and making a positive impact towards addressing our housing crisis while housing up to 162 individuals. With our proposed plan to keep 80% of our units below the Area Median Income (AMI) we can help create stability for individuals and families. This is why we are hoping the city will serve as the sponsor of our rezoning application.

## Attachment E1 – Parks related changes to Vancouver Comprehensive Plan, 2011-2030

### Page 5-33

Community parks provide a focal point and gathering place for broad groups of users. Usually 20 to 100 acres in size, community parks are used by all segments of the population and generally serve residents ~~from within a 1½-mile radius one-to-three-mile service area~~ from the park's public access points. Community parks often include recreation facilities for organized activities, such as sports fields, skate parks, community gardens and play courts as well as programming such as the amphitheater at Esther Short Park. Community parks may also incorporate such as community or senior centers. Because of their large service area, community parks require more support facilities, such as parking and restrooms. Some middle and high school sites are included in the community parkland inventory, since these facilities can serve some of the community park needs. The acquisition standard is 3 acres per 1,000 people, or a total of 278.5 additional acres needed. In urban areas where an adequate or suitable community park site is no longer available, or where areas are poorly served by a community park, VCPRD considers the modification of neighborhood park standards to compensate for the lack of a community park. Specifically, consideration is given to increasing site size and type of development of neighborhood parks to allow for increased recreation opportunities. In addition, where dense existing neighborhoods may preclude the acquisition of typical acreage for neighborhood parks, VCPRD has acquired and developed small urban parks to address the need for public park spaces in compact urban environments

### Page 5-38, Capital Facilities Plan

Table 5-14. Vancouver Parks, Recreation & Cultural Services Comprehensive Plan 2023-2032  
VCPRD Capital Facilities Plan for Vancouver City and UGA, 2011-2016

See Attachment B - Parks, Recreation & Cultural Services Comprehensive Plan, 2023 Capital Facilities Plan Summary

Replace existing Table 5-14 with below:

2023 Annual Review - Attachment B  
2023-2032 Capital Facilities Plan Summary - Vancouver Parks, Recreation & Cultural Services.

2023-2032 CAPITAL FACILITIES PLAN SUMMARY

| Project Name                      | Uninflated Local Cost | 2023             | 2024              | 2025              | 2026              | 2027              | 2028              | 2029              | 2030              | 2031              | 2032              | Total Estimated Local Cost | Potential Outside Funding |
|-----------------------------------|-----------------------|------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|----------------------------|---------------------------|
| Project Type                      |                       |                  |                   |                   |                   |                   |                   |                   |                   |                   |                   |                            |                           |
| Park Acquisition                  | 82,148,036            | 120,000          | 25,483,662        | 14,053,771        | 11,747,206        | 16,467,630        | 10,476,547        | 4,017,319         | 9,393,348         | 4,513,859         | 4,784,691         | 101,058,034                | 5,076,699                 |
| Park Development                  | 182,367,000           | 4,372,000        | 5,618,000         | 8,643,855         | 21,214,774        | 43,007,961        | 23,875,729        | 30,736,472        | 21,092,925        | 33,340,114        | 60,260,336        | 252,162,165                | 12,113,114                |
| Park Improvements                 | 5,332,000             | 1,250,000        | 619,040           | 775,284           | 469,260           | 497,416           | 540,643           | 573,082           | 607,467           | 643,915           | 682,549           | 6,658,656                  | 138,000                   |
| Trails: Planning, Capital Repairs | 17,067,210            | 165,000          | 692,180           | 1,593,265         | 11,622,184        | 1,537,697         | 405,482           | 451,089           | 1,959,230         | 2,626,662         | 478,123           | 21,530,912                 | -                         |
| Special Facility Devel. & Imp.    | 3,470,000             | 165,000          | 1,379,060         | 1,382,028         | 814,655           | 18,937            | 20,073            | 21,278            | 22,554            | 23,908            | 25,342            | 3,872,836                  | -                         |
| <b>GRAND TOTAL</b>                | <b>290,384,346</b>    | <b>6,072,000</b> | <b>33,791,942</b> | <b>26,448,203</b> | <b>45,868,080</b> | <b>61,529,641</b> | <b>35,318,475</b> | <b>35,799,340</b> | <b>33,073,524</b> | <b>41,148,457</b> | <b>66,231,041</b> | <b>385,282,603</b>         | <b>17,327,812</b>         |

## Appendix E

The following separate documents, providing technical data, analysis, and background information, are adopted as part of the Vancouver Comprehensive Plan:

### I. Facilities and Services Plans

- Vancouver Parks, Recreation & Cultural Services Comprehensive Plan 2022-2031, and subsequent legislatively approved Park Plan and CFP amendments. Vancouver Parks, Recreation and Natural Areas Comprehensive Plan 2014, and 2017- 2022 Capital Facilities Plan
- Vancouver Urban Parks, Recreation and Open Space Plan 2002

### II. Additional Plans.

- Clark County Natural Areas Acquisition Plan – Legacy Lands Program 2022-2027 ~~1990 Clark County Open Space Plan~~



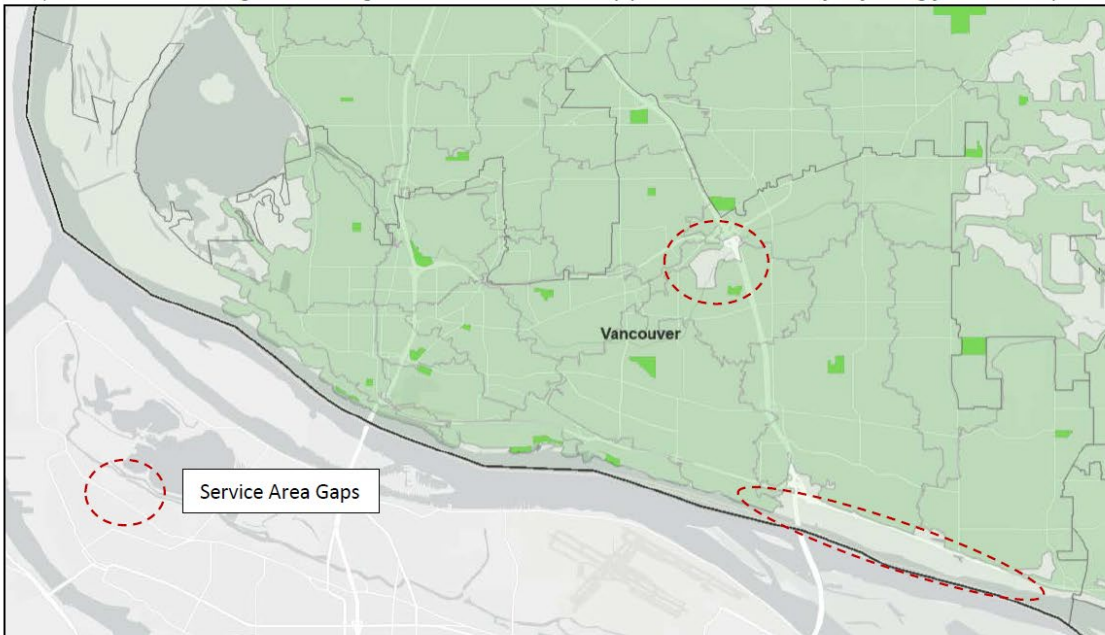
## Attachment E2 – Changes to Vancouver Parks, Recreation & Cultural Services Comprehensive Plan (2022-2031)

### Attachment C:

Vancouver Parks, Recreation & Cultural Services Comprehensive Plan (2022-2031)  
2023 Annual Review – Community Park Service Area Comparison

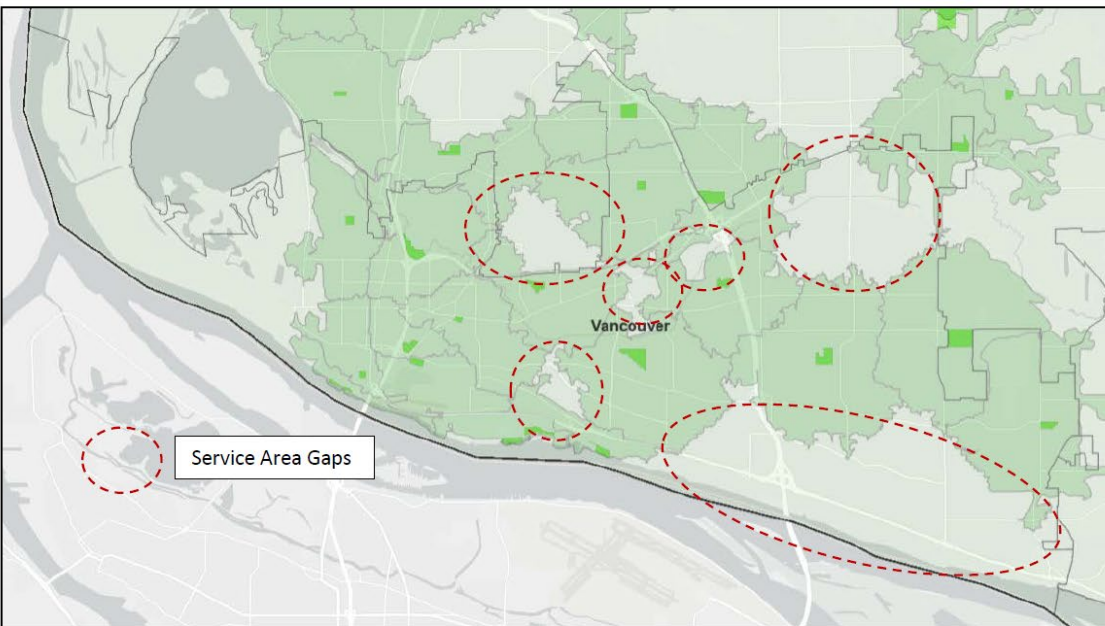
#### **3-Mile Community Park Service Area Coverage**

*(Service Area coverage shown in green; includes community park service areas of adjoining jurisdictions)*



#### **1½-mile (radius) Community Park Service Area Coverage**

*(Service Area coverage includes community park service areas of adjoining jurisdictions)*



### Comparison of 3-Mile and 1½-mile Community Park Service Area Level of Service

| Community Park Name                    | Park Acres<br>(GIS) | Current 3-Mile<br>Community Park<br>Distribution Standard |                                 | Proposed 1 1/2-Mile<br>Community Park<br>Distribution Standard |                                  |
|----------------------------------------|---------------------|-----------------------------------------------------------|---------------------------------|----------------------------------------------------------------|----------------------------------|
|                                        |                     | Acres / 1000                                              | LOS % of<br>3-Ac /1000 Standard | Ac / 1000                                                      | LOS % of<br>3-Ac / 1000 Standard |
| Bagley                                 | 16.19               | 0.20                                                      | 7%                              | 1.45                                                           | 48%                              |
| David Douglas                          | 40.17               | 0.56                                                      | 19%                             | 3.01                                                           | 100%                             |
| Dollie and Ed's                        | 9.59                | 0.20                                                      | 7%                              | 1.29                                                           | 43%                              |
| Esther Short                           | 5.34                | 0.12                                                      | 4%                              | 0.91                                                           | 30%                              |
| Fenton                                 | 23.22               | 0.48                                                      | 16%                             | 2.14                                                           | 71%                              |
| Fisher Basin                           | 12.67               | 0.24                                                      | 8%                              | 1.19                                                           | 40%                              |
| Leroy Haagen                           | 29.55               | 0.30                                                      | 10%                             | 1.3                                                            | 43%                              |
| Leverich                               | 28.52               | 0.38                                                      | 13%                             | 3.5                                                            | 117%                             |
| Marine                                 | 32.86               | 2.00                                                      | 67%                             | 71.92                                                          | 2397%                            |
| Marshall                               | 14.70               | 0.24                                                      | 8%                              | 5.13                                                           | 171%                             |
| Memory-Mill Plain                      | 11.24               | 0.20                                                      | 7%                              | 5.44                                                           | 181%                             |
| Oakbrook                               | 13.25               | 0.17                                                      | 6%                              | 0.99                                                           | 33%                              |
| Raymond E. Shaffer                     | 9.69                | 0.14                                                      | 5%                              | 0.55                                                           | 18%                              |
| Vancouver Waterfront                   | 6.88                | 0.18                                                      | 6%                              | 4.85                                                           | 162%                             |
| Waterworks                             | 5.46                | 0.08                                                      | 3%                              | 0.38                                                           | 13%                              |
| Wintler Park                           | 14.03               | 0.56                                                      | 19%                             | 6.02                                                           | 201%                             |
| <b>Average</b>                         | <b>17.09</b>        | <b>0.36</b>                                               | <b>13%</b>                      | <b>6.88</b>                                                    | <b>229%</b>                      |
| <b>Average w/o Marine</b>              |                     | <b>0.27</b>                                               | <b>9%</b>                       | <b>2.54</b>                                                    | <b>85%</b>                       |
| <b>Avg w/o Marine &amp; Waterworks</b> |                     | <b>0.28</b>                                               | <b>9%</b>                       | <b>2.70</b>                                                    | <b>90%</b>                       |

#### Attachment D:

#### **Vancouver Parks, Recreation & Cultural Services Comprehensive Plan (2022-2031)**

#### **2023 Annual Review - Proposed Amendments (Listed by Park Plan chapter and page)**

### **CLASSIFICATIONS & STANDARDS**

#### **Neighborhood Parks (pg. 57):**

Neighborhood parks provide access to basic recreation opportunities for nearby residents for a healthy active lifestyle and respite, support vibrant and distinctive neighborhoods, provide opportunities for social engagement, and preserve and enhance natural resources. These parks are designed primarily for non-organized recreation. Neighborhood parks are generally three to five acres in size and designed to serve residents of all ages and abilities within ½-mile from the park's public access points, creating a half-mile, 10-minute 'walkable' service area walking distance. Sites may vary in size depending upon unique site characteristics and land availability.

#### **Community Parks (pg. 58):**

Ideally a minimum of 20 to 100 acres in size, community parks are used by all segments of the population to provide a focal point and gathering place for more organized recreational uses and community events. In addition to the assets typical of neighborhood parks, community parks often include recreation improvements for organized activities such as sports fields, skate parks, picnic shelters, community gardens, trails, event spaces and public art and cultural features. Community parks may also integrate passive recreation space, natural resource areas and community facilities such as community or senior centers. Because of their larger size and palette of recreational features, community parks require more support facilities, including parking and restrooms, and can draw users from a 1½-mile service area from the park's public access points ~~three-mile service area~~. Community parks also serve as the walk-to park of those within the ½-mile service area.

#### **Geographic Distribution Standard (pg. 66):**

Additional guidelines for the provision of neighborhood and community parkland include the equitable geographic distribution of parks with designated service areas. Trust for Public Lands, Urban Land Institute and the National Recreation Parks Association provide national benchmarks for the walkability of park access. Each of these agencies promote a ½-mile (radius), 10-minute walking distance service area standard to provide walkable access to the outdoors. Ninety eight percent (98 percent) of our community outreach survey respondents strongly support the importance of the ½-mile standard for park access.

The service area coverage of neighborhood and community parks are identified on Maps 6 and 7 and are available in Section 16, Maps. Service area mapping provides a tool to identify locations with access to parks based upon the adopted distribution standard, and conversely, reveals the service area gaps that inform need for additional acquisitions. The image to the left represents a clip of the mapping model and how it follows public rights of way and easements from all points of public access to a park site to determine the applicable service area. However useful, there are limitations to this tool that we have been working to improve.

*\*Replace Map 7 Inset- 1½-mile ~~3-mile~~ Mile Service Area (Community Parks) \*Correct title, legend, and service area layer.*

(cont. pg. 68):

Currently, all parks regardless of size, population density, socioeconomic variables, or quality of improvements have the same ½-mile radius service area for 10-minute walkable access.

**Neighborhood Parks:** Neighborhood Parks generally serve an area within a ½-mile (radius) service area, or 10-minute walking distance (Map 6). The walkable service areas encourage alternative modes of transportation and

reasonable access for people of all abilities from those in wheelchairs, parents pushing a stroller, the elderly using a cane, or an eight-year-old on a bicycle.

| Park Type         | Geographic Distribution Standard |
|-------------------|----------------------------------|
| Neighborhood Park | <del>1/2 Mile Service Area</del> |
| Community Park    | <del>3 Mile Service Area</del>   |

| Park Type         | Geographic Distribution Standard                                |
|-------------------|-----------------------------------------------------------------|
| Neighborhood Park | 1/2 mile Service Area (radius) from park public access points   |
| Community Park    | 1 1/2 mile Service Area (radius) from park public access points |

Based on our GIS modeling of the 1/2-mile service areas for both neighborhood and community parks, 75 percent of all city residents are within walking distance of park properties. However, not all our parks are built with quality assets. Fifteen (15) of our 107 neighborhood and community parks remain undeveloped parks, representing 14 percent of the inventory. Even if we assume all properties are built and of equal quality, 50,000 current residents remain without walkable access to a park. There's still a need for more parks to serve all residents equitably.

**Community Parks** - Community Parks ~~serve an area with~~ draw from a 1/2-mile to 1 1/2-mile ~~3-mile~~ service area (Map 7). They provide the equivalent of a walk-to neighborhood park within the 10-minute service area as well as a 1 1/2-mile ~~3-mile~~ service area as a drive or roll-to facility.

~~Further evaluation is needed to determine if future adjustments are needed to this standard.~~

## PARK NEED & LEVEL OF SERVICE

### Level of Service (pg. 100):

Skate Parks: At the present time, however, the vast majority of VPRCS's community parks do not contain skate features. In order to distribute major skate facilities more adequately throughout the community, it is suggested that the department assume a 1 1/2-mile ~~3-mile~~ service area radius similar to community parks and develop skate parks in all areas of the city that are currently unserved. The 2021 NRPA ~~standard~~ average for cities of comparable size is 1 skate park per 110,000 residents.

### Park Quantity, Quality, Safety and Sustainability Criteria (pg. 105):

The maps shown here provide an example of the potential information available with analysis by the 1/2-mile park service area. These maps identify the Level of Service within the individual park service areas by park type relative to the adopted standards of two acres per thousand residents for neighborhood parks, and three acres per thousand for community parks.

*\*Replace Map 20 Level of Service (Community Park 1 1/2-mile ~~3-mile~~ service area) - Correct title, legend, and community park service area layer.*

The 2022 park planning process generated the first GIS analysis by individual park service area, offering detailed demographics and level of service details. A surprising result of the analysis was the low Level of Service of most existing community parks. ~~In future Park Plan review, consideration could be given~~ This data led to a 2023 amendment to reduce the service area reach of the community park classification from 3-miles to 1 1/2 miles, or by individual park. Doing so ~~would~~ significantly improves community park level-of service metrics and provides the mapping tools and data necessary to identify service gaps and guide where additional community park assets could be added to larger neighborhood parks, or where ~~to locate~~ new community park acquisitions are needed. The average level of service for community parks with the narrowed service area improved from approximately 9% of the community park standard to approximately 85%. An additional approach could be expansion of the user capacity within the parks with low Level of Service through additional assets for recreational variety and sustainability of the natural and built landscape.



## APPENDIX A: TERMS & ACRONYMS

### Community Parks (pg. 176):

Urban Park Type, ideally 20+ acres, serving residents within a 1½-mile ~~3-mile~~ radius area. Common amenities typically include walking paths, themed play areas, open lawns, benches, shelters, picnic tables, play courts and sport fields. Parking and restrooms are needed due to the larger service area.

**Neighborhood Park** - Urban Park Type, typically 2–5 acres, serving residents within a ½-mile, or 10-minute walk service area. Common amenities include walking paths, play areas, open lawns, benches, picnic tables and sport courts. This is a walk-to destination to serve the local community and do not typically include supportive facilities such as restrooms and parking. Some high use areas may warrant expanded amenities and support services where community parks are not available or in higher density land use areas.

### MAPS (pgs. 408-427):

Map 7 1½-Mile ~~Three-Mile~~ Service Area (Community Parks)

*\*Correct title, legend & service area layer*

Map 9 Demographic & Park Quality Matrix Analysis (1½-Mile ~~Three-Mile~~ Service Area)

*\*Correct title, legend & service area layer*

Map 20 Level of Service (Community Park 1½-Mile ~~Three-Mile~~ Service area)

*\*Correct title, legend & service area layer, and values for LOS*

Map 22 Park Quality & Variety – Community Park 1½-Mile ~~Three-Mile~~ Service Area

*\*Correct title, legend & service area layer (scores on legend will not change)*

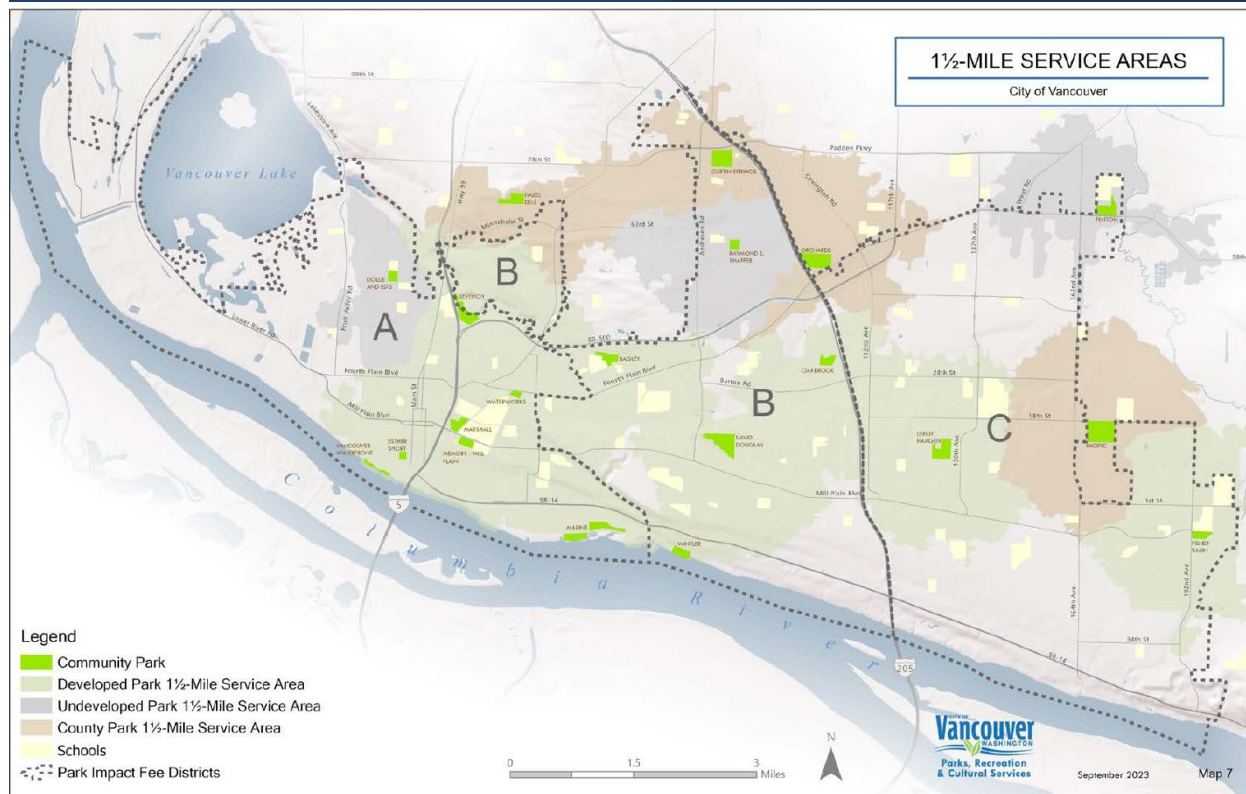
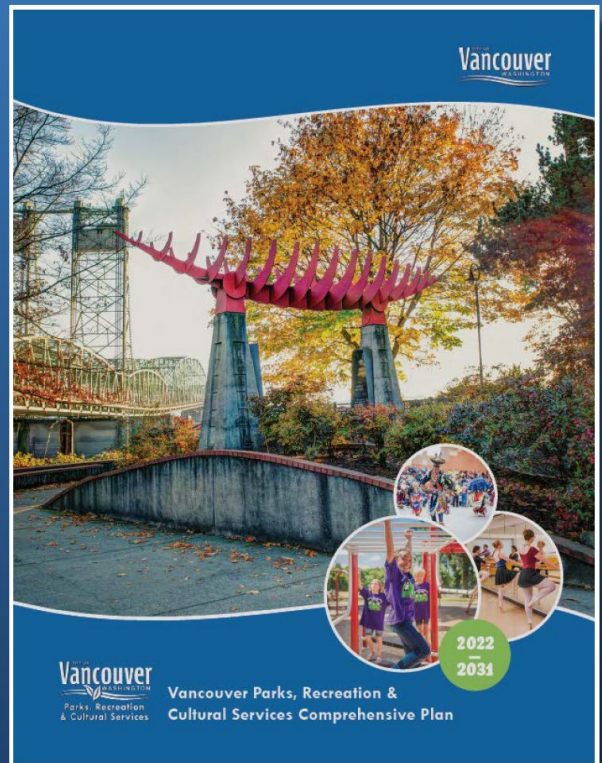
Map 24 Park Safety & Sustainability – 1½-Mile ~~Three-Mile~~ Service Area

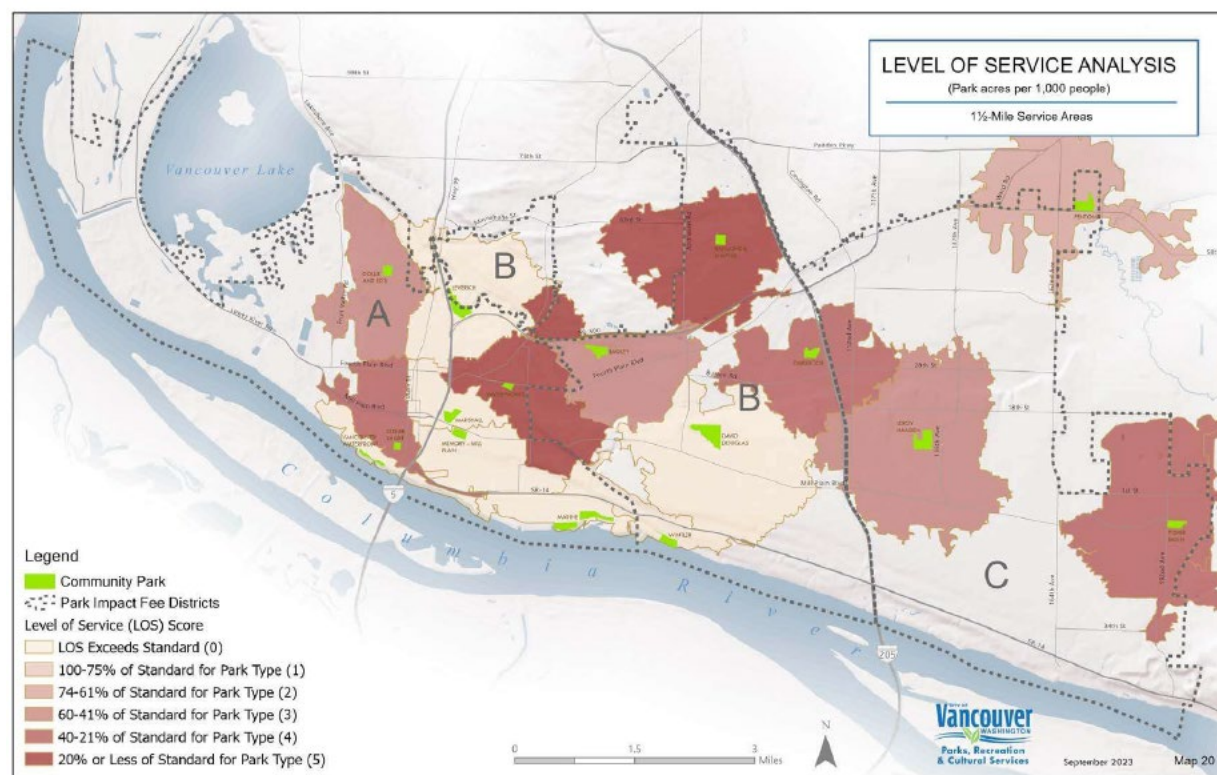
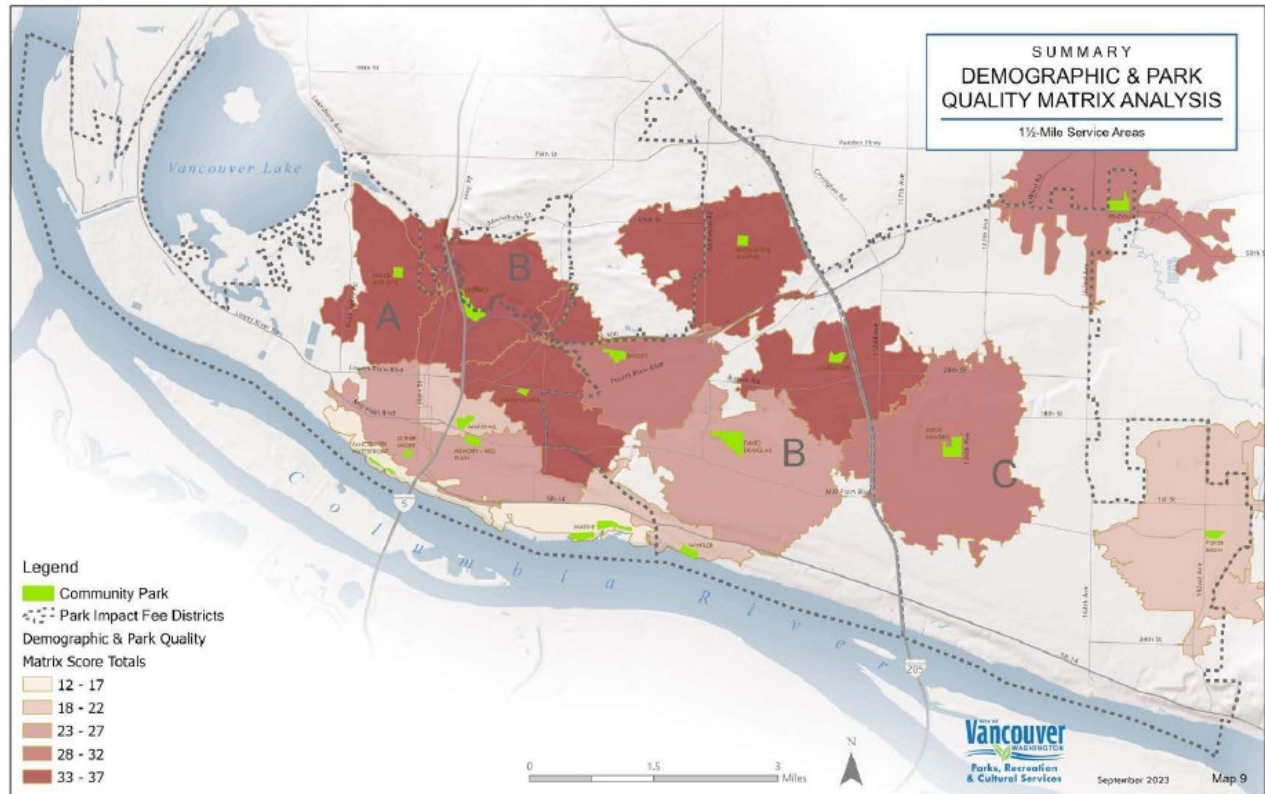
*\*Correct title, legend & service area layer (scores on legend will not change)*

Map 25 2022-2031 Capital Facilities Plan Projects

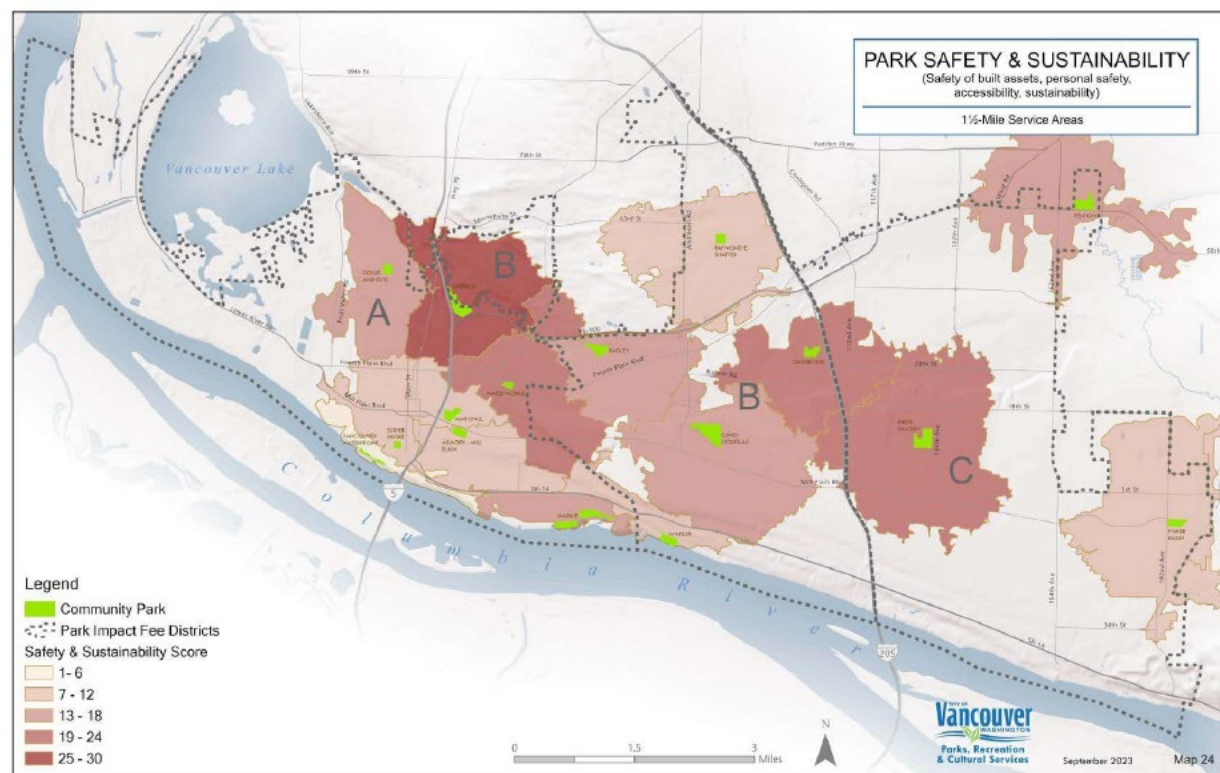
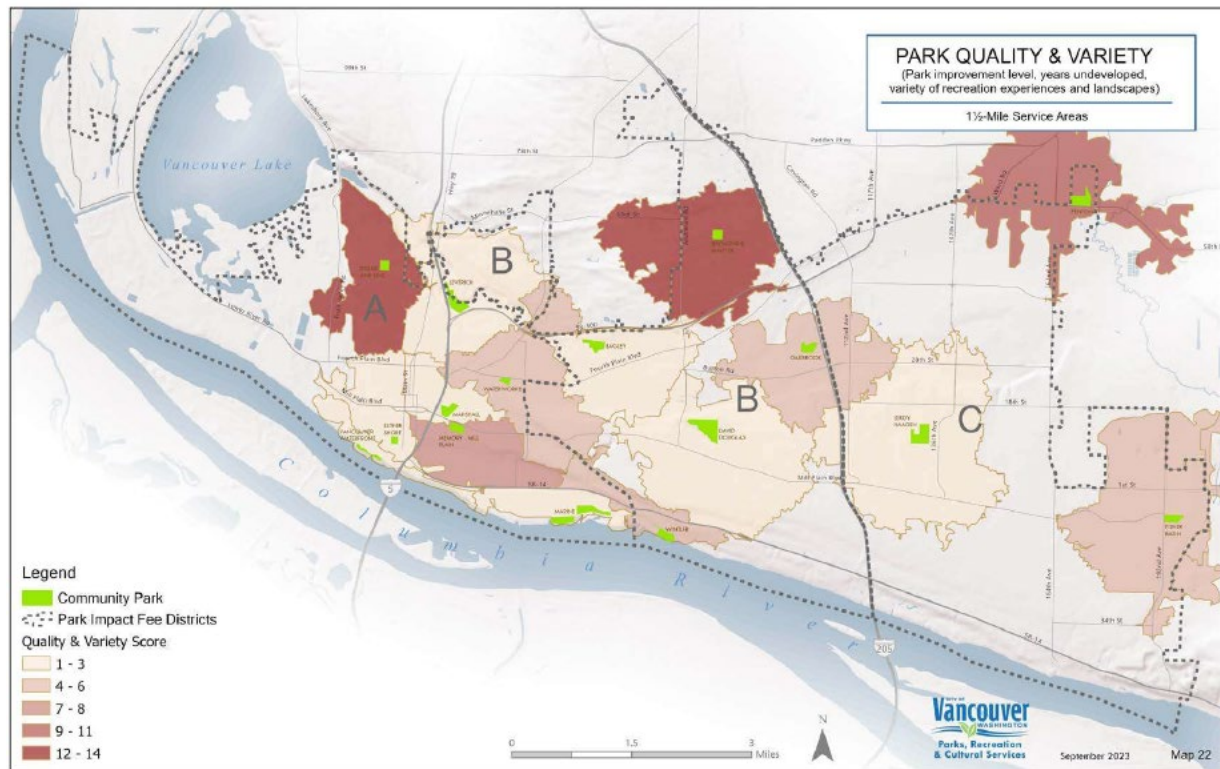
*\*Correct title, legend, and determine if any of the stars for project locations need to change*

# 2023 Annual Review Parks, Recreation & Cultural Services Comprehensive Plan Map Amendments – Attachment E

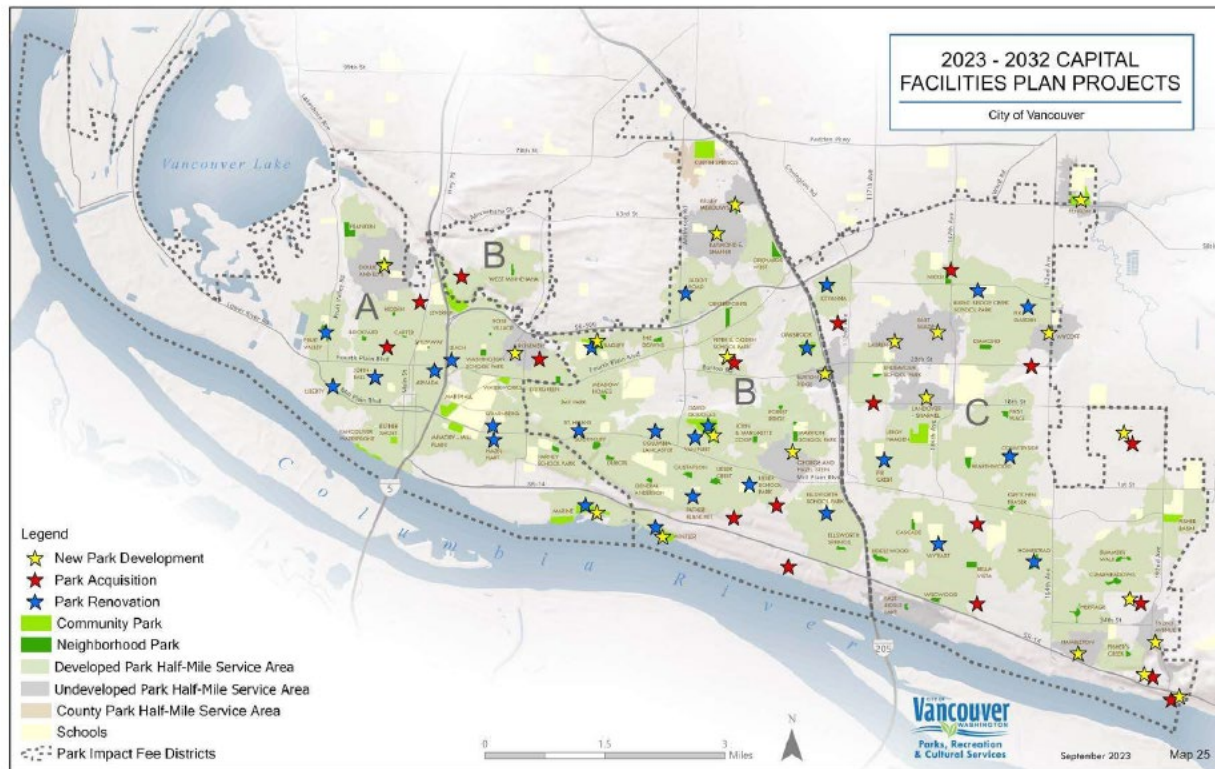












## Attachment F – VMC 20.330, Binding Site Plans

*Purpose.* The purpose of the binding site plan process is to provide an alternative to the standard subdivision process for specific types of development. The binding site plan shall only be applied for the purpose of dividing land for:

- A. Sale or for lease of commercially- or industrially-zoned property as provided in RCW [58.17.040\(4\)](#);
- B. A division for the purpose of lease as provided in **applicable** RCW [59.17.040\(5\)](#) when no other structure other than manufactured homes or travel trailers are permitted to be placed upon the land; provided, that the land use is in accordance with the requirements of this Title; and
- C. Condominiums as provided in **applicable** either RCW [64.32](#) or [64.34](#) consistent with RCW [58.17.040\(7\)](#). (Ord. M-3643, 01/26/2004)
- C. Preliminary plat information. The applicant shall provide the following information:
  - 1. Existing conditions plan. The following information shall be provided on one or more to-scale drawings:
    - a. A vicinity map showing streets and access points, pedestrian and bicycle pathways, transit stops and utility locations within a given radius of the site;
    - b. The site size, dimensions and orientation relative north;
    - c. The location, name and dimensions of public and private streets adjoining the site;
    - d. The location of existing structures and other improvements on the site, including structures, driveways, parking, loading, pedestrian and bicycle paths, passive or active recreational facilities or open space and utilities;
    - e. Elevation of the site at 2' contour intervals for grades 0% to 10% and at 5' contour intervals for grades more than 10%;
    - f. The approximate location of significant natural conditions as available from the City's and/or County's GIS system such as:
      - 1. The 100-year flood plain;
      - 2. The location of drainage patterns and drainage courses;
      - 3. Unstable ground (lands subject to slumping, slides or movement);
      - 4. High seasonal water table or impermeable soils;
      - 5. Areas having severe soil erosion potential;
      - 6. Areas having severe weak foundation soils;
      - 7. Significant wildlife habitat or vegetation;
      - 8. Slopes in excess of fifteen percent (15%);
      - 9. Significant historic, cultural or archaeological resources, rock outcroppings.
  - 10. Location, dimension, and purpose of existing easements.**

2. Preliminary Binding Site Plan. The proposed preliminary binding site plan shall include the following information presented on one or more drawings:

- a. The proposed site and its dimensions and area.
- b. Proposed lots, tracts and easements including dimensions and total acreage.
- c. Abutting properties or, if abutting properties extend more than 100' from the site, the portion of abutting properties within about 100' of the site, and the approximate location of structures and uses on abutting property or portion of the abutting property.
- d. The location and dimensions of development if proposed, including the following:
  1. Streets and other rights-of-way and public or private access easements on and adjoining the site;
  2. All parking and circulation areas;
  3. Loading and service areas;
  4. Active or passive recreational or open space features;
  5. All utilities;
  6. Existing structures to be retained on the site and their distance from property lines;
  7. Proposed structures on the site, including signs, fences, etc., and their distance from property lines if known at time of land division; and
  8. The location and type of proposed outdoor lighting and existing lighting to be retained if known at time of land division.
  9. Location, dimension, and purpose of existing easements.

## Attachment G – VMC 20.410, Single Family Residential Districts

### 20.410.050 Development Standards.

A. Compliance Required. All developments must comply with:

1. All of the applicable development standards contained in the underlying zoning district, except where the applicant has obtained a variance(s) in accordance with Chapter [20.290](#) VMC.
2. All other applicable standards and requirements contained in this title.

B. Development standards. Development standards in low-density residential zoning districts are contained in Table 20.410.050-1 and apply to land divisions approved after the effective date (07/27/2022) of this ordinance (M-4377). These apply to all primary dwellings and accessory buildings on the site. For additional regulations governing accessory buildings, see Chapter [20.902](#) VMC.

### 20.410.040 Minimum and Maximum Densities.

A. Purpose. The purpose of this section is to establish minimum and maximum densities in each residential zoning district. To ensure the quality and density of development envisioned, the maximum density establishes the ceiling for development in each zoning district based on minimum lot size. To ensure that property develops at or near the density envisioned for the zone, the minimum density for each zoning district is set at just above the maximum density of the next less intense zone.

B. Maximum and minimum densities. The maximum and minimum densities for the low-density residential districts are contained in Table 20.410.040-1.

**Table 20.410.040-1. Minimum and Maximum Densities and Lot Sizes<sup>1,2</sup>**

| Zone | Minimum Lot Size | Maximum Net Density | Maximum Average Size | Minimum Net Density |
|------|------------------|---------------------|----------------------|---------------------|
| R-2  | 20,000 sf        | 2.2                 | 30,000 sf            | 1.8                 |
| R-4  | 10,000 sf        | 4.4                 | 19,000 sf            | 2.3                 |
| R-6  | 7,500 sf         | 5.8                 | 10,500 sf            | 4.5                 |
| R-9  | 5,000 sf         | 8.7                 | 7,400 sf             | 5.9                 |
| R-17 | 2,000 sf         | 21.8                | 4,900 sf             | 8.8                 |

<sup>1</sup> The minimum and maximum density factors shall only be used for calculating densities of planned unit developments governed by Chapter [20.260](#) VMC, ~~infill development~~, density transfer, ~~cottage clusters~~ and situations where an existing house is allowed on a larger than maximum lot size per subsection (C)(2)(c) of this section (Exceptions). Minimum and maximum densities shall be calculated based on the gross area of the site minus any public rights-of-way, street tracts, private road easements, lots for dwellings existing on December 11, 2004, or designated critical areas.



## Attachment H – VMC 20.740.120 Frequently Flooded Areas.

*This section shall apply to all special flood hazard areas within the boundaries of the city of Vancouver.*

A. *Designation.* Frequently flooded areas are the areas of special flood hazards identified by the Federal Insurance Administration **Administrator** and the Federal Emergency Management Agency (FEMA), respectively, in scientific and engineering reports entitled Flood Insurance Study: Clark County, Washington and Incorporated Areas, Volumes 1 and 2 (Numbers 53011CV001A and 53011CV002A, respectively) effective September 5, 2012, and any revisions thereto, with accompanying Flood Insurance Rate Maps (FIRMs and their digital version, DFIRMs) and any revisions thereto, which are hereby adopted by reference and declared to be part of this chapter. The Flood Insurance Study (FIS), FIRMs and DFIRMs are available from the planning official, 415 West 6th Street, Vancouver, WA 98660. (See VMC [20.150.040](#), Meanings of Specific Words and Terms, for definitions for “areas of special flood hazards,” “floodplain,” “floodway,” and “frequently flooded areas.”)

When base flood elevation (BFE) data has not been provided in frequently flooded areas (Zone A), the planning official shall obtain, review, and reasonably utilize any base flood elevation and floodway data available from a federal, state or other source in order to administer the provisions of this chapter. This best available information for flood hazard area identification shall be the basis for regulation until a new FIRM/DFIRM is issued.

B. *Compliance.* All development within special flood hazard areas is subject to the terms of this chapter and other applicable regulations.

C. *Penalties for Noncompliance.* See VMC [20.740.090](#).

D. *Abrogation and Greater Restrictions.* This chapter is not intended to repeal, abrogate, or impair any existing easements, covenants, or deed restrictions. However, where this chapter and another ordinance, easement, covenant, or deed restriction conflict or overlap, whichever imposes the more stringent restrictions shall prevail.

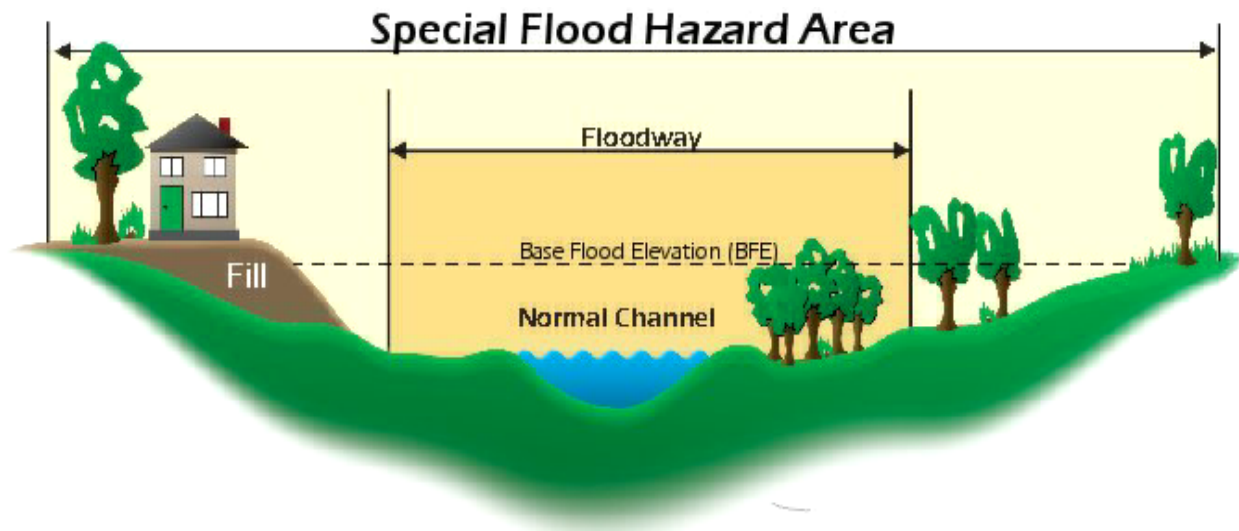
E. *Interpretation (Not Mandatory).* In the interpretation and application of this chapter, all provisions shall be:

1. Considered as minimum requirements;
2. Liberally construed in favor of the governing body; and
3. Deemed neither to limit nor repeal any other powers granted under state statutes.

F. *Warning and Disclaimer of Liability.* The degree of flood protection required by this chapter is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Larger floods can and will occur on rare occasions. Flood heights may be increased by manmade or natural causes. This chapter does not imply that land outside the areas of special flood hazards or uses permitted within such areas will be free from flooding or flood damages. This chapter shall not create liability on the part of the city of Vancouver, any officer or employee thereof, or the Federal Insurance Administration **Administrator** for any flood damages that result from reliance on this chapter or any administrative decision lawfully made hereunder.

G. *Severability.* This chapter and the various parts thereof are hereby declared to be severable. Should any section of this chapter be declared by the courts to be unconstitutional or invalid, such decision shall not affect the validity of the chapter as a whole, or any portion thereof other than the section so declared to be unconstitutional or invalid.

Figure 20.740.120-1. Frequently Flooded Areas/Areas of Special Flood Hazards



Adapted from *Floodplain Management: A Local Administrator's Guide to the National Flood Insurance Program, Fifth Edition, FEMA Region 10*

H. Designation of the Floodplain Administrator (44 CFR 59.22(b)(1)). The land use program manager is hereby appointed to administer, implement, and enforce this chapter by granting or denying development permits in accordance with its provisions. The floodplain administrator may delegate authority to implement these provisions.

1. Duties and Responsibilities of the Floodplain Administrator. Duties of the floodplain administrator shall include, but not be limited to:

a. Development Review. Review all proposed developments to:

i. Determine whether a floodplain permit is required;

ii. Make interpretations where needed as to the exact location of special flood hazard area boundaries, with respect to the flood insurance study maps and zoning district boundaries.

b. Permit Review. Review all development permits to determine that:

i. The permit requirements of this chapter have been satisfied;

ii. All other required state and federal permits have been obtained;

iii. The site is reasonably safe from flooding;

iv. The proposed development is not located in the floodway. If located in the floodway, assure the encroachment provisions of Section 5.4-1 are met;

v. Notify FEMA when annexations occur in the special flood hazard area.

I. Additional Critical Areas Report Requirements. In addition to the Critical Areas Report requirements in VMC [20.740.050](#), the following information shall be submitted. Elevation data shall reference the NAVD 1988 Datum.

1. Base (100-year) flood elevation in relation to mean sea level. When base flood elevation has not been provided or is not available from an authoritative source, it shall be generated by the applicant for developments which contain at least 50 lots or 5 acres, whichever is less.
  2. Elevation in relation to mean sea level, of the lowest floor (including basement) of all existing and proposed structures.
  3. Elevation in relation to mean sea level to which any structure's lowest floor (including basement) is raised to be at least 1 foot above the base flood elevation or for nonresidential flood-proofed structures, the elevation in relation to mean sea level to which any structure is flood-proofed.
  4. Location of the channel migration zone. See the Clark County Shoreline Inventory & Characterization Report, Volume 1, Lewis and Salmon-Washougal Watersheds and Rural Areas, Map 27, Potential Channel Migration Zone (CMZ) Areas for general locations of channel migration zones. The actual location of the channel migration zone on site must be identified by a qualified professional and mapped in accordance with the submittal requirements of VMC [20.740.050](#).
  5. Description of strategies taken to avoid, minimize, and mitigate unavoidable impacts to public safety. When the base flood elevation has not been provided or is not available from an authorized source (VMC [20.740.120\(A\)](#)), the Critical Areas Report shall include a discussion of how and whether the proposed development would be reasonably safe from flooding. Historical data, high water marks, photographs of past flooding and other available information will be used as the basis for this discussion and conclusion.
  6. Certification, documentation, and demonstration by a qualified professional of how the applicable standards of VMC [20.740.120\(J\)](#) will be met. To support the "no rise" analyses required in VMC [20.740.120\(J\)\(1\)](#), the documentation required in the most recently updated or amended FEMA Region 10 publication, Floodplain Management: A Local Floodplain Administrator's Guide to the National Flood Insurance Program shall be submitted.
- J. Performance Standards. Except as noted, the following standards apply to all structures and development (including but not limited to the placement of manufactured homes, substantial improvement, roads, railroads, trails, dikes, levees, or water, sewer, stormwater conveyance, gas, power, cable, fiber optic or telephone facilities) in all areas of special flood hazards and channel migration zones (CMZs). Additional restrictions apply in the floodway.
1. Encroachments.
    - a. Designated Floodway: Prohibited Encroachments. The following are prohibited in the floodway:
      1. Water wells ([20.740.120\(J\)\(4\)\(a\)](#)).
      2. On-site waste disposal systems ([20.740.120\(J\)\(5\)\(a\)](#)).
      3. Residential structures or other structures for human habitation including but not limited to:
        - a. Building envelopes within subdivisions ([20.740.120\(J\)\(9\)\(a\)](#));
        - b. New construction or reconstruction of residential structures ([20.740.120\(J\)\(10\)\(b\)\(1\)](#));
        - c. Placement or replacement of manufactured homes (all types) ([20.740.120\(J\)\(10\)\(b\)\(2\)](#));
        - d. Critical facilities housing vulnerable populations and emergency services ([20.740.120\(J\)\(12\)\(a\)](#)); and
        - e. Recreational vehicles ([20.740.120\(J\)\(13\)\(a\)](#)).

b. *Designated Floodway: Allowed Encroachments.* In areas where the base flood elevation has been provided and a regulatory floodway has been designated, other encroachments including but not limited to fill, new construction, replacement structures, substantial improvements and other development shall be prohibited unless:

1. Certification by a qualified professional (in this case, a registered professional engineer) is provided demonstrating through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachment would not result in a net increase in base flood elevation (less than 0.00 feet, rounded) or flood velocity during the occurrence of the base flood discharge. At a minimum, such “no rise” analyses shall include a step-backwater analysis and a conveyance compensation analysis as required in the most recently updated or amended FEMA Region 10 publication, *Floodplain Management: A Local Floodplain Administrator’s Guide to the National Flood Insurance Program*; and

2. The applicable standards of VMC [20.740.120\(J\)\(2\)](#) through [\(J\)\(15\)](#) are also met.

c. *No Designated Floodway: Allowed Encroachments.* In areas where the base flood elevation has been provided but a regulatory floodway has not been designated, no encroachments including but not limited to new construction, substantial improvement, or other development (including fill) shall be permitted, unless:

1. The applicant has demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development will not increase the water surface elevation of the base flood more than one foot at any point; and

2. The applicable standards of VMC [20.740.120\(J\)\(2\)](#) through [\(J\)\(15\)](#) are also met.

d. *Other Areas of Special Flood Hazards and CMZs.* In areas of special flood hazards except the floodway or where the BFE has not been provided, or in channel migration zones, encroachments, including but not limited to fill, new construction, replacement structures, substantial improvements and other development shall be prohibited, unless:

1. A qualified professional provides certification demonstrating that the proposed project would not result in a net loss of flood storage capacity; and

2. The applicable standards of VMC [20.740.120\(J\)\(2\)](#) through [\(J\)\(15\)](#) are also met.

2. *Property Damage.* Development shall not result in adverse impacts to other properties either upstream or downstream.

3. *Drainage.* Drainage paths around structures and on slopes shall be adequate to guide floodwaters around and away from proposed structures and adjacent properties.

4. *Water.*

a. Water wells are prohibited in the floodway.

b. In areas of special flood hazards except the floodway and in CMZs, water wells shall be constructed to withstand a 100-year flood without adversely impacting groundwater quality (WAC [173-160-171](#)).

c. All new and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the system.

5. *Waste.*

a. On-site waste disposal systems are prohibited in the floodway.



b. In areas of special flood hazards except the floodway and in CMZs, on-site waste disposal systems shall be located to avoid flood damage to them or release of contaminants from them during a base flood event.

c. New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the systems and discharge from the systems into flood waters.

6. Construction Materials and Methods.

a. Construction methods and practices shall minimize flood damage.

b. Construction materials and utility equipment shall be resistant to flood damage. For guidance on flood-resistant materials see the most current FEMA Technical Bulletin 2, Flood-Resistant Materials Requirements.

c. Electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities shall be designed and/or otherwise elevated or located so as to prevent water from entering or accumulating within the components during a base flood event. For guidance on the placement of building utility systems, see the most current FEMA Publication #348, Protecting Building Utilities from Flood Damage.

7. Anchoring. All new construction including substantial improvements and all types of manufactured homes shall:

a. Be elevated on a permanent foundation and securely anchored to an adequate foundation system to prevent flotation, collapse, or lateral movement of the structure resulting from hydrodynamic and hydrostatic loads including the effects of buoyancy.

b. Be installed or placed using methods and practices that minimize flood damage. Manufactured home placement shall follow the guidance in the most current FEMA P-85, Protecting Manufactured Homes from Floods and Other Hazards.

8. Enclosed Areas Below the Base Flood Elevation.

a. Enclosed areas below the base flood elevation shall be used only for vehicle parking, building access, or storage.

b. New or substantially improved enclosed areas below the base flood elevation shall be constructed in accordance with.

1. VMC [20.740.120\(J\)\(7\)](#), Anchoring

2. VMC [20.740.120\(J\)\(10\)\(c\)\(2\)\(d\)](#), Residential Construction

3. VMC [20.740.120\(J\)\(6\)\(b\)](#) and [\(J\)\(6\)\(c\)](#), Construction Materials and Methods

c. Enclosed areas below the BFE shall not be considered to be the lowest floor when they are not part of a basement and meet the requirements of VMC [20.740.120\(J\)\(10\)\(d\)](#).

d. Crawlpace Construction. Crawlspaces are a type of enclosed area below the BFE. Crawlspaces constructed at or above the lowest adjacent exterior grade are preferred. (Note: Insurance premiums for structures with below-grade crawlspaces will be higher than those with the interior elevation at or above the lowest adjacent exterior grade.) Refer to the most current FEMA Technical Bulletin 11, Crawlpace Construction for Buildings Located in Special Flood Hazard Areas (available from the Planning Official) for more information. Crawlspaces:

1. Are prohibited in areas with flood velocities greater than five feet (5') per second unless designed by a qualified professional (in this case an architect or professional engineer).

2. Shall meet the requirements of VMC [20.740.120\(J\)\(8\)\(a\)](#) through [\(J\)\(8\)\(c\)](#), Enclosed Areas below the BFE.

3. Shall not be considered “basements” for the purposes of VMC [20.740.120](#) when constructed according to the following standards:

a. The interior grade of a crawlspace below the base flood elevation must not be more than 2’ below the lowest adjacent exterior grade.

b. The height of the below-grade crawlspace, measured from the interior grade of the crawlspace to the top of the crawlspace foundation wall must not exceed 4’ at any point.

c. The crawlspace must be equipped with a drainage system that removes floodwaters from the interior area of the crawlspace in a reasonable period of time after a base flood event.

#### 9. Subdivisions.

a. All subdivisions shall be designed:

1. To ensure that no residential structure or other structures for human habitation are located in the floodway even though lots may extend into the floodway;

2. To avoid placement of any structures in areas of special flood hazards and in CMZs;

3. Where it is not possible to design a subdivision in a manner to avoid placement of any structures in areas of special flood hazards or CMZs, the subdivision shall be designed to minimize or eliminate potential flood damage.

b. All subdivisions shall have facilities such as sewer, gas, power, cable, fiber optic, telephone, stormwater and water systems located and constructed to minimize or eliminate flood damage. (See VMC [20.740.120\(J\)\(2\)](#), Property Damage; VMC [20.740.120\(J\)\(4\)](#), Water; VMC [20.740.120\(J\)\(5\)](#), Waste; VMC [20.740.120\(J\)\(6\)](#), Construction Materials and Methods; and VMC [20.740.120\(J\)\(7\)](#), Anchoring.)

c. All subdivisions shall have adequate drainage provided to reduce exposure to flood damage. (See VMC [20.740.120\(J\)\(3\)](#), Drainage.)

#### 10. Residential Construction (Including Manufactured Homes).

a. Residential Construction in the Floodway.

1. New construction and reconstruction of residential development including placement and replacement of all types of manufactured homes is prohibited in the floodway, **unless sited as a temporary use in accordance with subsection.**

2. Existing residential structures and manufactured homes in the floodway are nonconforming, but may be repaired or improved, provided:

a. The repair or improvement does not increase the ground floor area of the structure; and

b. The repair or improvement does not result in adverse impacts to other properties either upstream or downstream; and

c. The cost of the repair or improvement does not exceed 50% of the market value of the structure either:

1. Before the start of repair or improvement where there is no damage to the structure; or

2. Before flood or other damage to the structure occurred.

d. Any project for improvement of a structure to correct existing violations of state or local health, sanitary, or safety code specifications which have been identified by the Planning Official and which are the minimum necessary to assure safe living conditions may be excluded from the 50%.

e. Any project for improvement to a structure identified as a historic place may be excluded from the 50%.

b. Residential Construction in Other Areas of Special Flood Hazards and CMZs. In areas of special flood hazards except the floodway and in channel migration zones:

1. New residential construction and reconstruction, including all types of manufactured homes and other structures for human habitation shall meet all the provisions of this chapter, including VMC [20.740.120\(J\)\(8\)](#) and [\(J\)\(10\)\(c\)](#) through [\(J\)\(10\)\(d\)](#).

2. New placement or replacement of all types of manufactured homes shall meet the standards of VMC [20.740.120\(J\)\(7\)](#), Anchoring.

3. Repair or Substantial Improvement. All provisions of this chapter (including the elevation standards of VMC [20.740.120\(J\)\(8\)](#) and [\(J\)\(10\)\(c\)](#) and [\(J\)\(10\)\(d\)](#)), all state and local health, sanitary, safety codes, and where applicable, historic preservation codes shall be met when the cost of repair or improvement of an existing residential structure exceeds 50% of the market value of the structure either:

a. Before the start of repair or improvement where there is no damage to the structure; or

b. Before flood or other damage to the structure occurred.

c. Elevation.

1. BFE Established. The lowest floor (including basement) of new residential structures (including but not limited to reconstruction, substantial improvement, the placement or replacement of all types of manufactured homes) shall be elevated at least one foot above base flood elevation. Structures shall be elevated using means other than fill (such as extended foundation or other enclosure walls, piles, or columns) whenever feasible. Mechanical equipment and utilities shall be waterproofed or elevated at least one foot above the BFE.

2. No BFE. In areas where the base flood elevation has not been provided or is not available from an authorized source (VMC [20.740.120\(A\)](#) and [\(I\)\(5\)](#)) and the Critical Areas Report demonstrates to the satisfaction of the Planning Official that the proposed development would be reasonably safe from flooding, new residential construction (including but not limited to substantial improvement and the placement of manufactured homes) shall be elevated at least 2' above the highest adjacent grade. (Note: Failure to elevate at least 2' above the highest adjacent grade may result in higher insurance rates.)

d. Fully Enclosed Areas Below Lowest Floor. Fully enclosed areas below the lowest floor that are subject to flooding are prohibited unless designed to automatically equalize hydrostatic flood forces on exterior walls by allowing for the entry and exit of floodwaters. Designs for meeting this requirement must be certified by a qualified professional (in this case, a registered professional engineer or architect), or must meet or exceed the following minimum criteria:

1. Contain a minimum of 2 openings having a total net area of not less than 1 square inch for every 1 square foot of enclosed area subject to flooding;

2. The bottom of all openings are no higher than 1 foot above grade; and

3. Openings permit the automatic entry and exit of floodwaters even when equipped with screens, louvers, or other coverings or devices.

For guidance on flood openings, see FEMA Technical Bulletin 1-93, Openings in Foundation Walls.

4. A garage attached to a residential structure, constructed with the garage floor slab below the BFE, must be designed to allow for automatic entry and exit of floodwaters.

11. Nonresidential Construction. New construction and substantial improvement of any nonresidential structure shall either be elevated (subsection [\(J\)\(11\)\(a\)](#) or [\(J\)\(11\)\(b\)](#) of this section) or flood-proofed (subsection [\(J\)\(11\)\(c\)](#) of this section):

a. Be Elevated: BFE Established.

1. Have the lowest floor, including basement, elevated at least one foot above the base flood elevation or elevated as required by ASCE 24, whichever is greater;

2. Meet the same standards for space below the lowest floor as described in subsections [\(J\)\(8\)\(d\)](#) and [\(J\)\(10\)\(d\)\(1\)](#) through [\(J\)\(10\)\(d\)\(3\)](#) of this section; and

3. Have mechanical equipment and utilities waterproofed or elevated at least one foot above the BFE, or as required by ASCE 24, whichever is greater.

b. Be Elevated: No BFE.

1. In areas where the base flood elevation has not been provided or is not available from an authorized source (VMC [20.740.120\(J\)\(2A\)](#) and [\(3.120\(B\)\(5\)\)](#) and the Critical Areas Report demonstrates to the satisfaction of the Planning Official that the proposed development would be reasonably safe from flooding, new nonresidential construction shall be elevated at least 2' above the highest adjacent grade. Failure to elevate at least 2' above the highest adjacent grade may result in higher insurance rates; and

2. Meet the same standards for space below the lowest floor as described in [20.740.120\(J\)\(8\)\(d\)](#) and VMC [20.740.120\(J\)\(10\)\(d\)](#); or

c. Be Flood-Proofed. Together with attendant utility and sanitary facilities shall:

1. Be flood-proofed so that below one foot (or more) above the base flood elevation, the structure is watertight with walls substantially impermeable to the passage of water or dry flood-proofed to the elevation required by ASCE 24, whichever is greater;

2. Have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy;

3. Be certified by a registered professional engineer or architect that the design and methods of construction are in accordance with accepted standards of practice for meeting provisions of this subsection based on their development and/or review of the structural design, specifications and plans. Such certifications shall be provided to the Planning Official as set forth in VMC [20.740.120\(L\)](#).

12. Critical Facilities.

a. Critical facilities housing vulnerable populations and emergency services shall be prohibited in the floodway.

b. In areas of special flood hazards except the floodway and in CMZs, construction of new critical facilities shall be prohibited unless the applicant demonstrates that:

1. No feasible alternative site is available; and either:



a. The lowest floor, entrances, egresses, and to the extent feasible access routes are elevated to three feet above the base flood elevation or to the elevation of the 500-year flood, whichever is higher; or

b. The applicant demonstrates that other measures would ensure that in the event of a flood, the facility would remain safe and fully operational and that potentially harmful materials would not be displaced by or released into floodwaters. Such measures shall be conditions of approval of the Critical Areas Permit.

### 13. Recreational Vehicles.

a. Recreational vehicles shall be located outside the floodway.

b. Recreational vehicles in areas of special flood hazard except the floodway and in CMZs shall either:

1. Be on the site for fewer than 180 consecutive days;

2. Be fully licensed and ready for highway use, on its wheels or jacking system, attached to the site only by quick disconnect-type water, sewer, stormwater, gas, power, cable, fiber optic, telephone, and security devices, and have no permanently attached additions; or

3. Meet the requirements of VMC [20.740.120\(J\)\(7\)](#), Anchoring; VMC [20.740.120\(J\)\(8\)](#), Enclosed Areas below the Base Flood Elevation; and VMC [20.740.120\(J\)\(10\)\(c\)](#), Elevation.

### 14. Appurtenant Structures (Detached Garages and Small Storage Structures). For A zones:

a. Appurtenant structures used solely for parking of vehicles or limited storage may be constructed such that the floor is below the BFE, provided the structure is designed and constructed in accordance with the following requirements:

i. Use of the appurtenant structure must be limited to parking of vehicles or limited storage;

ii. The portions of the appurtenant structure located below the BFE must be built using flood-resistant materials;

iii. The appurtenant structure must be adequately anchored to prevent flotation, collapse, and lateral movement;

iv. Any machinery or equipment servicing the appurtenant structure must be elevated or flood-proofed to or above the BFE;

v. The appurtenant structure must comply with floodway encroachment provisions in Section 5.4-1;

vi. The appurtenant structure must be designed to allow for the automatic entry and exit of floodwaters in accordance with Section 5.2-1 (5);

vii. The structure shall have low damage potential;

viii. If the structure is converted to another use, it must be brought into full compliance with the standards governing such use; and

ix. The structure shall not be used for human habitation.

b. Detached garages, storage structures, and other appurtenant structures not meeting the above standards must be constructed in accordance with all applicable standards in Section 5.2-1.

c. Upon completion of the structure, certification that the requirements of this section have been satisfied shall be provided to the floodplain administrator for verification.

15. *Alteration of Watercourse.*

- a. *The planning official shall notify adjacent communities and the state coordinating agency, Washington State Department of Ecology, prior to any alteration or relocation of a watercourse, and submit evidence of such notification to the Federal Insurance Administration Administrator.*
- b. *Alteration or relocation of a watercourse shall be allowed only after:*
  - i. *Certification by a qualified professional that the alteration or relocation:*
    - A. *Is the only feasible alternative or is part of a restoration project approved by the appropriate state or federal agencies;*
    - B. *Will not diminish the flood-carrying capacity of the watercourse;*
    - C. *Will not block side channels;*
    - D. *Will be accomplished using soft armoring techniques wherever possible;*
    - E. *Will avoid to the extent possible and then minimize and mitigate removal of vegetation including downed woody vegetation; and*
    - F. *Will not endanger development in the channel migration zone.*
  - ii. *The applicant provides assurance acceptable to the planning official of maintenance of the relocated channel such that the flood carrying capacity of the watercourse is not diminished.*

16. *Changes to Special Flood Hazard Area.*

- a. *If a project will alter the BFE or boundaries of the SFHA, then the project proponent shall provide the community with engineering documentation and analysis regarding the proposed change. If the change to the BFE or boundaries of the SFHA would normally require a letter of map change, then the project proponent shall initiate within 180 days of the information being made available, and receive approval of, a conditional letter of map revision (CLOMR) prior to approval of the development permit. The project shall be constructed in a manner consistent with the approved CLOMR.*
- b. *If a CLOMR application is made, then the project proponent shall also supply the full CLOMR documentation package to the floodplain administrator to be attached to the floodplain development permit, including all required property owner notifications.*
- K. *Variances and Minor Exceptions. Variances as interpreted in the National Flood Insurance Program are based on the principle that they pertain to a physical piece of property. They apply to the land and are not personal in nature, do not pertain to the structure, its inhabitants, or economic or financial circumstances. The development standards contained in VMC [20.740.120](#), Frequently Flooded Areas are required by the Federal Emergency Management Agency (FEMA) under the National Flood Insurance Program (NFIP) to protect life and property from flood damage.*

*Variances from the NFIP standards of VMC [20.740.120](#) shall meet the approval criteria and other requirements of VMC [20.740.120\(K\)](#) in addition to any other applicable variance criteria or requirements (e.g., VMC [20.290](#) or VMC [20.760](#)). Variances from the NFIP standards of VMC [20.740.120](#) shall be processed as Type I or II variances or shoreline variances as appropriate, not as Minor Exceptions (VMC [20.740.070](#)).*

Variances or minor exceptions from other critical area standards (any standards of VMC [20.740](#) not in Section VMC [20.740.120](#)) shall meet the applicable criteria and follow the applicable procedures for the relief requested (VMC [20.740.070](#), VMC [20.290](#), or VMC [20.760](#))

1. NFIP variances may be allowed:

a. For Historic Structures. NFIP variances may be issued for the repair, reconstruction, rehabilitation or restoration of ~~structures listed on the National Register of Historic Places, the Washington Heritage Register, Washington's Heritage Barn Register, Washington's Historic Property Inventory Database, Clark County Cultural Resources Inventory, or Clark County Heritage Register, provided:~~ Historic Structures upon a determination that the proposed repair or rehabilitation will not preclude the structure's continued designation as a Historic Structure and the variance is the minimum necessary to preserve the historic character and design of the structure. This variance possibility is only available to those structures that are:

- i. Listed individually in the National Register of Historic Places (a listing maintained by the Department of Interior) or preliminarily determined by the Secretary of the Interior as meeting the requirements for individual listing on the National Register;
- ii. Certified or preliminarily determined by the Secretary of the Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined by the Secretary to qualify as a registered historic district;
- iii. Individually listed on a state inventory of historic places in states with historic preservation programs which have been approved by the Secretary of the Interior;
- iv. Individually listed on a local inventory of historic places in communities with historic preservation programs that have been certified either:
  - a. By an approved state program as determined by the Secretary of the Interior or
  - b. Directly by the Secretary of the Interior in states without approved programs.
- v. The proposed development will not preclude the structure's continued designation as a historic structure;

b. From the Elevation Standard. An NFIP variance from the elevation standard may be issued for new construction and substantial improvements to be erected on a small or irregularly shaped lot contiguous to and surrounded by lots with existing structures constructed below the base flood elevation. As the lot size increases the technical justification required for issuing the variance increases.

c. From the Flood-proofing Standard for Non-Residential Buildings. NFIP variances may be issued for nonresidential buildings to allow a lesser degree of flood-proofing than watertight or dry flood-proofing where it can be determined that such action:

1. Will have low damage potential;
2. Complies with all other NFIP variance criteria except VMC [20.740.120\(K\)\(1\)\(a\)\(2\)](#);
3. Complies with VMC [20.740.120\(J\)\(4\)](#), Water; VMC [20.740.120\(J\)\(5\)](#), Waste; VMC [20.740.120\(J\)\(7\)](#), Anchoring; and VMC [20.740.120\(J\)\(9\)](#), Subdivisions.
- d. For Allowed Development within the Floodway. NFIP variances may be issued for development within a floodway only when the requirements of VMC [20.740.120\(J\)\(1\)\(b\)](#) are met.

2. *NFIP Variance Approval Criteria.* NFIP variances from elevation and flood-proofing standards, and for development in the floodway (VMC [20.740.120\(K\)\(1\)\(a\)\(2\)](#) through (4) may be granted only if the applicant demonstrates that the requested action conforms to all of the following criteria:

- a. *The NFIP variance is the minimum necessary, considering the flood hazard, to afford relief.*
- b. *The applicant has demonstrated good and sufficient cause.*
- c. *Failure to grant the NFIP variance would result in exceptional hardship to the applicant. (Exceptional hardship for an NFIP variance is described in a FEMA memorandum dated July 22, 1986 entitled Resource Materials on NFIP Variance Criteria available from the Planning Official.)*
- d. *Granting the NFIP variance will not result in increased flood heights or velocities, additional threats to public safety, significantly increased property damage potential, extraordinary public expense, or conflict with existing local laws or ordinances.*
- e. *Demonstration that the following factors have been considered:*
  1. *The danger that materials may be swept onto other lands to the injury of others;*
  2. *The danger to life and property due to flooding or erosion damage;*
  3. *The susceptibility of the proposed facility and its contents to flood damage and the effect of such damage on the individual owner;*
  4. *The importance of the services provided by the proposed facility to the community;*
  5. *The necessity to the facility of a waterfront location, where applicable;*
  6. *The availability of alternative locations for the proposed use which are not subject to flooding or erosion damage;*
  7. *The compatibility of the proposed use with existing and anticipated development;*
  8. *The relationship of the proposed use to the comprehensive plan;*
  9. *The safety of access to the property in times of flood for ordinary and emergency vehicles;*
  10. *The expected heights, velocity, duration, rate of rise, and sediment transport of the flood waters and the effects of wave action, if applicable, expected at the site; and*
  11. *The costs of providing governmental services during and after flood conditions, including maintenance and repair of facilities such as sewer, gas, electrical, stormwater, and water systems, and streets and bridges.*
3. *Notices Required.* A notice to the applicant is required whenever a variance is approved, approved with conditions, or denied. Such notice shall include the decision and the reasons for the decision. When a variance from the elevation standard is approved or approved with conditions, such notice shall state that the structure will be permitted to be built with a lowest floor elevation below that normally required with respect to the base flood elevation and that the cost of flood insurance will be commensurate with the increased risk resulting from the reduced lowest floor elevation.

*L. Information to be Obtained and Maintained.*

1. *For all new and substantially improved structures and development, the planning official shall complete Section B of a current elevation certificate and obtain and record on that certificate:*



- a. *For elevated (rather than flood-proofed) structures and development, the actual (as-built) elevation in relation to mean sea level of the lowest floor (including basement), and whether or not the structure contains a basement.*
  - b. *For nonresidential, flood-proofed structures, the elevation to which the structure was flood-proofed. All flood-proofing certifications shall also be maintained.*
  - c. *Maintain all records pertaining to development in frequently flooded areas subject to the provisions of this chapter, VMC [20.740](#), for public inspection.*
2. *Records of Variance Actions. The planning official shall keep records of all variance actions and report any approved variances to the Federal Insurance Administration **Administrator** upon request.*
  3. *Records of Appeal Actions. The planning official shall keep records of all appeal actions. (Ord. M-4325 § 3, 2020; Ord. M-4020 § 2, 2012; Ord. M-4017 § 9, 2012; Ord. M-3844 § 2, 2007; Ord. M-3692 § 2, 2005)*

## Attachment I – VMC 20.950 Cottage Cluster Developments

### 20.950.020 Applicability.

A. *Permitted zones and required minimum project size.* Cottage cluster housing developments shall be allowed on properties 20,000 square feet or larger in size, in the R-17, R-9, R-6, R-4 and R-2 zoning districts. **Lot size minimums of the underlying zone are not applicable to cottage cluster developments.**

B. *Permitted Uses.* Cottage cluster development uses shall be limited to attached and detached single-family homes and associated outbuildings, public or private open space, and parking areas. Duplexes or attached single-family homes may constitute no more than 20 percent of the total number of units. Home occupations pursuant to Chapter [20.860](#) VMC shall be permitted only if there are no employees residing off site. Accessory dwelling units pursuant to Chapter [20.810](#) VMC shall be permitted only if located entirely within the single-family homes.

C. The narrow lot development standards in Chapter [20.927](#) VMC and R-17 zoning district standards of Chapter [20.410](#) VMC shall not apply to cottage housing developments. (Ord. M-4377 § 2(d), 2022)

### 20.950.030 Site Development and Design Standards.

#### A. General Standards.

1. Cottage housing developments may be allowed at up to **two times** ~~200 percent of~~ the maximum density of the underlying zone, including any accessory dwelling units.
2. Cottage housing developments shall contain a minimum of four and a maximum of 12 units in a cluster; provided, that a cottage development may contain up to two clusters.
3. Each single-family cottage shall not exceed 1,600 square feet in total floor area, and each duplex cottage 3,000 square feet. Floor areas of attached or detached garages and outbuildings shall count towards these size limits, with the exception of the first 200 hundred square feet of garage or outbuilding per single-family cottage, or 400 square feet per duplex. **Existing single-family homes may remain on site but will be counted toward the total density.**
4. Building heights may not exceed 25 feet within 50 feet of the project site perimeter, and 30 feet elsewhere in the site. Roofs higher than 18 feet shall be pitched at a ratio of at least 6:12.
5. Covered porches shall be at least 60 square feet, with no dimension less than five feet.
6. Buildings shall be set back at least 10 feet from the nearest public or private road, and at least five feet from other buildings. Building setbacks to exterior property lines shall be that of the underlying zoning district.

B. *Cottage Orientation.* Cottages must be clustered around a common courtyard and must meet the following standards:

1. At least 75 percent of the cottage units shall be located within 25 feet of a common **courtyard**, **and** shall have covered porches and main entries which face the common courtyard **or an adjacent public street.**

# Memorandum

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October 12, 2023

Project# 29273

To: Eric Hahn, PE – City of Vancouver  
Cc: Gary Vance – Vance Development LLC  
From: Kristine Connolly, PE, Megan Mannion, & Ana Silva  
Project: SE 192<sup>nd</sup> Avenue CPA and Zone Change  
Subject: Transportation Impact Analysis (Proposed CPA and Zone Change)

---



This transportation impact analysis documents the traffic impacts of the proposed Comprehensive Plan Amendment (CPA) and Zone Change request (from existing R-6 zoning to R-22 zoning) for the 10.15 acres of land on the northwest corner of SE 15<sup>th</sup> Street and SE 192<sup>nd</sup> Avenue in Vancouver. With approval of the proposed CPA and Zone Change request, site development is expected to commence in 2025, with completion and full occupancy anticipated by 2027. Further traffic analysis and concurrency review of a specific site development plan will be provided under separate cover at a later date as part of a site land use application assuming approval of the CPA and Zone Change request.

A summary of the findings and recommendations of the CPA and Zone Change traffic analysis is provided below. The methodology of our analysis, pertinent findings, and our recommendations are documented herein.

## Findings

- All of the study intersections were found to operate acceptably under opening year (2027) and five-year horizon (2032) traffic conditions with reasonable worst-case development of the site under both the existing (R-6) and proposed (R-22) zoning.
- The eastbound left-turn queues at SE 192<sup>nd</sup> Avenue / SE 15<sup>th</sup> Street are anticipated to exceed the currently available storage length under future five-year 2032 background (existing zoning) and total (proposed zoning) traffic conditions during the AM and PM peak hours assuming reasonable worst-case development of the site under both the existing (R-6) and proposed (R-22) zoning.
  - Subject to City of Vancouver direction and the specific traffic impacts of potential future site development, the eastbound left-turn lane at SE 192<sup>nd</sup> Avenue / SE 15<sup>th</sup> Street may need to be extended to provide up to 175 feet of storage based on the projections in this study.
  - The actual turn lane storage length needs will depend in part on the density of site development that is proposed in the future and can be best assessed at the time of site plan application as required by the Vancouver Municipal Code (VMC, Reference 1).
- No safety-based mitigation needs were identified based on review of historic crash data at the study intersections.
- Washington State Department of Transportation (WSDOT) volume-based criteria for providing turn lanes at the anticipated site driveways on SE 192<sup>nd</sup> Avenue and SE 15<sup>th</sup> Street are not met under either weekday AM or PM peak hour traffic conditions. Southbound volumes on SE 192<sup>nd</sup> Avenue do meet the criteria for considering a right-turn pocket or taper; however, installation of tapers is not recommended given the presence of the bicycle lane and intersection sight distance considerations. Potential turn lane needs at the site access driveways can be revisited at the time of a future site development application.

## Recommendations

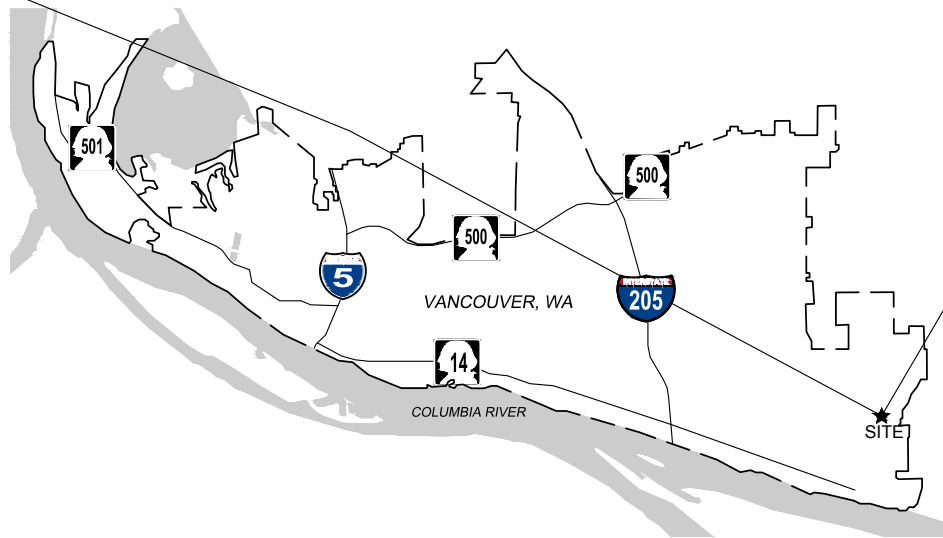
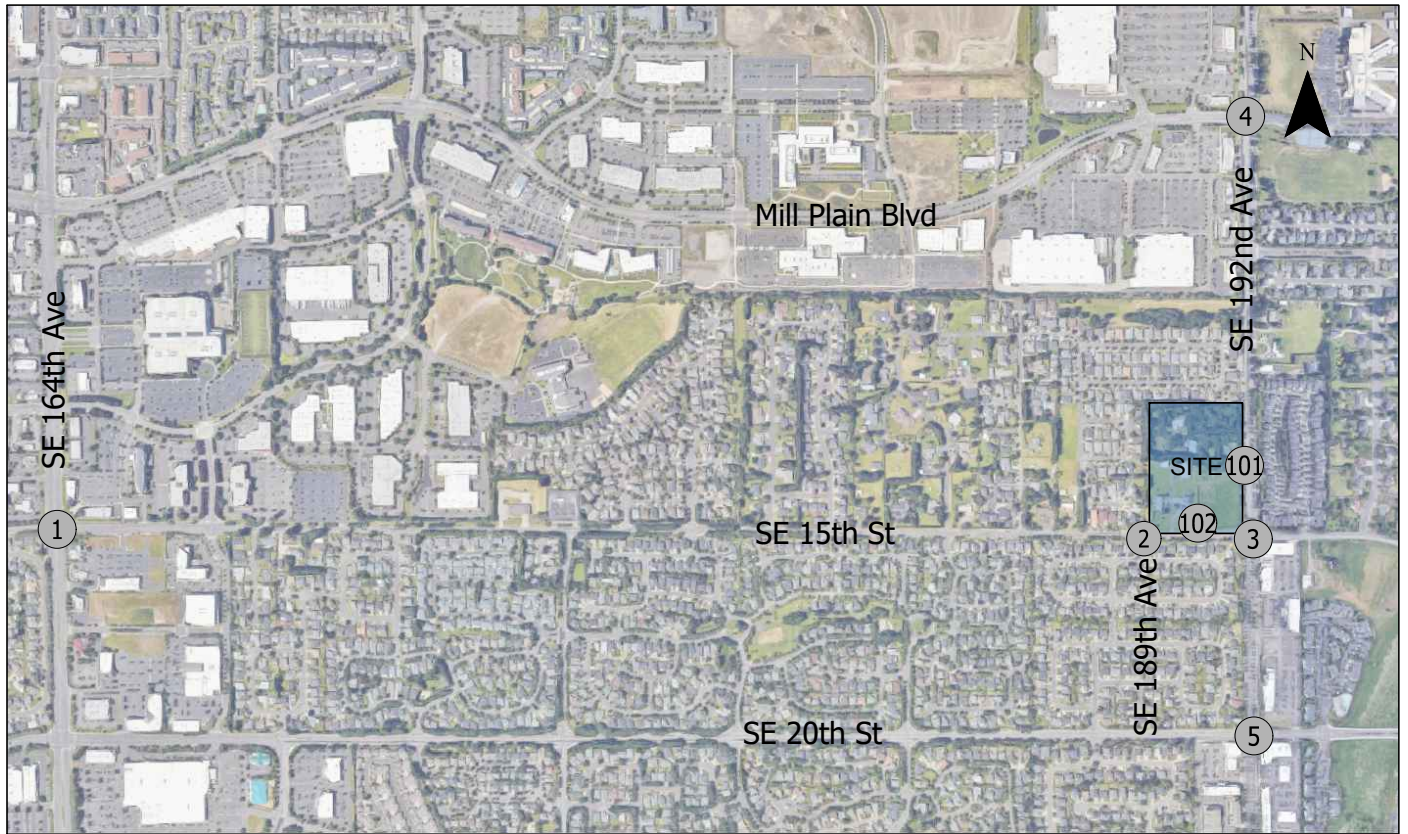
- Subject to City of Vancouver direction and per standard City development review practice, future site development applications for the study site (as well as other development in the area) should continue to assess the need for additional eastbound left-turn lane queue storage on SE 15<sup>th</sup> Street at SE 192<sup>nd</sup> Avenue. The City of Vancouver can monitor turn lane storage length needs through the City's development review process and require an extension of the turn lane in conjunction with a future site plan application based on the documented turn lane storage needs at the time of site plan application in accordance with the VMC.

## INTRODUCTION

Vance Development LLC is proposing a CPA and Zone Change request for the 10.15 acres of land on the northwest corner of SE 15<sup>th</sup> Street and SE 192<sup>nd</sup> Avenue from its existing R-6 zoning designation to R-22. Access to homes within the new subdivision is assumed to be provide via SE 192<sup>nd</sup> Avenue and SE 15<sup>th</sup> Street. Figure 1 shows the site vicinity map and Figure 2 shows a preliminary concept site development plan for CPA and Zone Change assessment purposes. A specific site development plan will be provided under separate cover at a later date as part of a site land use application assuming approval of the CPA and Zone Change request.



H:\20\20273 - SE 192nd Avenue CPA\_Zone Change\report\figs\20273 - SE 192nd Avenue - Figures.dwg Oct 09, 2023 - 12:54pm - mmammon Layout Tab: Site Vicinity Map



# - STUDY INTERSECTION

Site Vicinity Map  
Vancouver, WA

Figure  
1





## Conceptual Development Plan Information

|                  |            |
|------------------|------------|
| Gross Area       | = 8.87 ac  |
| Street Vacation  | = 0.28 ac  |
| Total Gross Area | = 10.15 ac |

## Development Standards: Vancouver, Washington

|                                              |                        |
|----------------------------------------------|------------------------|
| Existing Zoning Base: R-6                    |                        |
| Proposed Re-Zoning: R-22 (Chapter 20.20.040) |                        |
| Net Density - Min & Max                      | = 18.1 - 22 units / ac |
| Lot Size - Min                               | = 1,500 sf             |
| Lot Coverage - Max                           | = 50%                  |
| Front Yard Setback - Min                     | = 10'                  |
| Rear & Through Lot Yard - Min                | = 0' / 5'              |
| Side Yard Setback - Min                      | = 0' / 5'              |
| Street Side Yard Setback - Min               | = 10'                  |
| Landscaping - Min                            | = 10% net area         |

## Potential Development:

Total Units: Approximately 210 - 223 units (could include internal conversion of existing SFRs)

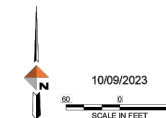
Target Parking Ratio: 1.75 - 1.9 parking stalls per unit

## Notes:

- Map information based on GIS data obtained from Clark County and Microsoft Bing. Survey data was not used for this plan and area calculations are approximate. DOWL has not verified accuracy of this information.
- Concept plan does not reflect potential ROW dedication along SE 192nd Avenue or SE 15th Street.

## Legend

- Project Boundary
- Property Lines
- 20' Landscape Buffer



7200 NE 41st Street, Suite 204  
Vancouver, WA 98662  
360.314.2301  
Project No. 2451-14946.01  
Contact: Jessica Herceg

## SE 192nd Avenue Comprehensive Plan Amendment and Zone Change

Conceptual Site Plan - R-22 Alternative

Vancouver, Wa

RECEIVED FROM DOWL: 10/09/2023

Preliminary Concept Site Plan  
Vancouver, WA

Figure  
2

## SCOPE OF THE REPORT

This analysis determines the transportation-related impacts associated with the proposed CPA and Zone Change. The study intersections and overall study area for this project were determined based on a review of existing travel patterns, the traffic impact analysis requirements pursuant to VMC Sections 11.80.080 and 11.80.130, the City's Traffic Study Guidelines, and direction provided by City of Vancouver staff.

### Study Intersections

Five study intersections were identified by City of Vancouver staff as shown in Figure 1 and listed below.

1. SE 164<sup>th</sup> Avenue and SE 15<sup>th</sup> Street
2. SE 189<sup>th</sup> Avenue and SE 15<sup>th</sup> Street
3. SE 192<sup>nd</sup> Avenue and SE 15<sup>th</sup> Street
4. SE 192<sup>nd</sup> Avenue and Mill Plain Boulevard
5. SE 192<sup>nd</sup> Avenue and SE 20<sup>th</sup> Street

### Analysis Periods

Weekday AM and PM peak hour traffic conditions were analyzed at the study intersections. Traffic counts were collected in June 2023 at Intersections 1-3, and in 2017 at Intersections 3-5. The previous and current traffic counts at Intersection 3 were compared and the June 2017 counts were generally higher than the counts collected in June 2023. Therefore, no growth factor was applied to the 2017 counts at Intersections 4 and 5 to reflect existing year 2023 conditions. *Appendix "A" includes the count data at each of the study intersections.*

The remaining sections of this report address the following transportation issues:

- Analysis methodology;
- Existing land use and transportation system conditions within the site vicinity;
- Study intersection crash history review;
- Reasonable worst-case development scenario trip generation estimates for the site under the existing and proposed zoning;
- Trip distribution estimates and concurrency corridor trip assignment under the existing and proposed zoning;
- Existing year (2023) traffic conditions during the weekday AM and PM peak hours;
- Opening year (2027) background traffic conditions assuming site development under the existing zoning during the weekday AM and PM peak hours;
- Opening year (2027) total traffic conditions assuming site development under the proposed zoning during the weekday AM and PM peak hours;
- Five-year horizon year (2032) background traffic conditions assuming site development under the existing zoning during the weekday AM and PM peak hours;
- Five-year horizon year (2032) total traffic conditions assuming site development under the proposed zoning during the weekday AM and PM peak hours;
- Anticipated site driveway turn lane considerations; and,
- Conclusions and recommendations.

## ANALYSIS METHODOLOGY

### Intersection Levels-of-Service

All level-of-service analyses described in this report were performed in accordance with the procedures stated in the *2000 Highway Capacity Manual* (HCM, Reference 2)<sup>1</sup> for signalized intersections and HCM 6<sup>th</sup> Edition (Reference 3) for unsignalized intersections using Synchro 11 software. Peak 15-minute flow rates were used in the evaluation of all intersection levels of service to provide analyses based on a reasonable worst-case scenario. Queuing analyses presented in this report reflect 95<sup>th</sup> percentile queues and were also obtained from Synchro 11 software.

### Operating Standards

VMC Section 11.80.130.B states the following:

*A proposed development that adds at least five net new peak hour trips to an intersection approach operating at an LOS E or lower within the required traffic impact analysis area may be denied based upon any of the following:*

- 1. For signalized intersections, when off-site intersection conditions are at a LOS F, or*
- 2. For signalized intersections, when the LOS E and the volume to capacity ratio is greater than 0.95, or*
- 3. For unsignalized intersections, when the volume to capacity ratio for any lane on any approach is greater than 0.95, and*
- 4. When significant traffic hazards would be caused or materially aggravated by the proposed development.*

## EXISTING CONDITIONS

The existing conditions analysis identifies site conditions and geometric characteristics of roadways within the study area. Kittelson & Associates, Inc. (KAI) staff visited and inventoried the site of the proposed CPA and Zone Change and surrounding area in June 2023 to observe site conditions, adjacent land uses, existing study intersection traffic operations, and transportation facilities in the study area.

### Site Conditions and Adjacent Land Uses

The majority of the study site is currently undeveloped. Six single family residences and one commercial space are located on the northern and western portions of the site, accessible via existing driveways on SE 15<sup>th</sup> Street and SE 192<sup>nd</sup> Avenue. Existing residential development borders the site in all directions.

---

<sup>1</sup> The HCM 2000 methodology in Synchro was used because the Synchro HCM 6<sup>th</sup> Edition methodology does not produce an overall intersection volume to capacity (V/C) ratio calculation (City standards are predicated in part on the overall intersection V/C ratio).



## Adjacent Roadway Facilities

Table 1 summarizes the existing transportation facilities and roadways in the study area.

**Table 1. Existing Transportation Facilities and Roadway Designations**

| Roadway                     | Functional Classification <sup>1</sup> | Number of Travel Lanes | Posted Speed (mph) | Sidewalks?           | Bicycle Lanes? | Raised Median? | On-Street Parking? |
|-----------------------------|----------------------------------------|------------------------|--------------------|----------------------|----------------|----------------|--------------------|
| SE 192 <sup>nd</sup> Avenue | Principal Arterial                     | 4-5                    | 40                 | Yes                  | Yes            | Yes            | No                 |
| SE 189 <sup>th</sup> Avenue | Neighborhood Circulator                | 2                      | Not posted         | Yes                  | No             | No             | No                 |
| SE 164 <sup>th</sup> Avenue | Principal Arterial                     | 6-7                    | 40                 | Yes                  | No             | Yes            | No                 |
| SE Mill Plain Boulevard     | Principal Arterial                     | 4-5                    | 40                 | Yes                  | Yes            | Yes            | No                 |
| SE 20 <sup>th</sup> Street  | Minor Arterial                         | 2-3                    | 40                 | Yes                  | Yes            | Partial        | No                 |
| SE 15 <sup>th</sup> Street  | Collector Arterial                     | 2-3                    | 35                 | Partial <sup>2</sup> | Yes            | No             | No                 |

<sup>1</sup> Source: *City of Vancouver Arterial Street System and Classification Map*, Adopted June 2022.

<sup>2</sup> Sidewalks are provided along the south side of SE 15<sup>th</sup> Street adjacent to the site. There are no sidewalks on the north side of SE 15<sup>th</sup> Street along the site, but intermittent sidewalks are provided on the north side of SE 15<sup>th</sup> Street west of SE 189<sup>th</sup> Avenue.

## Pedestrian and Bicycle Facilities

As indicated by Table 1, sidewalks and bicycle facilities in the study area are generally present and the available facilities appear to have been completed in conjunction with adjacent development projects.

## Transit Facilities

C-Tran currently offers a fixed transit route within the general site vicinity. The route is summarized below.

- Route 37 (Mill Plain/Fisher's) provides bus service between Downtown Vancouver to Fisher's Landing Transit Center, including service along SE Mill Plain Boulevard, SE 192<sup>nd</sup> Avenue and SE 164<sup>th</sup> Avenue. The service operates on weekdays from approximately 4:55 AM to 1:00 AM, with 15-minute headways for most of the day. On weekends, the route operates with 20-minute headways on Saturdays and 30-minute headways on Sundays.

The transit stops for Route 37 are located approximately 200 feet south and east of the site at the SE 192<sup>nd</sup> Street & SE 15<sup>th</sup> Street intersection.

## Crash Analysis

The study intersection crash history was obtained from WSDOT for the period from January 1, 2017 to December 31, 2021. Table 2 summarizes the reported crash frequency, type, and severity by intersection. Generally, the City of Vancouver considers a crash rate greater than one crash per million entering

vehicles (MEV) to be an indicator that a potential geometric or operational issue may exist, and that further evaluation should be considered.

**Table 2. Study Intersection Crash Frequency and Severity (January 2017 through December 2021)**

| Intersection                                          | No. of Crashes | Crash Type |        |         |       |            |          | Crash Severity |        | Crash Rate <sup>1</sup> |
|-------------------------------------------------------|----------------|------------|--------|---------|-------|------------|----------|----------------|--------|-------------------------|
|                                                       |                | Rear-End   | Object | Turning | Angle | Side-swipe | Ped/Bike | Non-Injury     | Injury |                         |
| 192 <sup>nd</sup> Avenue & SE 15 <sup>th</sup> Street | 9              | 3          | 1      | 1       | 4     | 0          | 0        | 5              | 4      | 0.19                    |
| 192 <sup>nd</sup> Avenue & Mill Plain Blvd.           | 10             | 4          | 1      | 2       | 2     | 1          | 0        | 6              | 4      | 0.20                    |
| 192 <sup>nd</sup> Avenue & SE 20 <sup>th</sup> Street | 12             | 7          | 1      | 1       | 2     | 0          | 1        | 8              | 4      | 0.22                    |
| 164 <sup>th</sup> Avenue & SE 15 <sup>th</sup> Street | 19             | 8          | 3      | 0       | 6     | 2          | 0        | 15             | 4      | 0.32                    |
| 189 <sup>th</sup> Avenue & SE 15 <sup>th</sup> Street | 1              | 0          | 0      | 1       | 0     | 0          | 0        | 0              | 1      | 0.11                    |

<sup>1</sup> Crash rate is calculated as the number of crashes per million entering vehicles. Average daily traffic volumes were estimated using PM peak hour total entering volume at the intersection.

As shown in Table 2, each of the study intersections has a crash rate of less than 1.0 per million entering vehicles. There was one reported crash on SE 192<sup>nd</sup> Avenue at SE 20<sup>th</sup> Street involving a passenger vehicle making an eastbound right-turn and a bicyclist, for which no contributing circumstances were recorded. No crashes involving pedestrians were reported.

Additionally, one crash at SE 164<sup>th</sup> Avenue / SE 15<sup>th</sup> Street resulted in a fatality. The crash involved a motorcycle and a truck (under 10,000 lb.) The motorcycle was reported to be traveling southbound and the truck was traveling westbound. Speeding was recorded as a contributing factor in the crash report.

No safety-based mitigation needs were identified through review of the available crash data. *Appendix "B" includes the crash data provided for each of the study intersections.*

## TRIP GENERATION

A trip generation estimate was prepared for the existing R-6 zoning using the Institute of Transportation Engineer's (ITE) *Trip Generation Manual, 11<sup>th</sup> Edition* (Reference 4). The current allowed usage of the property can be best described as "single family detached housing" (ITE Code 210). According to VMC Section 20.410.020.C (Reference 1), the maximum density for the current zoning district R-6 is 5.8 units/net acre. With a lot size of 10.15 acres, this leads to a maximum allotment of up to 59 units.

For a conservative estimate, the allowed usage of the property after the proposed CPA/Zone Change can be described as "multi-family housing (low-rise)" (ITE Code 220). The maximum density in the VMC for the proposed zoning district R-22 is 22 units/net acre. For consistency with the analysis of the worst-case development scenario under existing conditions, the maximum density was applied to the gross site acreage. With a lot size of 10.15 acres, this leads to a maximum allotment of up to 223 units.

The resulting weekend daily, AM, and PM peak hour vehicle trip ends are summarized in Table 3. Per the ITE *Trip Generation Handbook* (Reference 5), the fitted curve equation was utilized for the AM and PM peak hour trips, while the weighted average was used for weekday daily trips.

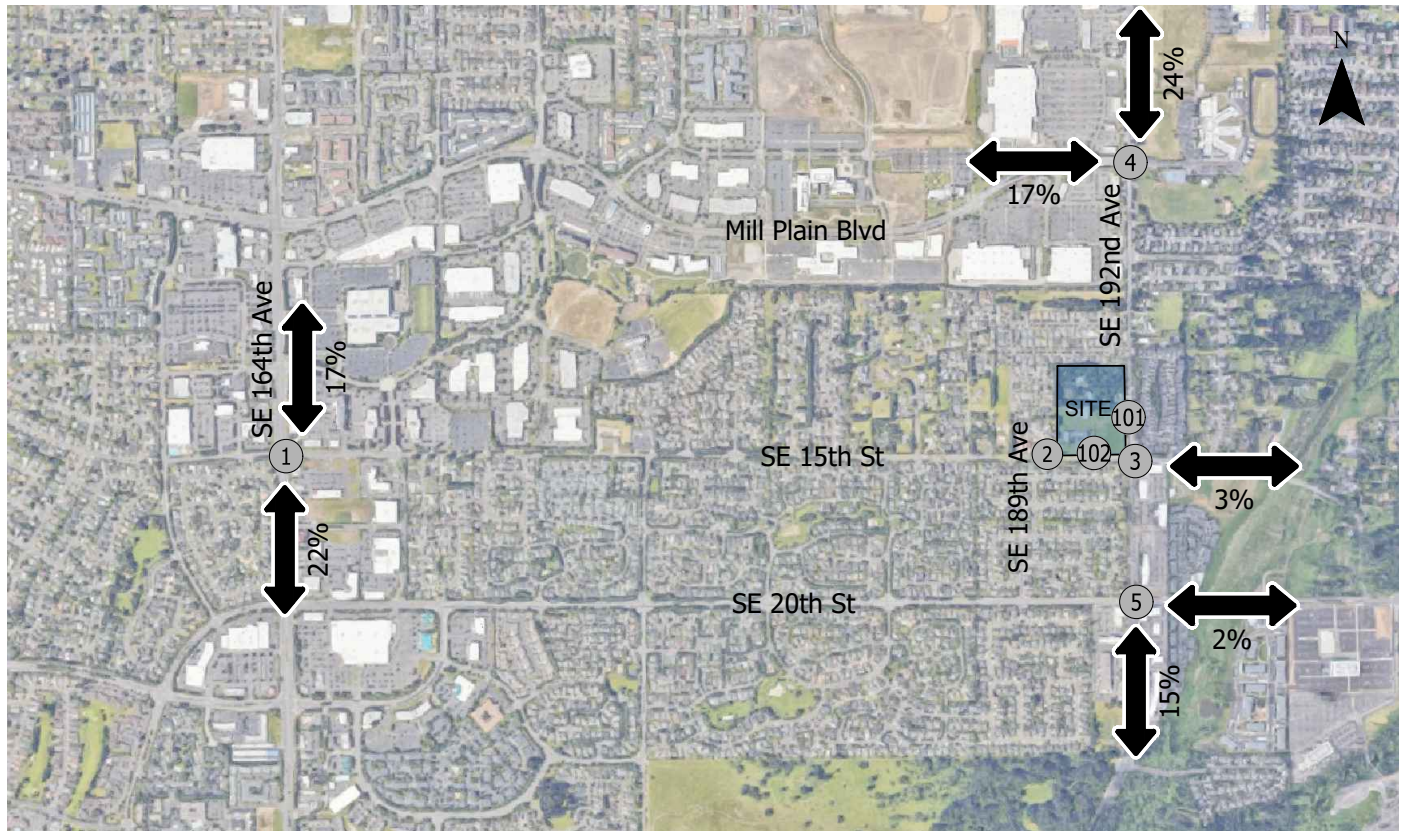
**Table 3. Trip Generation Estimate**

| Land Use                                                                                 | ITE Code | Size (Units) | Weekday Daily Trips | Weekday AM Peak Hour Trips |    |     | Weekday PM Peak Hour Trips |    |     |
|------------------------------------------------------------------------------------------|----------|--------------|---------------------|----------------------------|----|-----|----------------------------|----|-----|
|                                                                                          |          |              |                     | Total                      | In | Out | Total                      | In | Out |
| Existing R-6 Single-Family Detached Housing Reasonable Worst Case Development Scenario   |          |              |                     |                            |    |     |                            |    |     |
| Single-Family Detached Housing                                                           | 210      | 59           | 556                 | 46                         | 12 | 34  | 61                         | 38 | 23  |
| Proposed R-22 Multi-Family Housing (Low-Rise) Reasonable Worst Case Development Scenario |          |              |                     |                            |    |     |                            |    |     |
| Multi-Family Housing (Low-Rise)                                                          | 220      | 223          | 1,503               | 92                         | 22 | 70  | 116                        | 73 | 43  |
| Trip Difference = (Proposed – Existing)                                                  |          |              |                     |                            |    |     |                            |    |     |
|                                                                                          |          |              | 947                 | 46                         | 10 | 36  | 55                         | 35 | 20  |

## TRIP DISTRIBUTION AND ASSIGNMENT

The site-generated trips shown in Table 3 were distributed to the study area roadways based on a trip distribution pattern derived from the Southwest Washington Regional Transportation Council travel demand model (select zone analysis of Transportation Analysis Zone 1752) as well as existing travel patterns in the site vicinity.

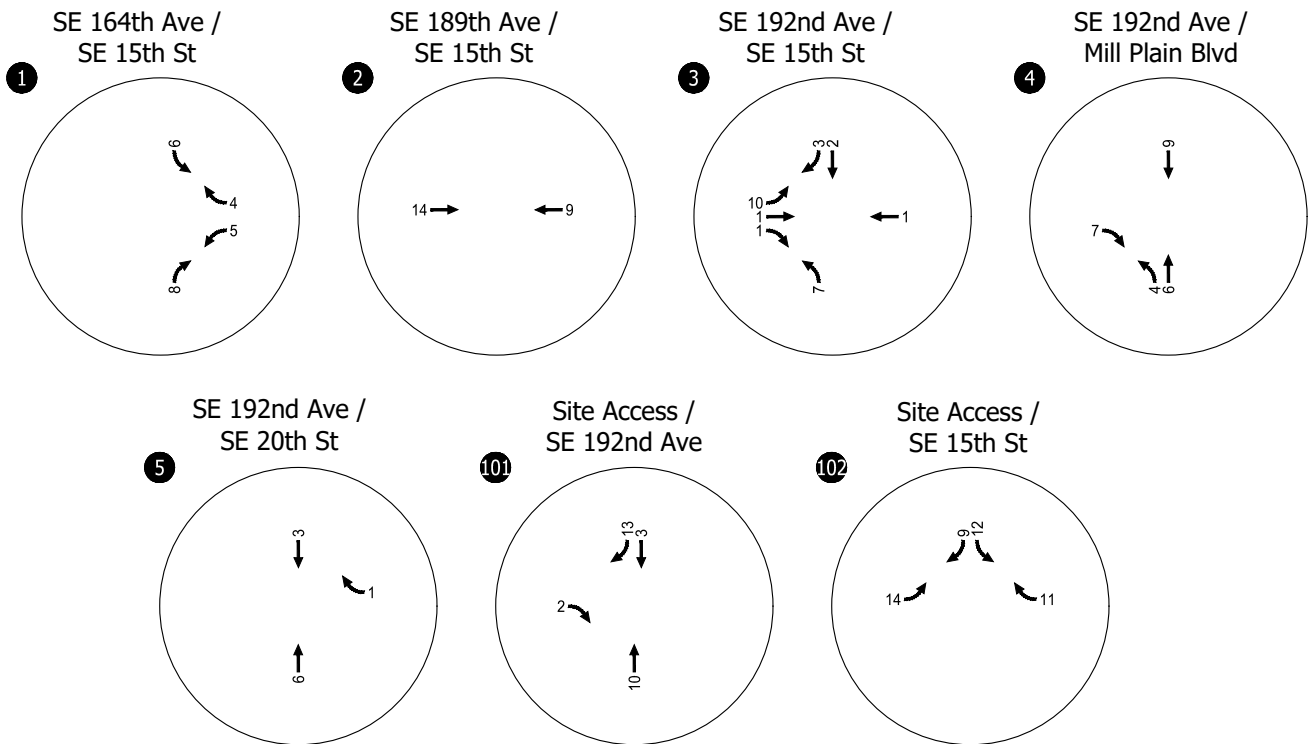
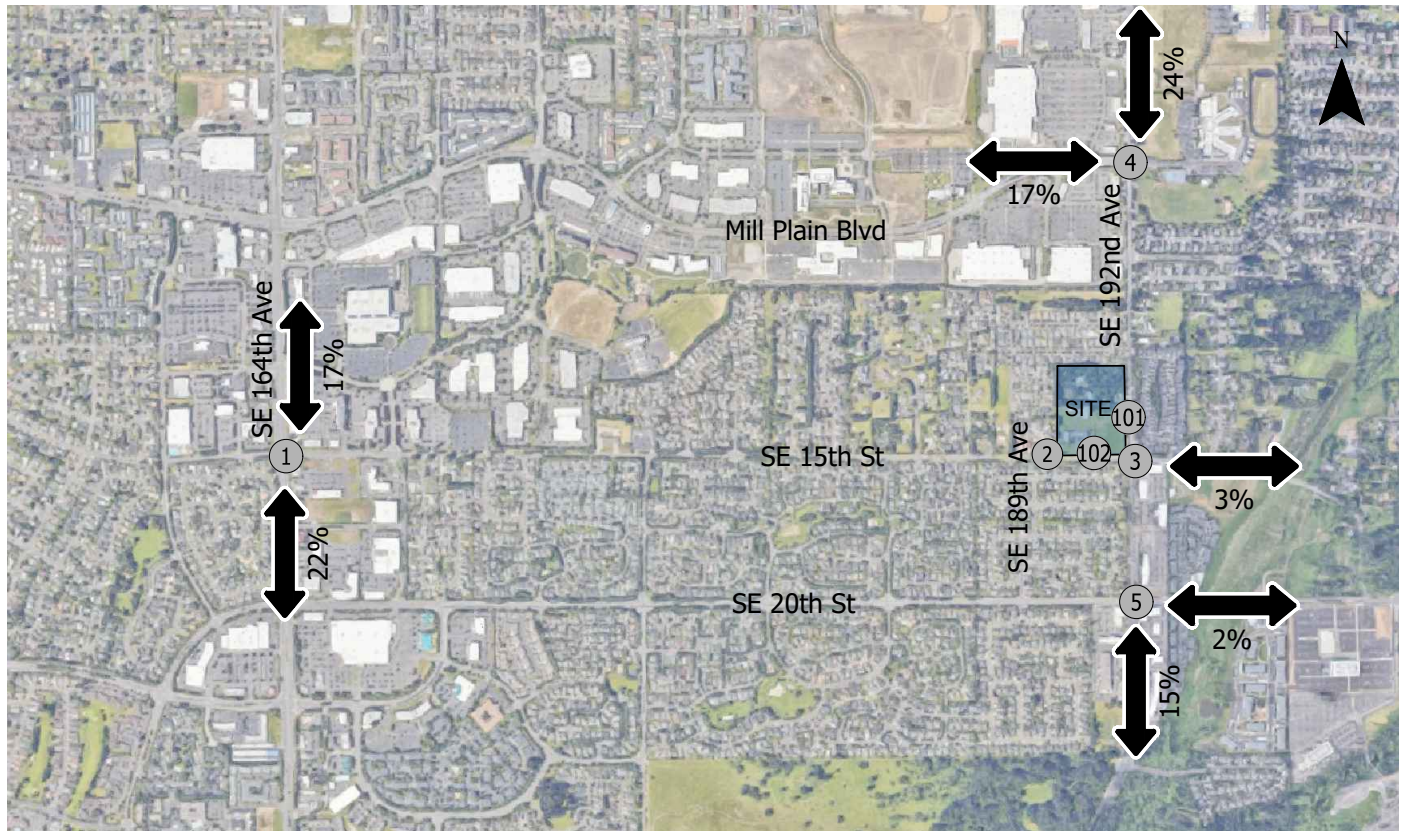
Figures 3 to 6 show the estimated trip distribution pattern and site-generated traffic volumes assigned to the five study intersections and the two anticipated site driveways under the existing and proposed zoning, respectively.



**Trip Distribution and Assignment (Existing Zoning)**  
**Weekday AM Peak Hour**  
**Vancouver, WA**

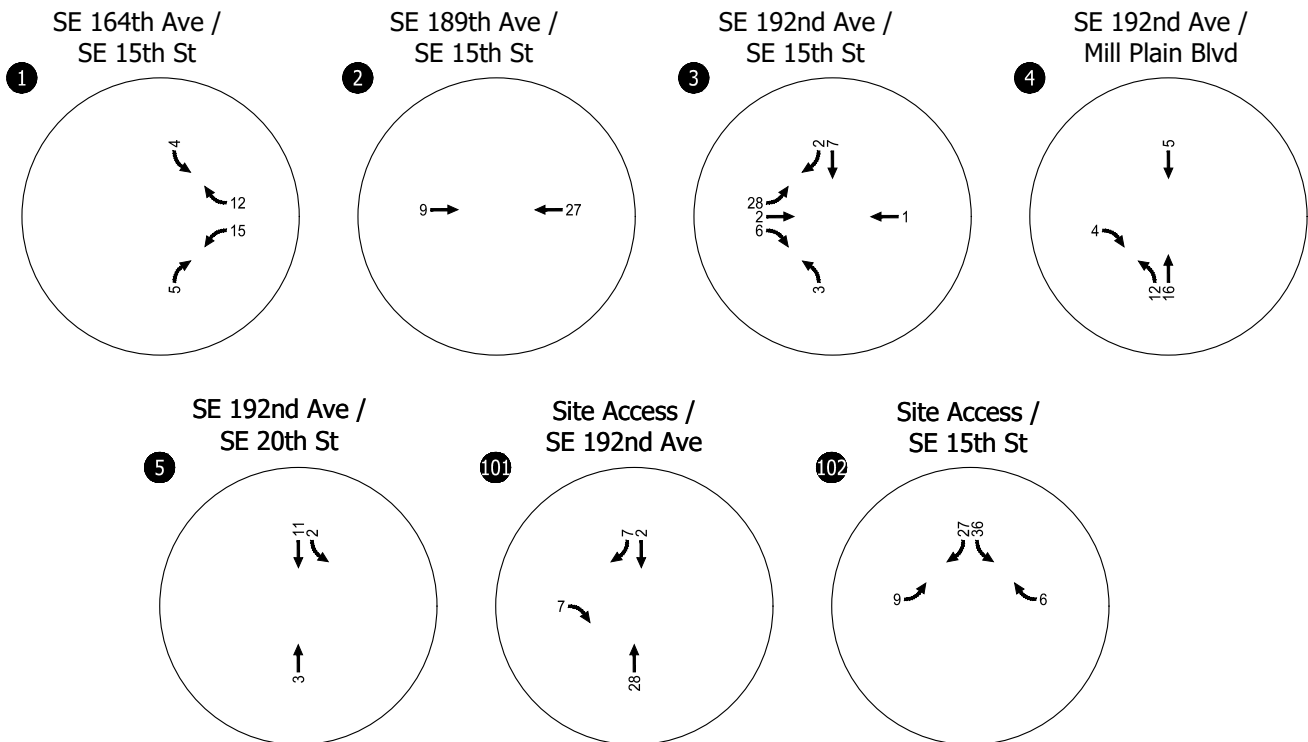
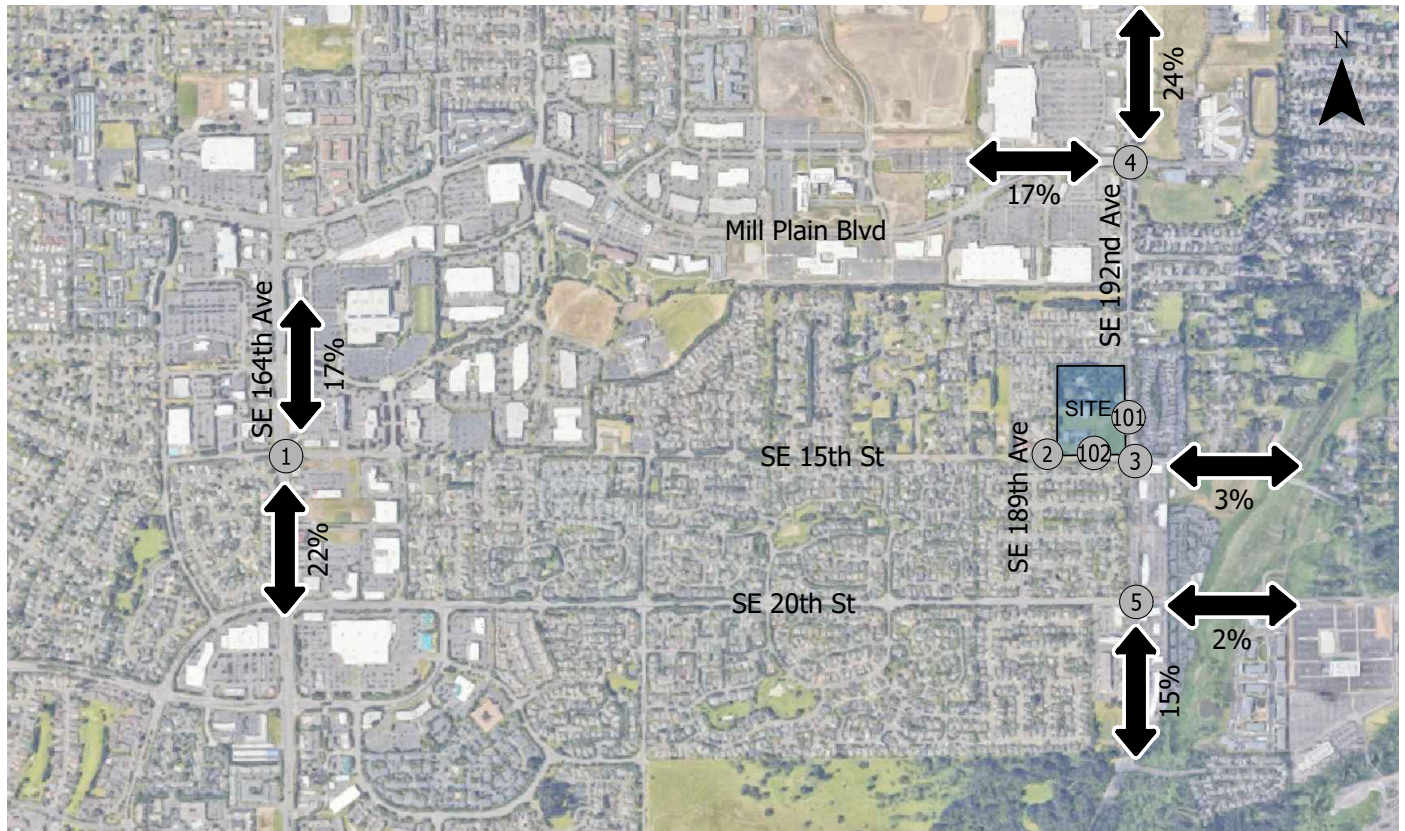
Figure  
**3**





**Trip Distribution and Assignment (Existing Zoning)**  
**Weekday PM Peak Hour**  
**Vancouver, WA**

Figure  
**4**

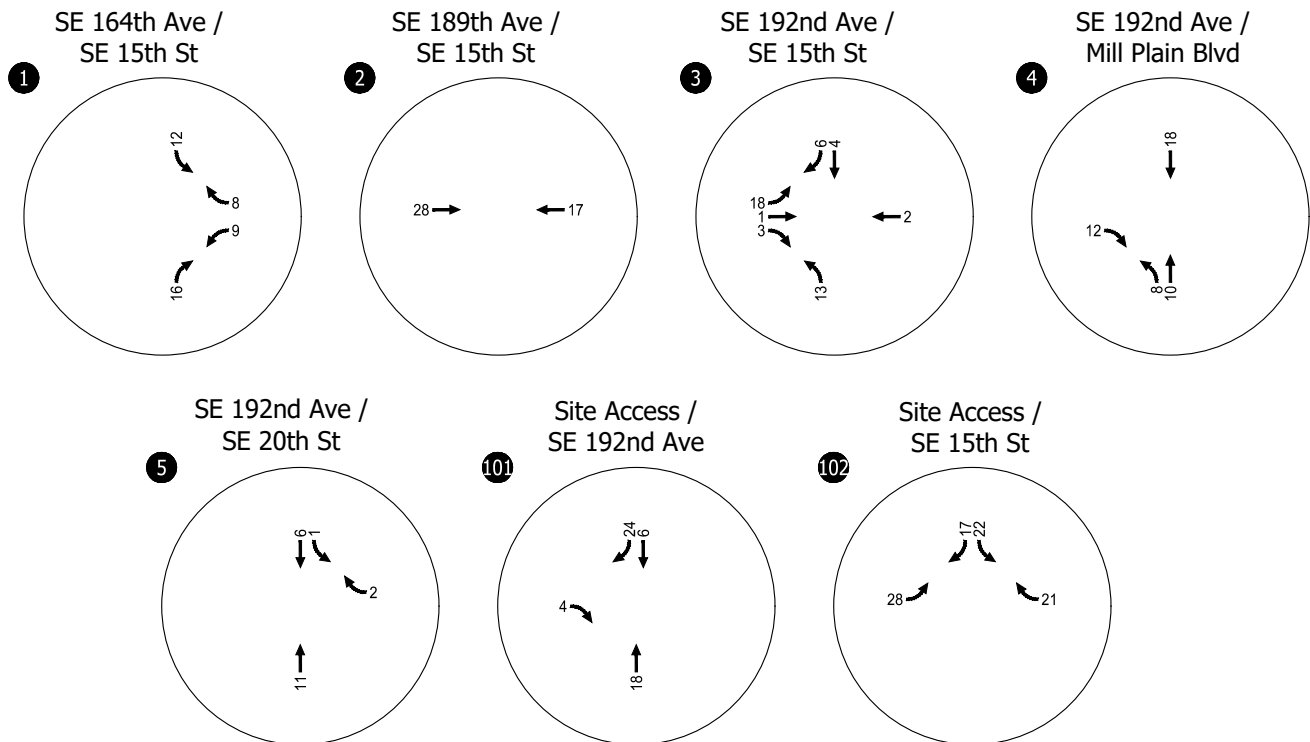
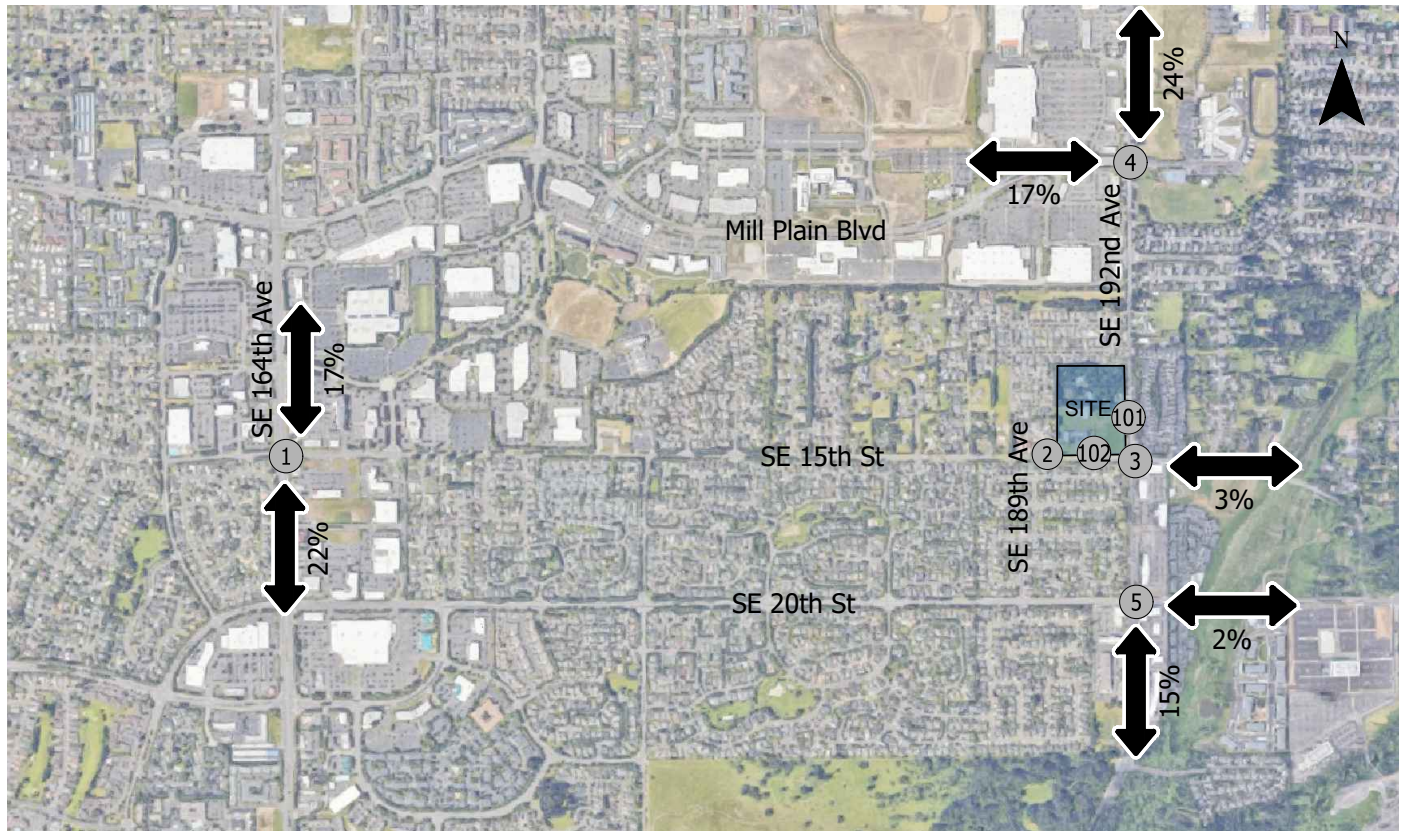


 Trip Distribution  
 X%

Trip Distribution and Assignment (Proposed Zoning)  
 Weekday AM Peak Hour  
 Vancouver, WA

Figure  
5





Trip Distribution  
 X%

Trip Distribution and Assignment (Proposed Zoning)  
 Weekday PM Peak Hour  
 Vancouver, WA

Figure  
6

## Concurrency Corridor Trip Assignment

Per City of Vancouver requirements, Table 4 summarizes the estimated number of site-generated weekday PM peak hour trips entering each of the City's adopted concurrency corridors before and after the proposed CPA and zone change for illustrative comparison purposes. Assigned trips were recorded counting trips only once along each of the specified corridors. Because the trips shown in Table 4 represent reasonable worst case development, the actual trip assignment for concurrency purposes may be different and will need to be re-assessed in conjunction with a future site development review application.

**Table 4. Concurrency Corridor Weekday PM Peak Hour Trip Assignment**

| Corridor Name                               | Corridor Limit                                   | PM Peak Trips to Corridor<br>(Existing Zoning) | PM Peak Trips to Corridor<br>(Proposed Zoning) |
|---------------------------------------------|--------------------------------------------------|------------------------------------------------|------------------------------------------------|
| Mill Plain Blvd.                            | Fourth Plain to I-5                              | 1                                              | 2                                              |
|                                             | I-5 to Andresen                                  | 2                                              | 4                                              |
|                                             | Andresen to I-205                                | 3                                              | 7                                              |
|                                             | I-205 to 136 <sup>th</sup> Ave.                  | 8                                              | 13                                             |
|                                             | 136 <sup>th</sup> Ave. to 164 <sup>th</sup> Ave. | 10                                             | 18                                             |
|                                             | 164 <sup>th</sup> Ave. to 192 <sup>nd</sup> Ave. | 11                                             | 20                                             |
| St. Johns / Ft. Van Way                     | Mill Plain to 63 <sup>rd</sup> St.               | -                                              | -                                              |
| Fourth Plain Blvd.                          | Mill Plain to I-5                                | -                                              | -                                              |
|                                             | I-5 to Andresen                                  | -                                              | -                                              |
|                                             | Andresen to I-205                                | -                                              | -                                              |
|                                             | I-205 to 162 <sup>nd</sup> Ave.                  | 1                                              | 3                                              |
| Andresen Road                               | Mill Plain to SR500                              | -                                              | -                                              |
|                                             | SR500 to 78 <sup>th</sup> St.                    | -                                              | -                                              |
| 112 <sup>th</sup> Avenue                    | Mill Plain to 28 <sup>th</sup> St.               | 1                                              | 3                                              |
|                                             | 28 <sup>th</sup> St. to 51 <sup>st</sup> St.     | -                                              | -                                              |
| 164 <sup>th</sup> /162 <sup>nd</sup> Avenue | SR14 to SE 1 <sup>st</sup> St.                   | 31                                             | 59                                             |
|                                             | SE 1 <sup>st</sup> St. to Fourth Plain           | 16                                             | 31                                             |
| Burton Road / 28 <sup>th</sup> Street       | 18 <sup>th</sup> St. to 112 <sup>th</sup> Ave.   | -                                              | -                                              |
|                                             | 112 <sup>th</sup> Ave. to 138 <sup>th</sup> Ave. | -                                              | -                                              |
|                                             | 138 <sup>th</sup> Ave. to 162 <sup>nd</sup> Ave. | -                                              | -                                              |
| 18 <sup>th</sup> Street                     | 112 <sup>th</sup> Ave. to 138 <sup>th</sup> Ave. | 1                                              | 3                                              |
|                                             | 138 <sup>th</sup> Ave. to 164 <sup>th</sup> Ave. | 2                                              | 5                                              |
| 136 <sup>th</sup> /137 <sup>th</sup> Avenue | Mill Plain to 28 <sup>th</sup> St.               | 1                                              | 3                                              |
|                                             | 28 <sup>th</sup> St. to Fourth Plain             | -                                              | -                                              |
| 192 <sup>nd</sup> Avenue                    | SR14 to NE 18 <sup>th</sup> St.                  | 36                                             | 68                                             |

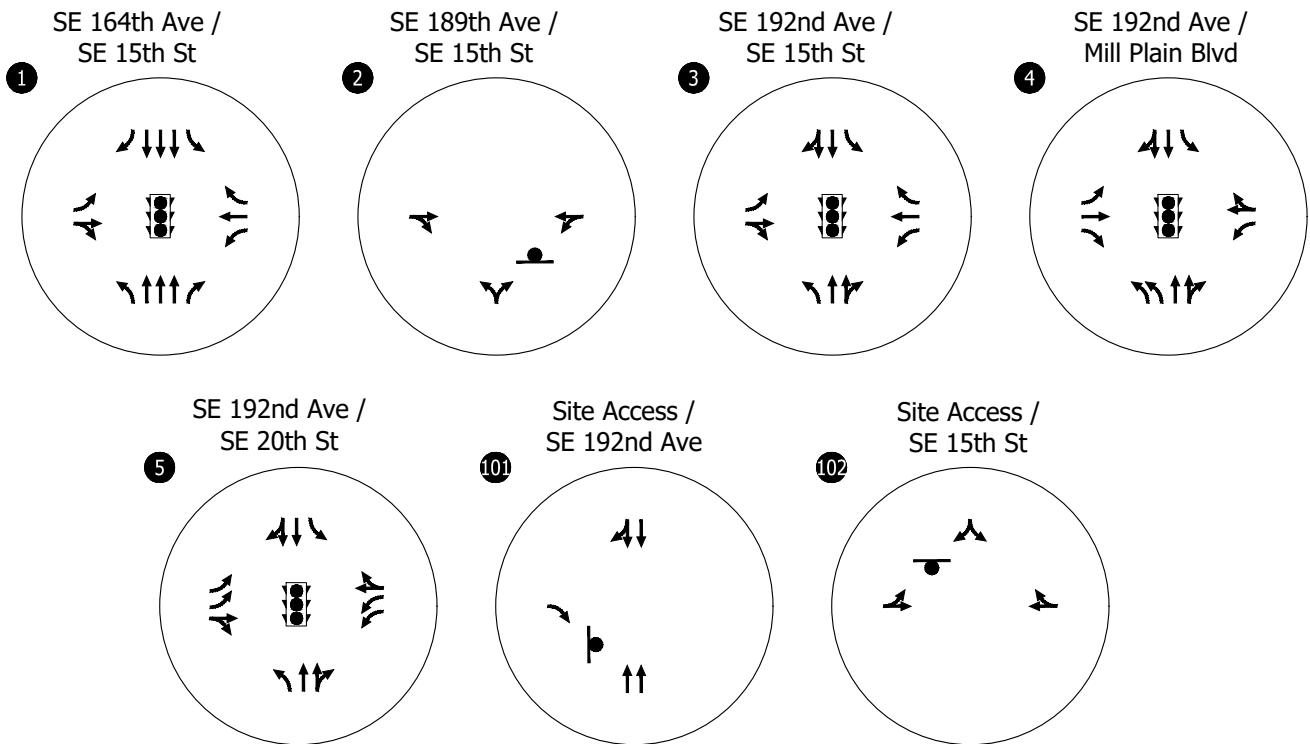
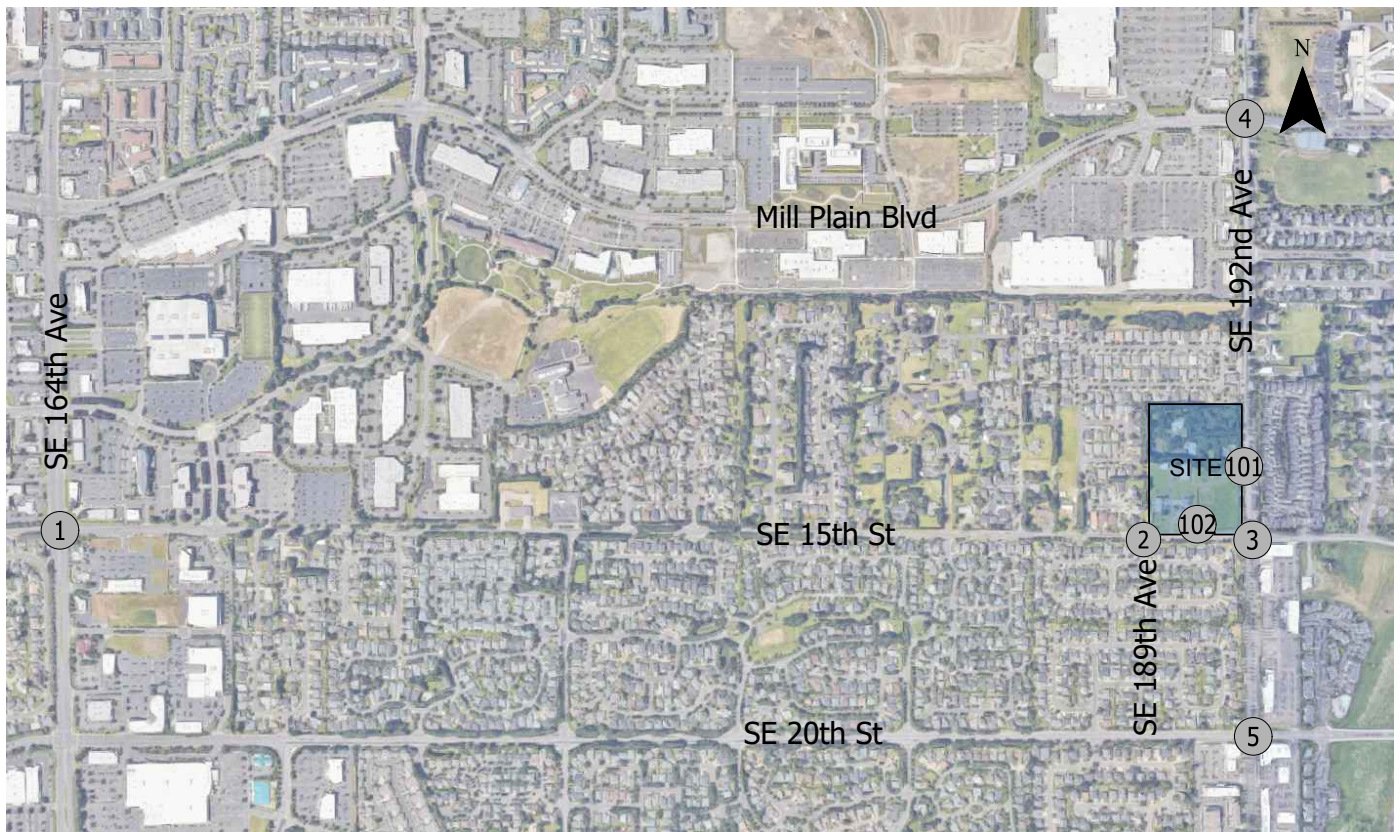


## STUDY INTERSECTION OPERATIONS REVIEW

This section provides an overview of operations at the study intersections under existing conditions as well as opening year and five-year horizon year background and total traffic conditions for both the existing and proposed zoning. The analysis determined that the study intersections all operate acceptably today and will continue to do so in the future, during both the weekday AM and PM peak hours. Figures 8 through 17 illustrate weekday AM and PM peak hour conditions under existing and future traffic conditions. Derivation of the existing and future conditions analysis at the study intersections is further described below.

### Existing 2023 Traffic Conditions

Figure 7 illustrates the existing lane configuration and traffic control devices at each of the study intersections. Figures 8 and 9 present the existing traffic volumes and corresponding intersection operations. All study intersections satisfy City of Vancouver operational thresholds under existing conditions. *Appendix "C" contains the existing operational analysis worksheets.*

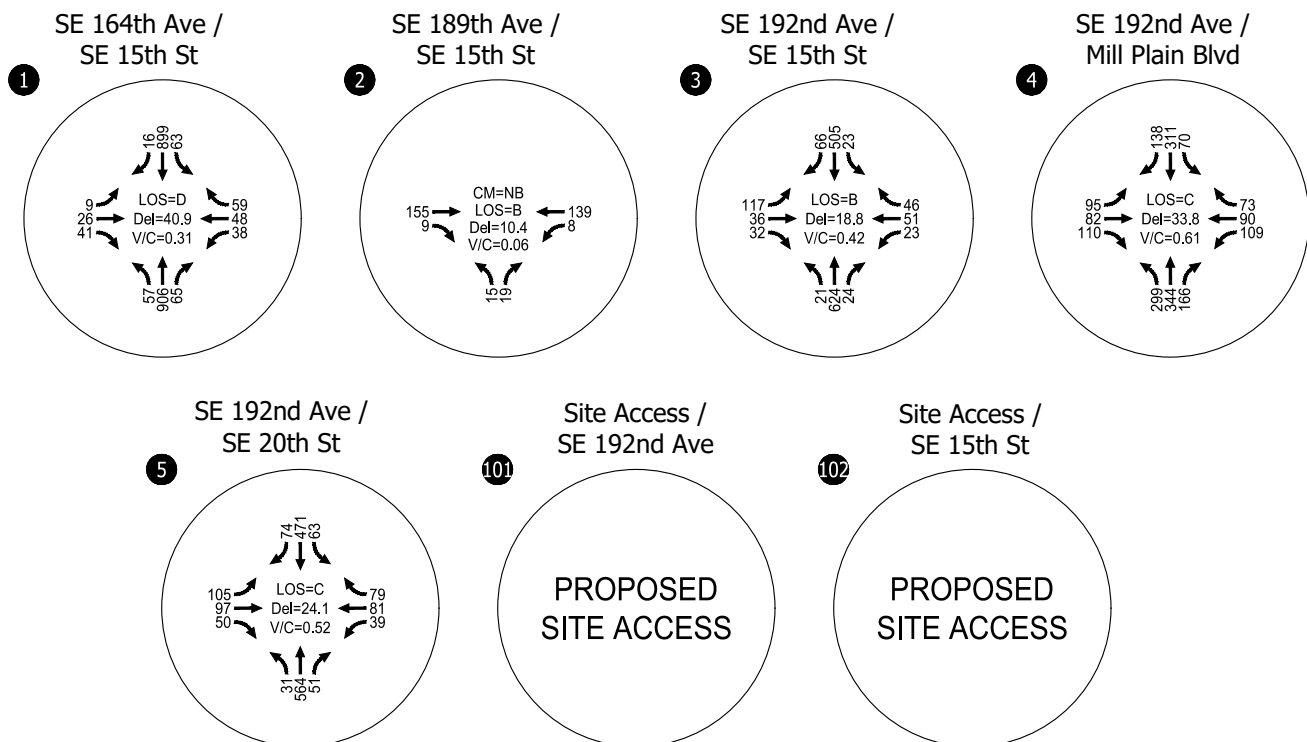
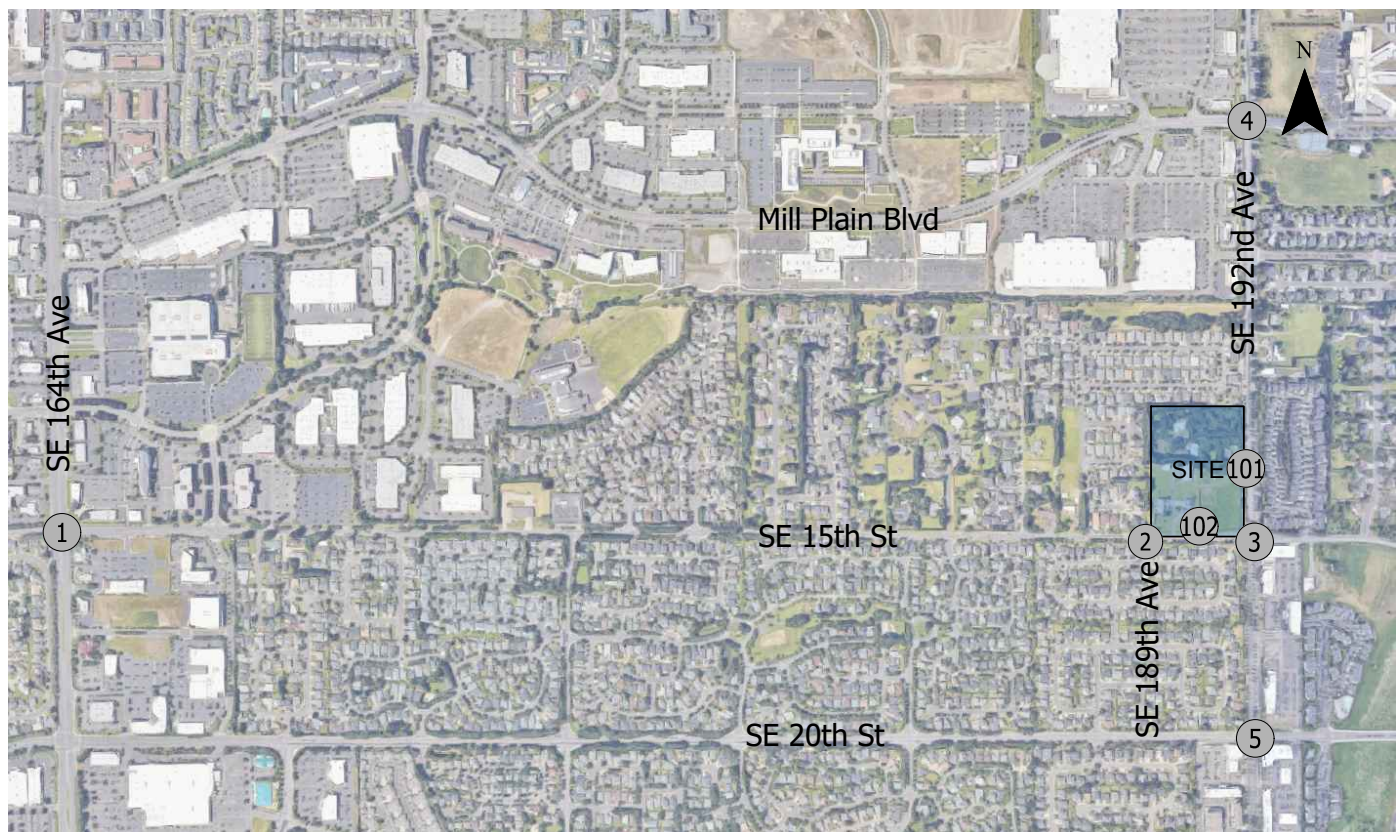


-  - Existing Lane Configuration
-  - Stop Sign
-  - Traffic Signal

Existing Lane Configurations  
& Traffic Control Devices  
Vancouver, WA

Figure  
7

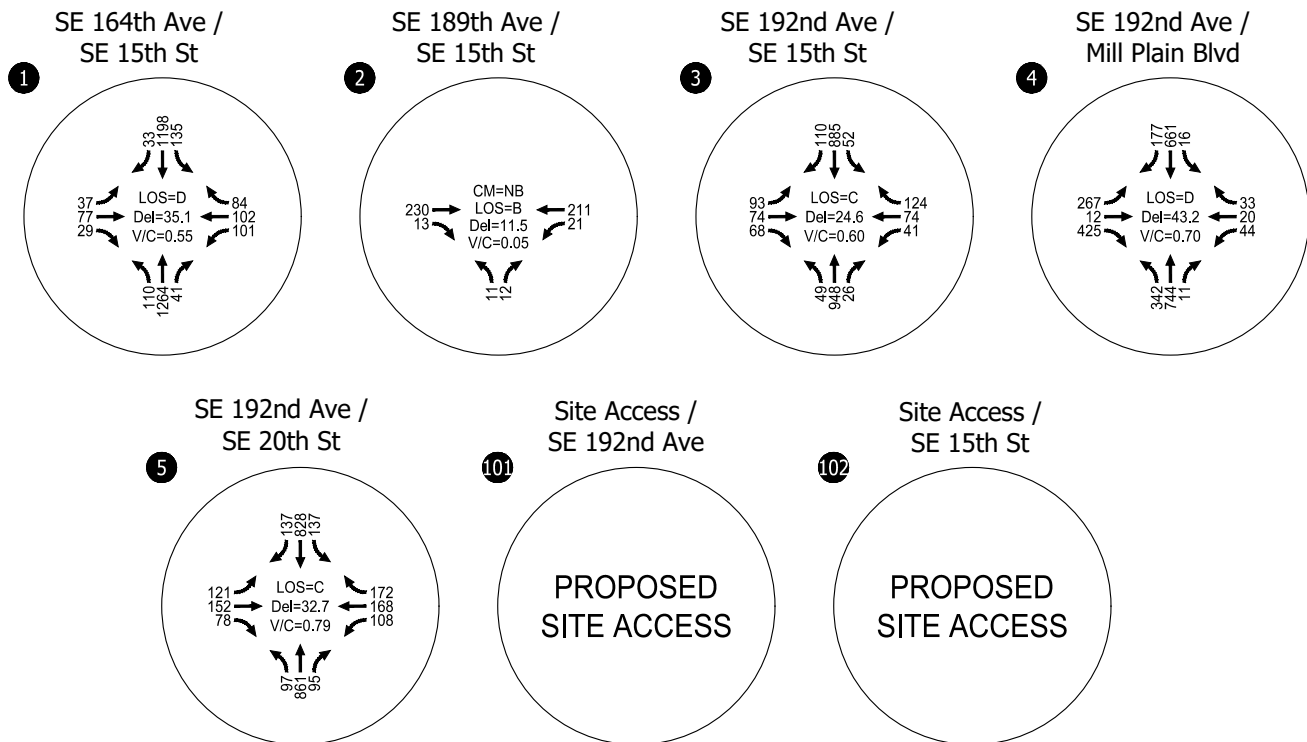
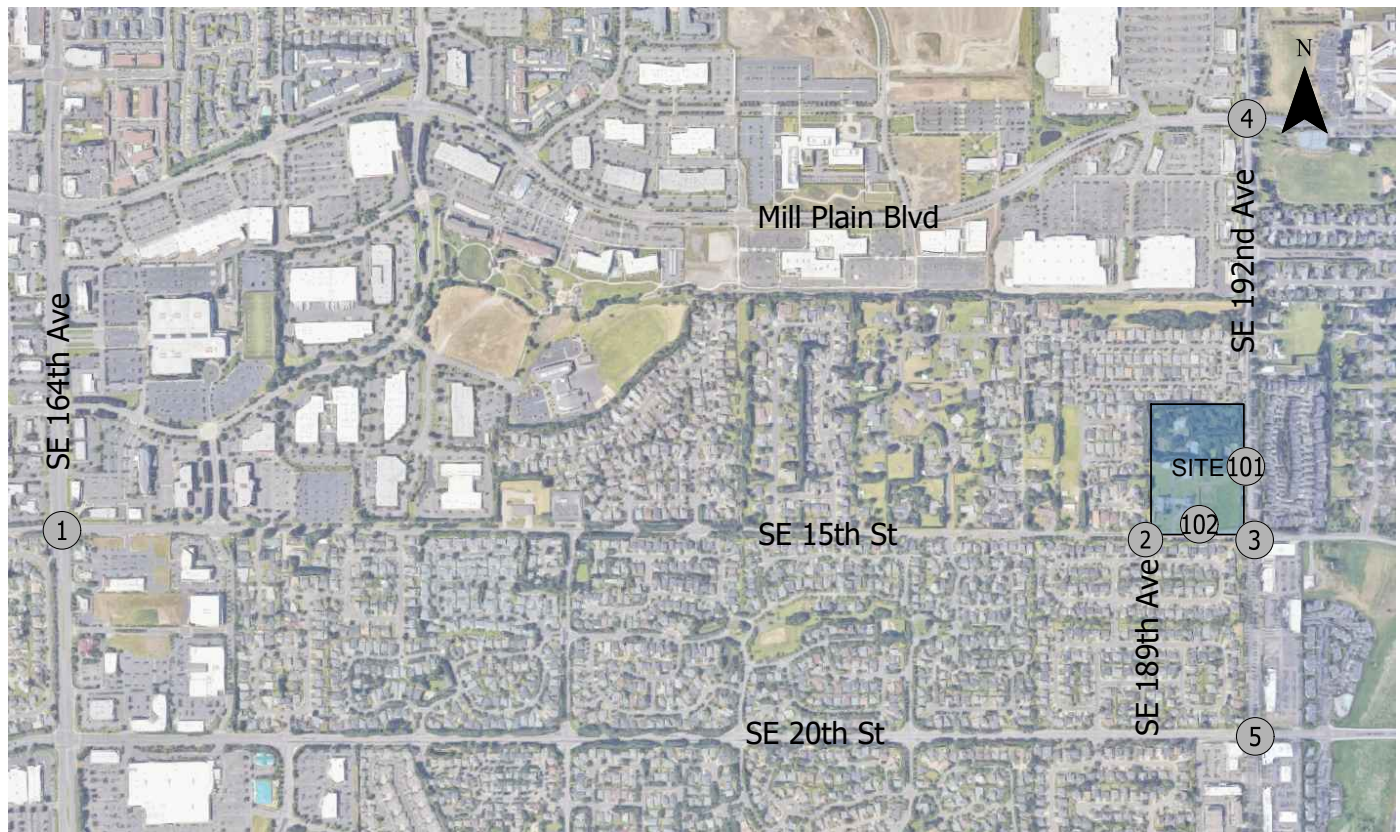




CM = CRITICAL MOVEMENT (UNSIGNALIZED)  
 LOS = INTERSECTION LEVEL OF SERVICE (SIGNALIZED)/CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALIZED)  
 Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/CRITICAL MOVEMENT CONTROL DELAY (UNSIGNALIZED)  
 V/C = INTERSECTION VOLUME-TO-CAPACITY RATIO/ APPROACH VOLUME-TO-CAPACITY RATIO (UNSIGNALIZED)

Existing Traffic Operations  
 Weekday AM Peak Hour  
 Vancouver, WA

Figure  
 8



CM = CRITICAL MOVEMENT (UNSIGNALIZED)  
 LOS = INTERSECTION LEVEL OF SERVICE (SIGNALIZED)/CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALIZED)  
 Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/CRITICAL MOVEMENT CONTROL DELAY (UNSIGNALIZED)  
 V/C = INTERSECTION VOLUME-TO-CAPACITY RATIO/ APPROACH VOLUME-TO-CAPACITY RATIO (UNSIGNALIZED)

Existing Traffic Operations  
 Weekday PM Peak Hour  
 Vancouver, WA

Figure  
 9



## Opening Year 2027 Traffic Conditions

Opening year 2027 traffic volumes include the addition of estimated trips from general growth in the region (application of a 1.5 percent compounded annual growth). In-process trips associated with the following nearby developments were also added to the study intersections:

- HP Phase 1, to be developed north of this study;
- Vancouver Innovation Center, to be developed south of this study;
- Grass Valley (retail trips only<sup>2</sup>), to be developed southeast of this study;
- Kate Woods, to be developed southeast of this study; and
- Rerouting a portion of westbound right-turning vehicles at SE 20<sup>th</sup> Street / SE 192<sup>nd</sup> Avenue to use SE Bybee Road to SE 15<sup>th</sup> Street / SE 192<sup>nd</sup> Avenue during the PM peak hour, consistent with the Section 30 Study assumption<sup>3</sup>.

*Appendix "D" contains the in-process trip for the weekday AM and PM peak hours.*

## Background Traffic Conditions (Existing Zoning)

The opening year 2027 background traffic conditions analysis identifies how the study area's transportation system will operate during the anticipated opening year with the addition of trips generated by a reasonable worst-case development scenario under the existing zoning (see Table 3).

The site-generated trips in Figures 3 and 4 were added to the general growth and in-process trips to produce year 2027 background traffic volumes. Figures 10 and 11 illustrate the resultant "existing zoning" conditions. As shown, inclusive of regional growth, all the study intersections continue to operate acceptably under year 2027 background conditions. *Appendix "E" contains the 2027 background traffic operational analysis worksheets.*

## Total Traffic Conditions (Proposed Zoning)

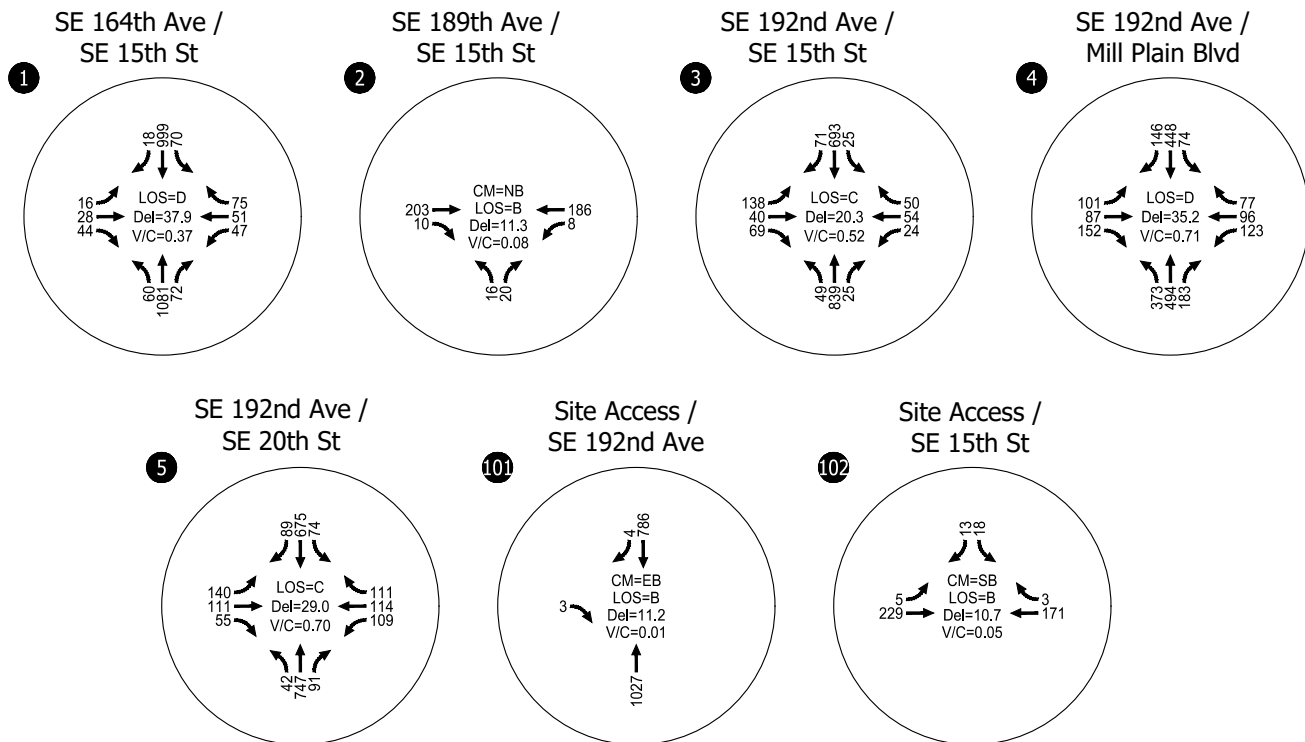
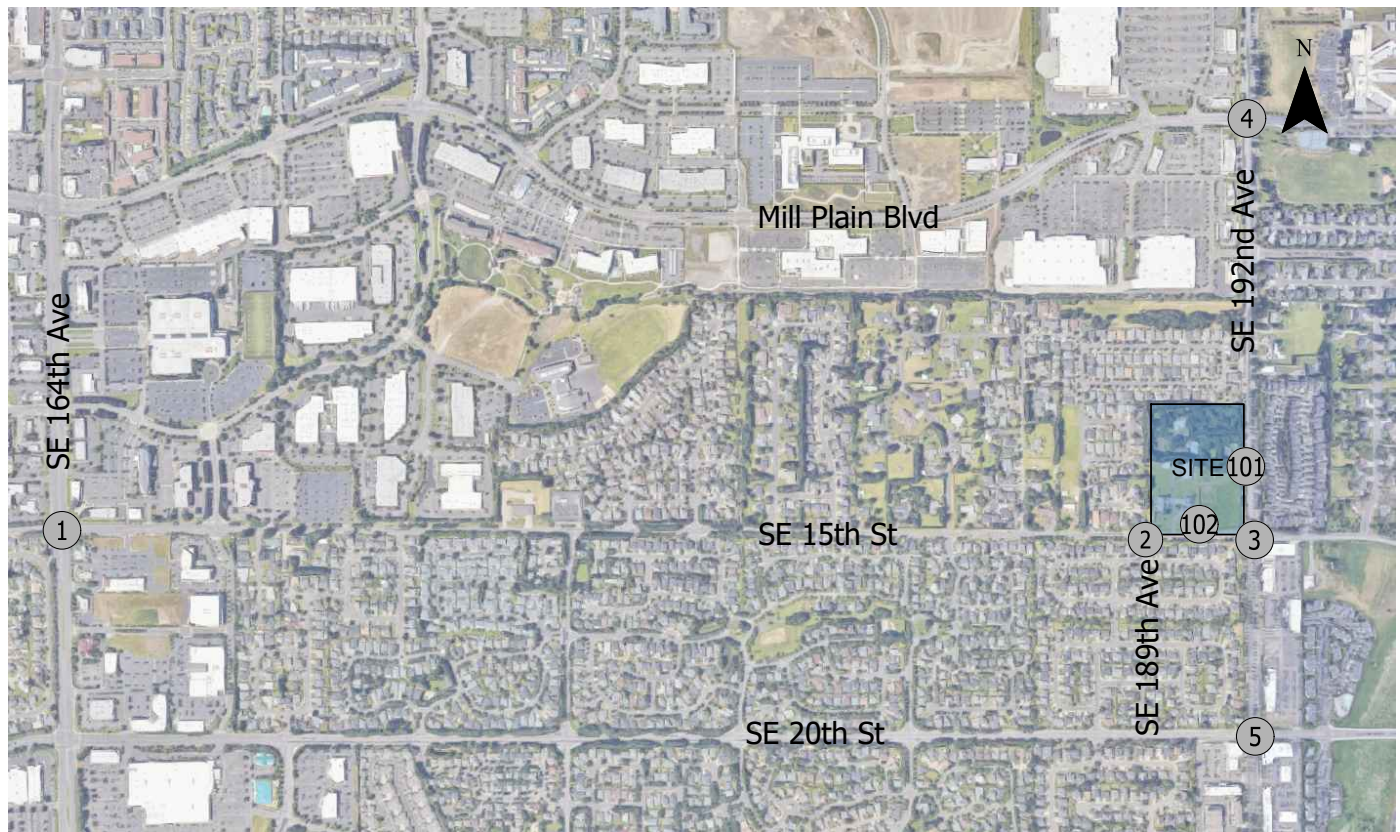
The opening year 2027 total traffic conditions analysis identifies how the study area's transportation system will operate during the anticipated opening year with the addition of trips generated by a reasonable worst-case development scenario under the proposed zoning (see Table 3).

The site-generated trips in Figures 5 and 6 were added to the general growth and in-process trips to produce year 2027 total traffic volumes. Figures 12 and 13 illustrate the resultant "proposed zoning" conditions. As shown, inclusive of regional growth, all the study intersections continue to operate acceptably under the year 2027 total traffic conditions with the proposed zoning. *Appendix "F" contains the year 2027 total traffic operational analysis worksheets.*

---

<sup>2</sup>The residential and office components of the Grass Valley development have been constructed and were operational at the time of the traffic counts.

<sup>3</sup>Given the anticipated year of the SE Bybee Road realignment is uncertain, to provide a conservative approach southbound left-turning trips were not rerouted from SE 20<sup>th</sup> Avenue / SE 192<sup>nd</sup> Avenue.

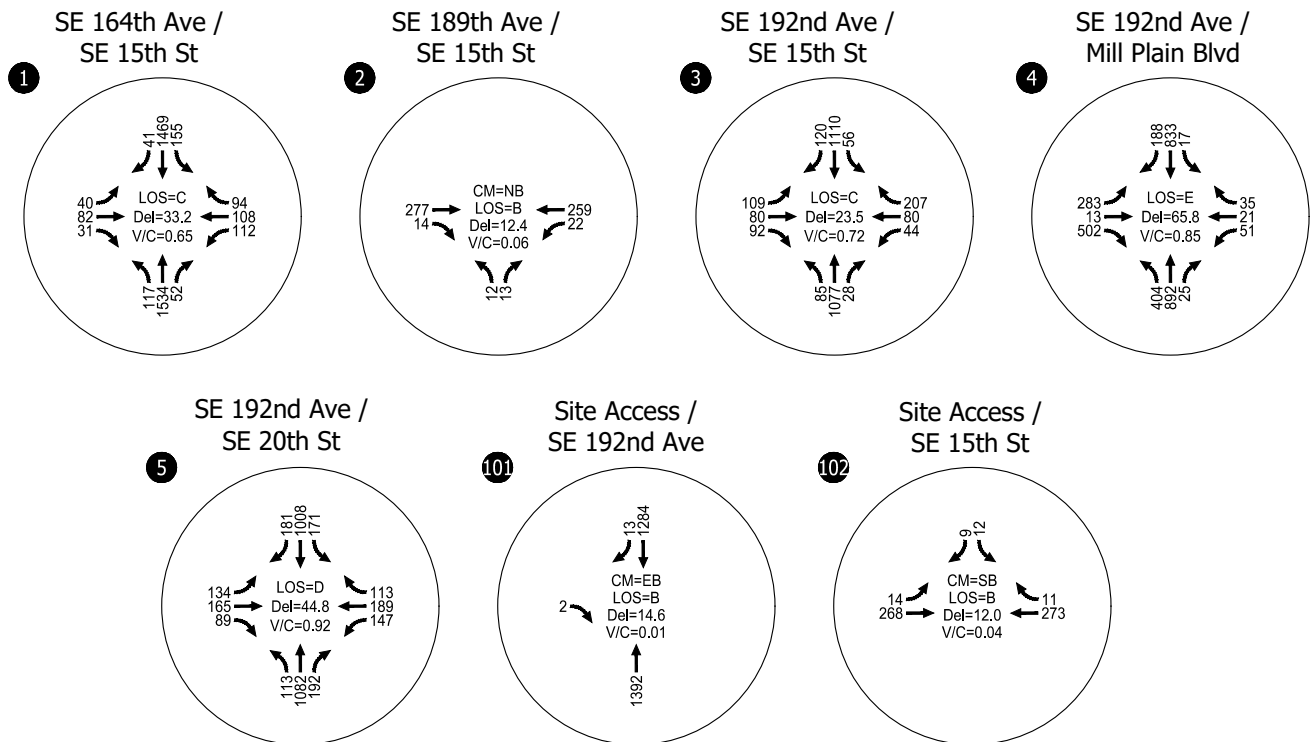
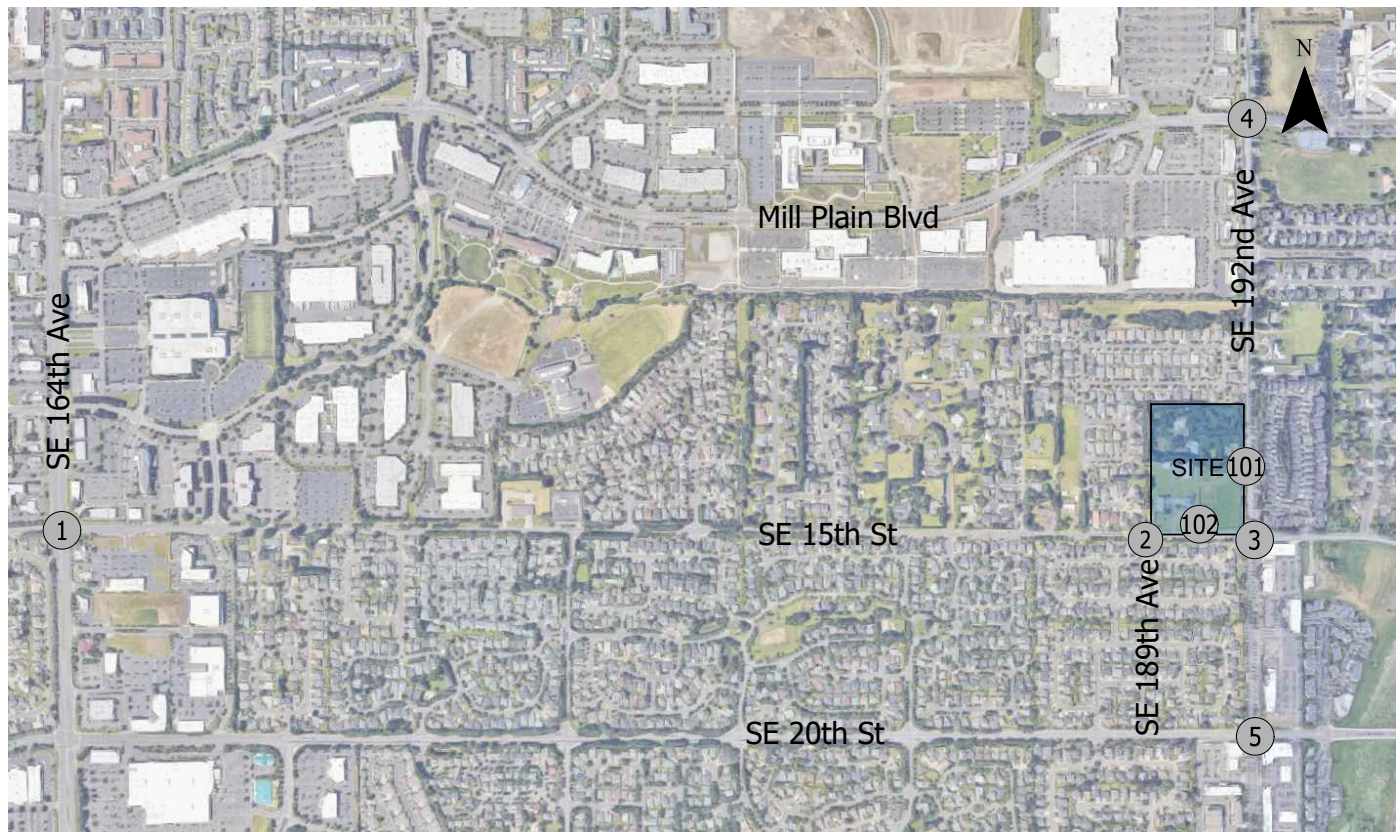


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 Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/CRITICAL MOVEMENT CONTROL DELAY (UNSIGNALIZED)  
 V/C = INTERSECTION VOLUME-TO-CAPACITY RATIO/ APPROACH VOLUME-TO-CAPACITY RATIO (UNSIGNALIZED)

2027 Background Conditions  
 Weekday AM Peak Hour  
 Vancouver, WA

Figure  
 10

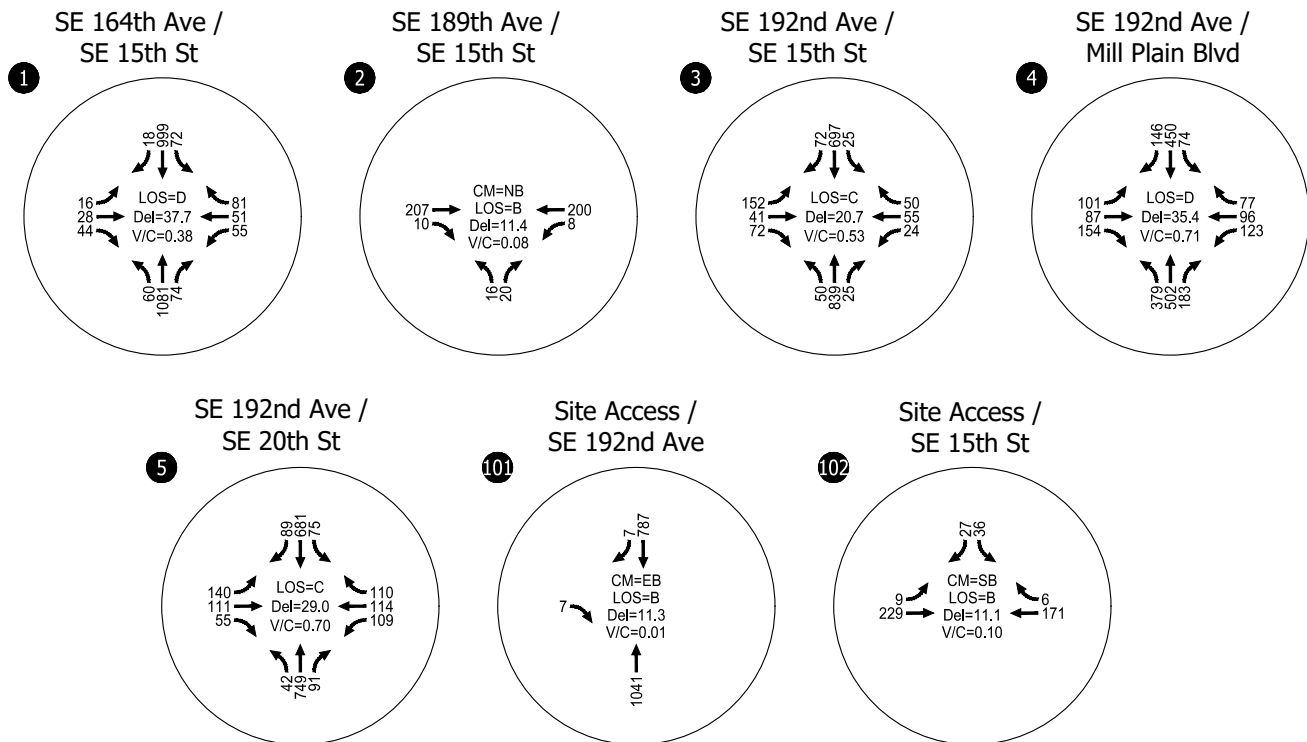
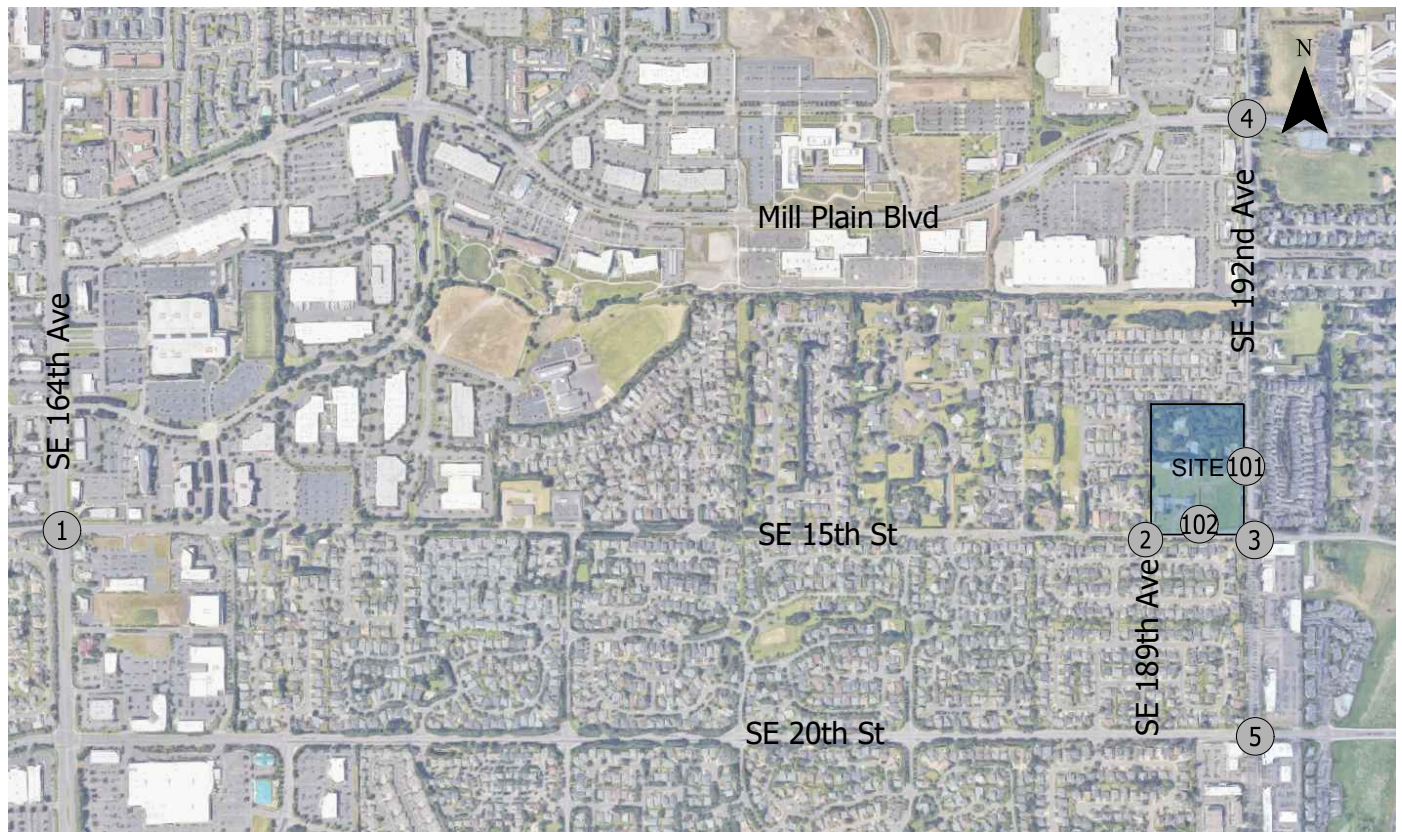




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 LOS = INTERSECTION LEVEL OF SERVICE (SIGNALIZED)/CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALIZED)  
 Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/CRITICAL MOVEMENT CONTROL DELAY (UNSIGNALIZED)  
 V/C = INTERSECTION VOLUME-TO-CAPACITY RATIO/ APPROACH VOLUME-TO-CAPACITY RATIO (UNSIGNALIZED)

2027 Background Conditions  
 Weekday PM Peak Hour  
 Vancouver, WA

Figure  
 11

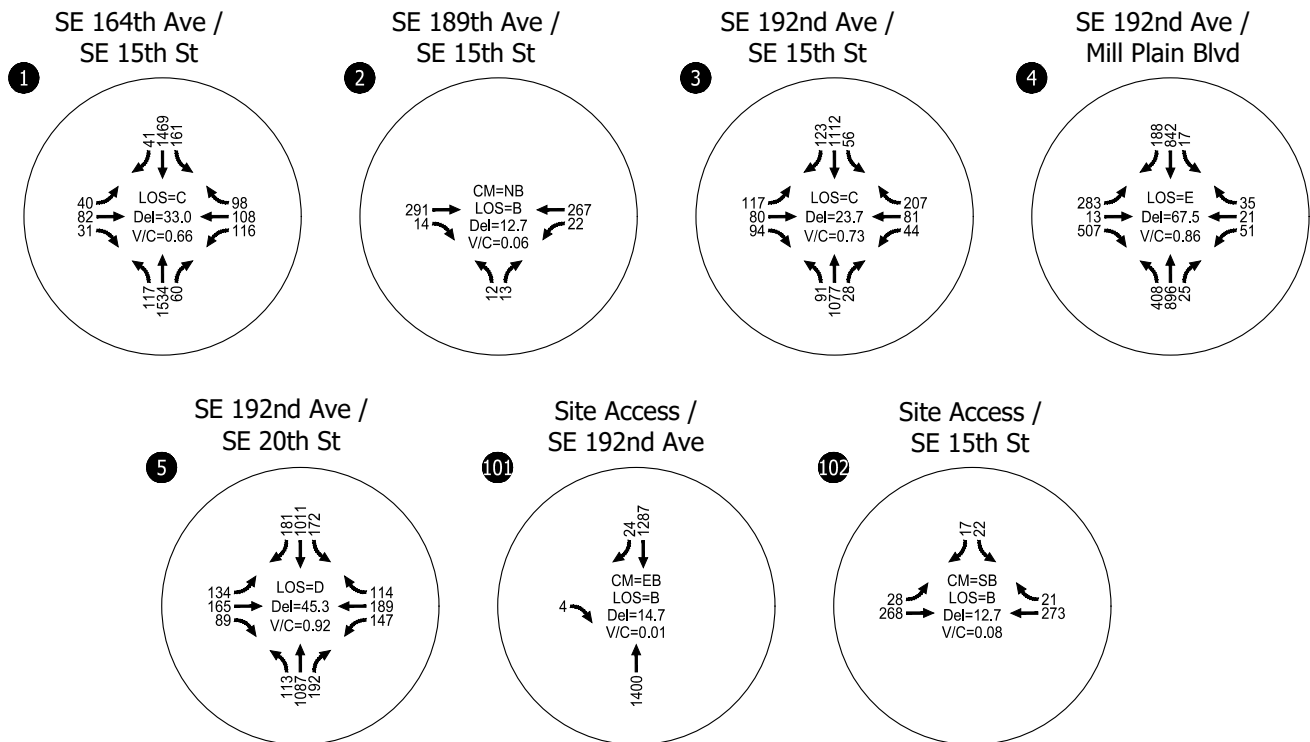
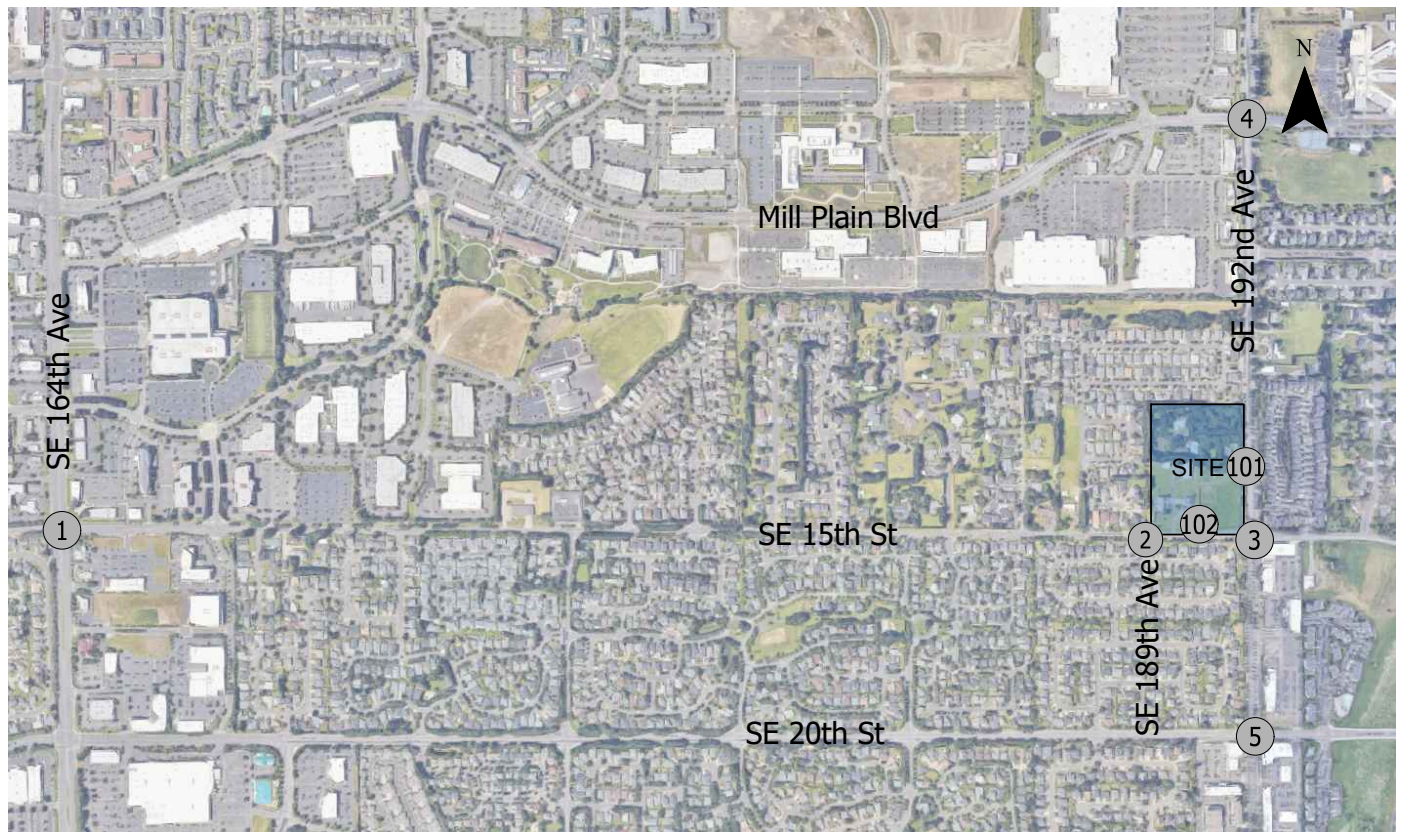


CM = CRITICAL MOVEMENT (UNSIGNALIZED)  
 LOS = INTERSECTION LEVEL OF SERVICE (SIGNALIZED)/CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALIZED)  
 Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/CRITICAL MOVEMENT CONTROL DELAY (UNSIGNALIZED)  
 V/C = INTERSECTION VOLUME-TO-CAPACITY RATIO/ APPROACH VOLUME-TO-CAPACITY RATIO (UNSIGNALIZED)

2027 Total Conditions  
 Weekday AM Peak Hour  
 Vancouver, WA

Figure  
 12





CM = CRITICAL MOVEMENT (UNSIGNALIZED)  
 LOS = INTERSECTION LEVEL OF SERVICE (SIGNALIZED)/CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALIZED)  
 Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/CRITICAL MOVEMENT CONTROL DELAY (UNSIGNALIZED)  
 V/C = INTERSECTION VOLUME-TO-CAPACITY RATIO/ APPROACH VOLUME-TO-CAPACITY RATIO (UNSIGNALIZED)

2027 Total Conditions  
 Weekday PM Peak Hour  
 Vancouver, WA

Figure  
 13

## Future Five-year (2032) Traffic Conditions

Future year 2032 traffic volumes were projected assuming a 1.5 percent compound annual growth from 2023 to 2027, and compound annual growth consistent with the Section 30 Subarea Study TIA to project growth from 2027 to 2032<sup>4</sup>. In-process trips were also added to the study intersections consistent with opening year 2027 traffic conditions.

## Background Traffic Conditions (Existing Zoning)

The future five-year 2032 background traffic conditions analysis identifies how the study area's transportation system will operate five years after the anticipated opening year with the addition of trips generated by a reasonable worst-case development scenario under the existing zoning (see Table 3).

The site-generated trips in Figures 3 and 4 were added to the general growth and in-process trips to produce year 2032 background traffic volumes. Figures 14 and 15 illustrate the resultant "existing zoning" conditions. As shown, inclusive of regional growth, all the study intersections continue to operate acceptably under year 2032 background conditions. *Appendix "G" contains the 2032 background traffic operational analysis worksheets.*

## Total Traffic Conditions (Proposed Zoning)

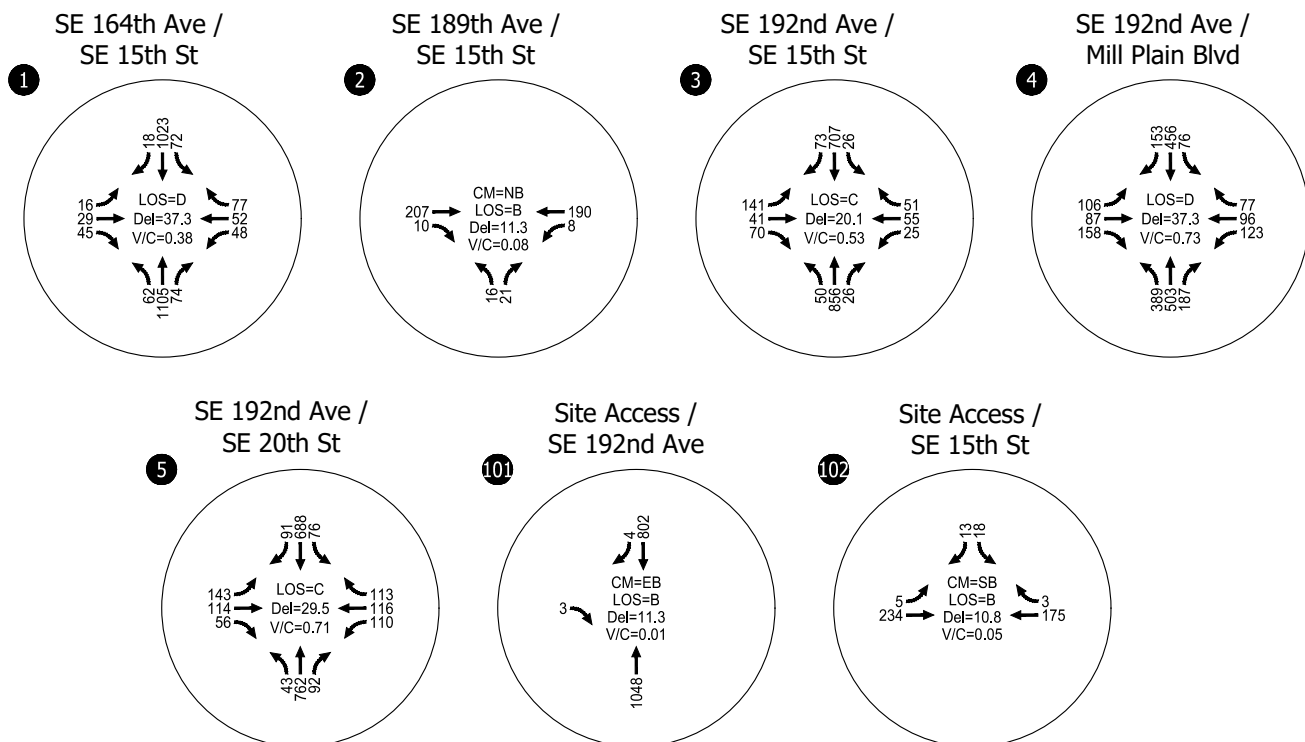
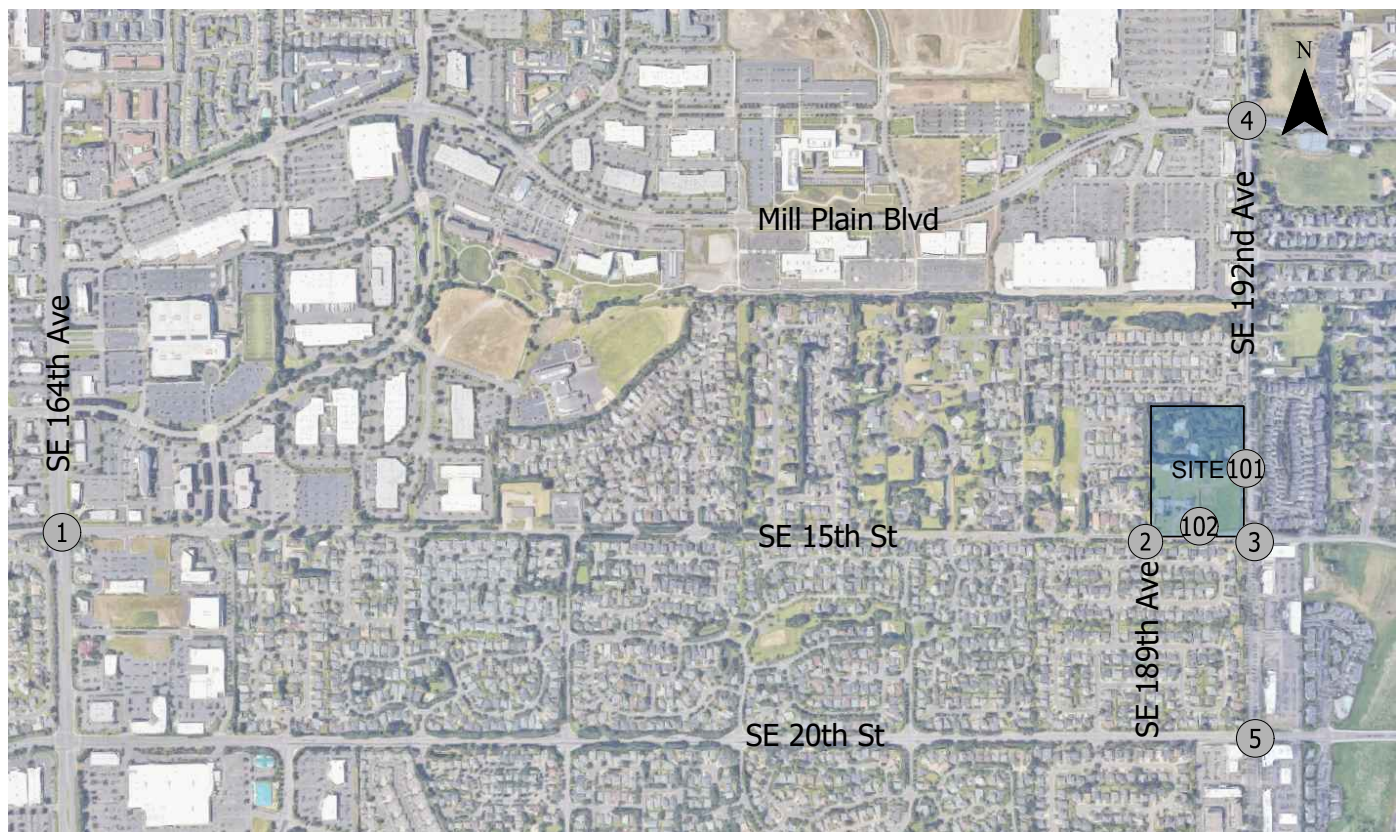
The future five-year 2032 total traffic conditions analysis identifies how the study area's transportation system will operate five years after the anticipated opening year with the addition of trips generated by a reasonable worst-case development scenario under the proposed zoning (see Table 3).

The site-generated trips in Figures 5 and 6 were added to the general growth and in-process trips to produce year 2032 total traffic volumes. Figures 16 and 17 illustrate the resultant "proposed zoning" conditions. As shown, inclusive of regional growth, all the study intersections continue to operate acceptably under year 2032 total traffic conditions with the proposed zoning. *Appendix "H" contains the year 2032 total traffic operational analysis worksheets.*

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<sup>4</sup> Consistent with the Section 30 study, a 0.5% compound growth rate was assumed for SE 192<sup>nd</sup> Avenue, SE 15<sup>th</sup> Street, and SE 20<sup>th</sup> Street. Also, a 1% annual growth rate was assumed along SE Mill Plain Boulevard and no growth was assumed for movements providing local access.



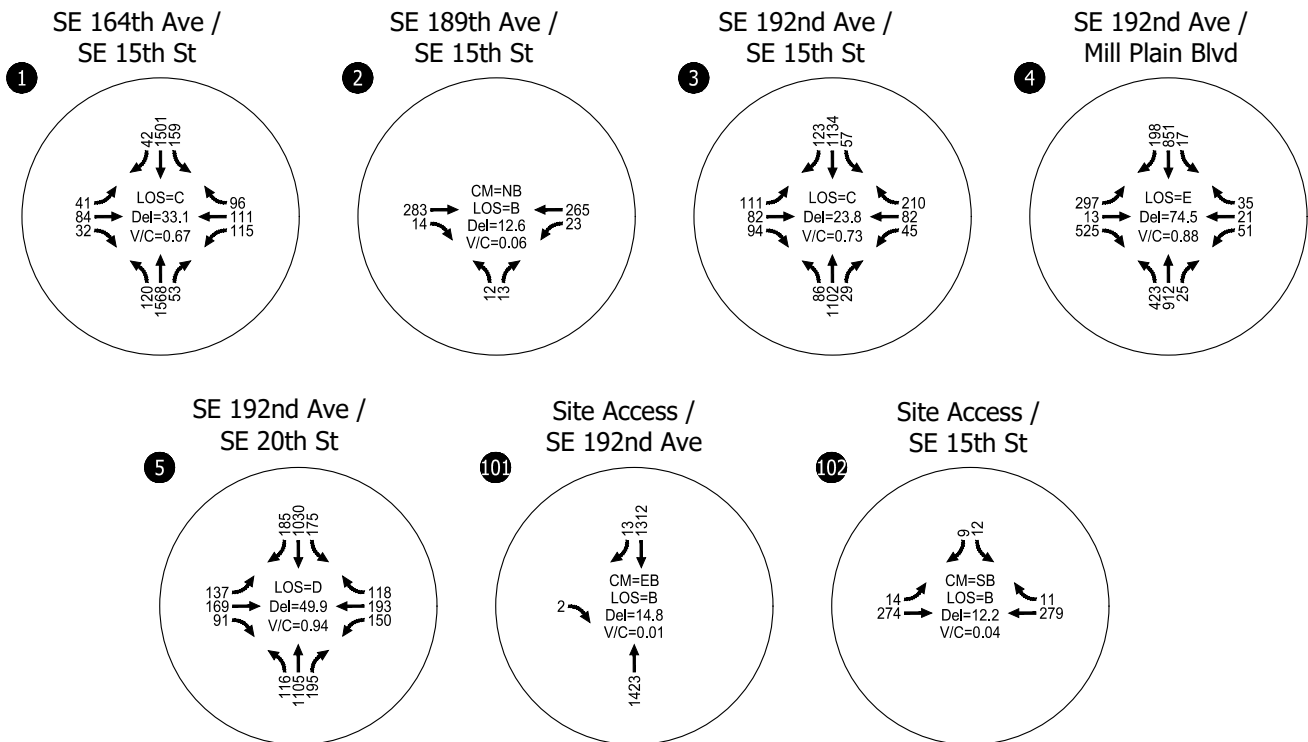
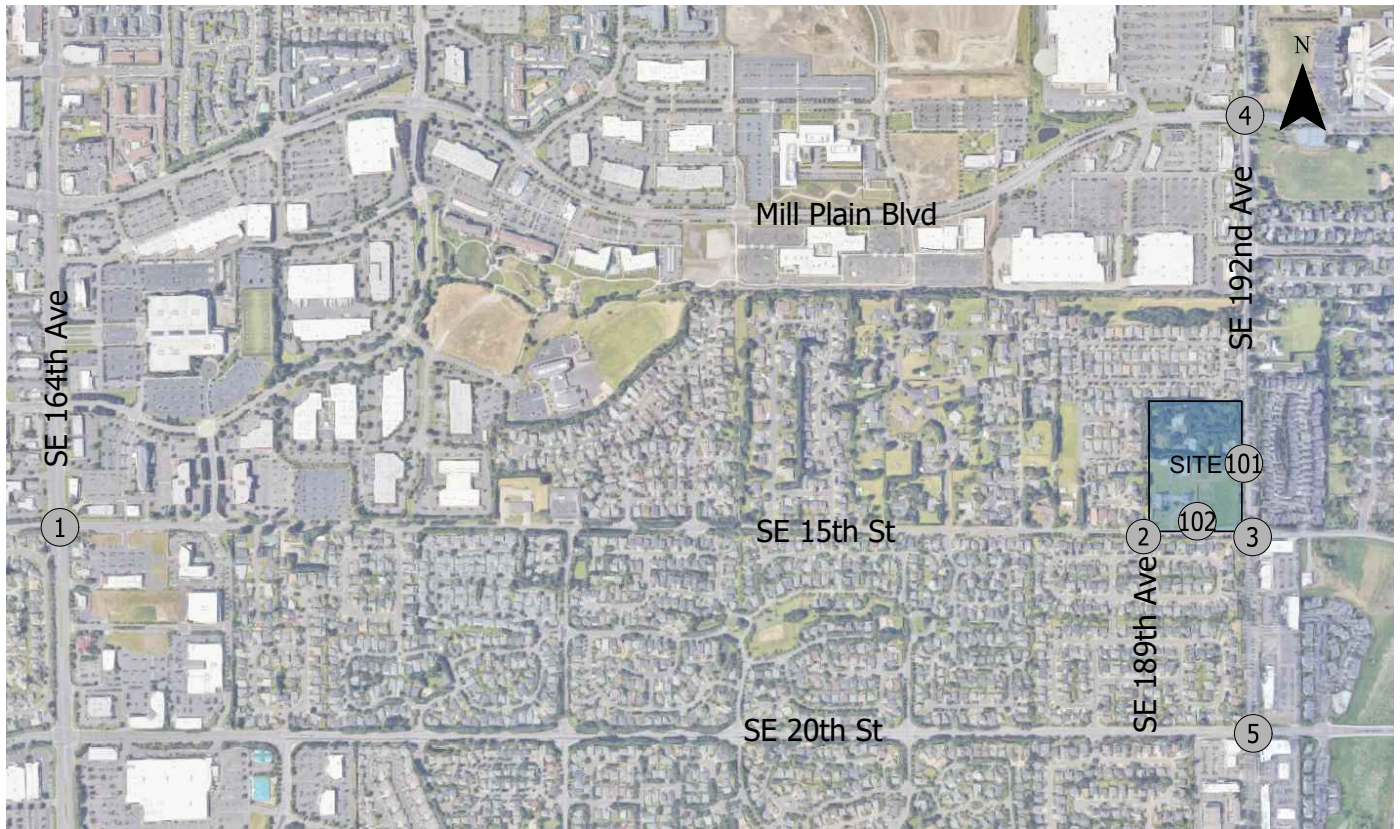


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 V/C = INTERSECTION VOLUME-TO-CAPACITY RATIO/ APPROACH VOLUME-TO-CAPACITY RATIO (UNSIGNALIZED)

2032 Background Conditions  
 Weekday AM Peak Hour  
 Vancouver, WA

Figure  
 14



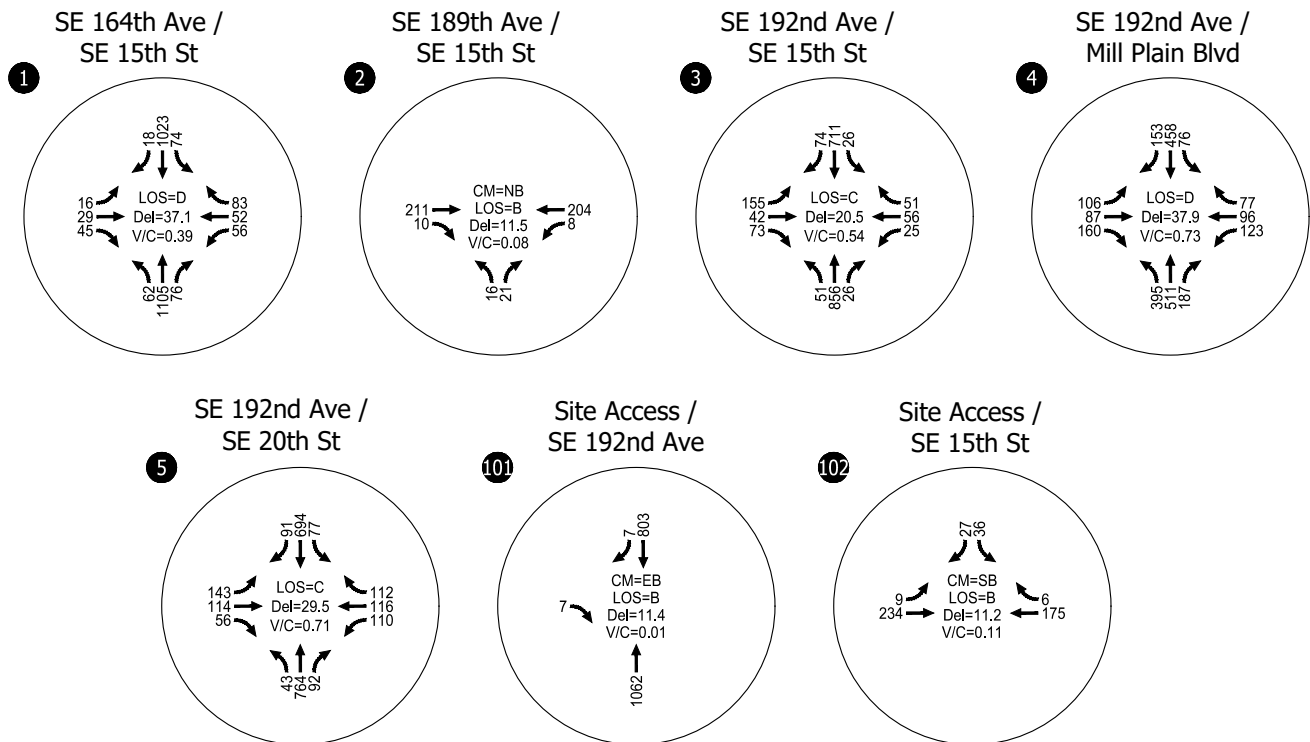
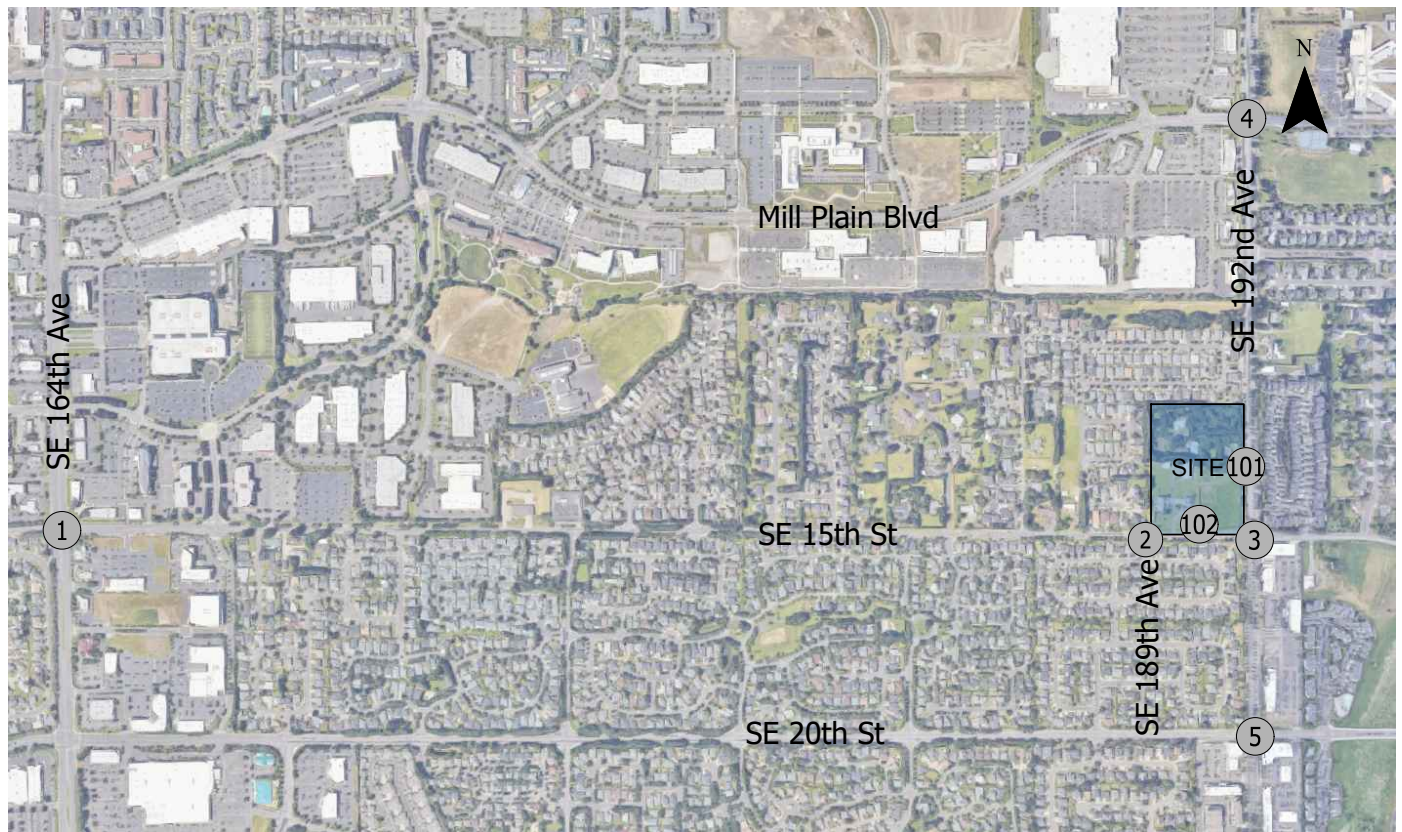


CM = CRITICAL MOVEMENT (UNSIGNALIZED)  
 LOS = INTERSECTION LEVEL OF SERVICE (SIGNALIZED)/CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALIZED)  
 Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/CRITICAL MOVEMENT CONTROL DELAY (UNSIGNALIZED)  
 V/C = INTERSECTION VOLUME-TO-CAPACITY RATIO/ APPROACH VOLUME-TO-CAPACITY RATIO (UNSIGNALIZED)

2032 Background Conditions  
 Weekday PM Peak Hour  
 Vancouver, WA

Figure  
 15

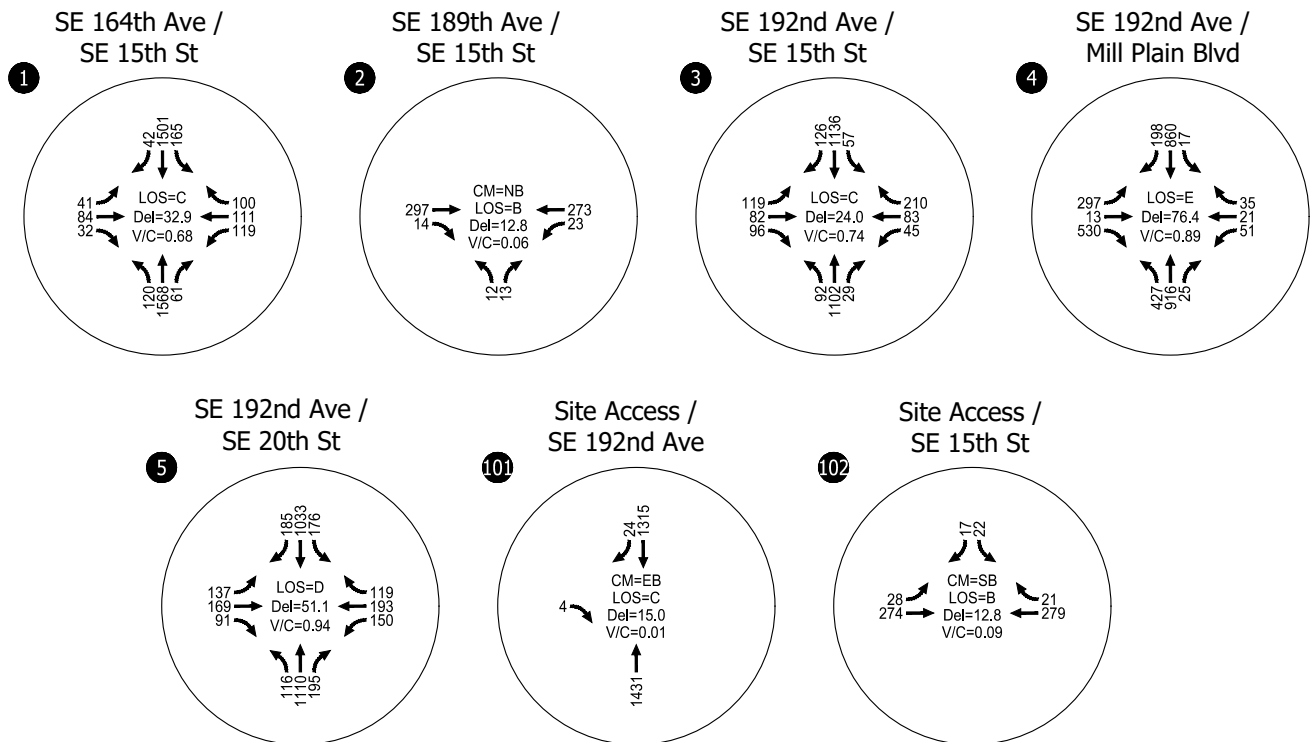
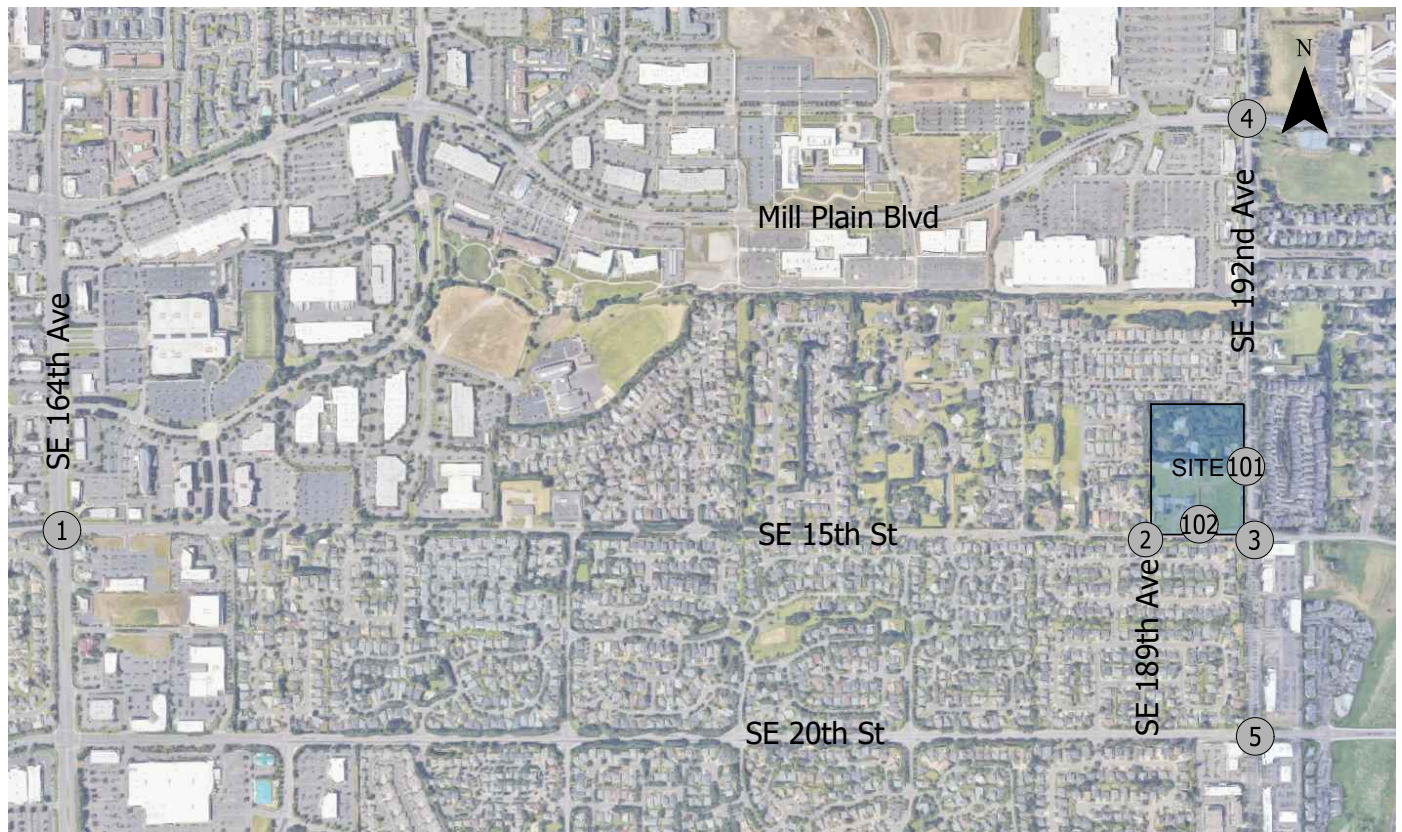




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 Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/CRITICAL MOVEMENT CONTROL DELAY (UNSIGNALIZED)  
 V/C = INTERSECTION VOLUME-TO-CAPACITY RATIO/ APPROACH VOLUME-TO-CAPACITY RATIO (UNSIGNALIZED)

2032 Total Conditions  
 Weekday AM Peak Hour  
 Vancouver, WA

Figure  
 16



CM = CRITICAL MOVEMENT (UNSIGNALIZED)  
 LOS = INTERSECTION LEVEL OF SERVICE (SIGNALIZED)/CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALIZED)  
 Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/CRITICAL MOVEMENT CONTROL DELAY (UNSIGNALIZED)  
 V/C = INTERSECTION VOLUME-TO-CAPACITY RATIO/ APPROACH VOLUME-TO-CAPACITY RATIO (UNSIGNALIZED)

2032 Total Conditions  
 Weekday PM Peak Hour  
 Vancouver, WA

Figure  
 17



## Signalized Intersection Queuing Analysis

Queue lengths were evaluated at each of the signalized study intersections to identify potential queue spillback occurring during the future five-year 2032 background and total traffic scenarios. Tables 5 and 6 summarize 95<sup>th</sup> percentile queue lengths estimated by Synchro 11 at each of the study intersection's respective turn lanes and the through lanes adjacent to the anticipated site driveways.

**Table 5. Future Five-Year (2032) Background Traffic Conditions (Existing Zoning) 95<sup>th</sup> Percentile Queue Lengths at Signalized Study Intersections**

| Intersection                                             | Queue Length (feet) | Eastbound  |      |            | Westbound  |       | Northbound |       | Southbound |      |       |
|----------------------------------------------------------|---------------------|------------|------|------------|------------|-------|------------|-------|------------|------|-------|
|                                                          |                     | Left       | Thru | Right      | Left       | Right | Left       | Right | Left       | Thru | Right |
| SE 164 <sup>th</sup> Avenue & SE 15 <sup>th</sup> Street | Storage             | 100        | -    | -          | 250        | 325   | 150        | 150   | 225        | -    | 225   |
|                                                          | AM Peak             | 25         | -    | -          | 75         | 50    | 100        | 25    | 125        | -    | 25    |
|                                                          | PM Peak             | 75         | -    | -          | 150        | 50    | <b>175</b> | 25    | 200        | -    | 25    |
| SE 192 <sup>nd</sup> Avenue & SE 15 <sup>th</sup> Street | Storage             | 110        | -    | -          | 110        | 110   | 175        | -     | 475        | -    | -     |
|                                                          | AM Peak             | <b>175</b> | 75   | -          | 50         | 0     | 50         | -     | 50         | 300  | -     |
|                                                          | PM Peak             | <b>150</b> | 175  | -          | 100        | 100   | 50         | -     | 100        | 475  | -     |
| SE 192 <sup>nd</sup> Avenue & SE Mill Plain Boulevard    | Storage             | 225        | -    | 150        | 100        | -     | 200        | -     | 150        | -    | -     |
|                                                          | AM Peak             | 125        | -    | 50         | <b>150</b> | -     | <b>250</b> | -     | 100        | -    | -     |
|                                                          | PM Peak             | <b>500</b> | -    | <b>325</b> | 75         | -     | <b>300</b> | -     | 50         | -    | -     |
| SE 192 <sup>nd</sup> Avenue & SE 20 <sup>th</sup> Street | Storage             | 100        | -    | -          | 100        | -     | 325        | -     | 400        | -    | -     |
|                                                          | AM Peak             | 100        | -    | -          | 75         | -     | 75         | -     | 125        | -    | -     |
|                                                          | PM Peak             | 75         | -    | -          | 100        | -     | 175        | -     | 225        | -    | -     |

Notes:

95<sup>th</sup> percentile queue lengths have been rounded up to the nearest vehicle length, assuming one vehicle equals 25 feet

**Bold** cells indicate 95<sup>th</sup> percentile queue lengths greater than the storage length

Storage measured as the length of white gore stripe for turn lane

**Table 6. Future Five-Year (2032) Total Traffic Conditions (Proposed Zoning) 95<sup>th</sup> Percentile Queue Lengths at Signalized Study Intersections**

| Intersection                                             | Queue Length (feet) | Eastbound  |                  |            | Westbound  |       | Northbound |       | Southbound |                  |       |
|----------------------------------------------------------|---------------------|------------|------------------|------------|------------|-------|------------|-------|------------|------------------|-------|
|                                                          |                     | Left       | Thru             | Right      | Left       | Right | Left       | Right | Left       | Thru             | Right |
| SE 164 <sup>th</sup> Avenue & SE 15 <sup>th</sup> Street | Storage             | 100        | -                | -          | 250        | 325   | 150        | 150   | 225        | -                | 225   |
|                                                          | AM Peak             | 25         | -                | -          | 75         | 50    | 100        | 25    | 125        | -                | 25    |
|                                                          | PM Peak             | 75         | -                | -          | 150        | 50    | <b>175</b> | 25    | 225        | -                | 25    |
| SE 192 <sup>nd</sup> Avenue & SE 15 <sup>th</sup> Street | Storage             | 110        | 400 <sup>1</sup> | -          | 110        | 110   | 175        | -     | 475        | 525 <sup>2</sup> | -     |
|                                                          | AM Peak             | <b>175</b> | 75               | -          | 50         | 0     | 50         | -     | 50         | 300              | -     |
|                                                          | PM Peak             | <b>150</b> | 175              | -          | 100        | 100   | 75         | -     | 100        | 500              | -     |
| SE 192 <sup>nd</sup> Avenue & SE Mill Plain Boulevard    | Storage             | 225        | -                | 150        | 100        | -     | 200        | -     | 150        | -                | -     |
|                                                          | AM Peak             | 125        | -                | 50         | <b>150</b> | -     | <b>250</b> | -     | 100        | -                | -     |
|                                                          | PM Peak             | <b>500</b> | -                | <b>325</b> | 75         | -     | <b>300</b> | -     | 50         | -                | -     |
| SE 192 <sup>nd</sup> Avenue & SE 20 <sup>th</sup> Street | Storage             | 100        | -                | -          | 100        | -     | 325        | -     | 400        | -                | -     |
|                                                          | AM Peak             | 100        | -                | -          | 75         | -     | 75         | -     | 125        | -                | -     |
|                                                          | PM Peak             | 75         | -                | -          | 100        | -     | 175        | -     | 225        | -                | -     |

Notes:

95<sup>th</sup> percentile queue lengths have been rounded up to the nearest vehicle length, assuming one vehicle equals 25 feet

**Bold** cells indicate 95<sup>th</sup> percentile queue lengths greater than the storage length

Storage measured as the length of white gore stripe for turn lane

<sup>1</sup>There is approximately 400 feet between the eastbound traffic signal stop bar at SE 192<sup>nd</sup> Avenue and the conceptual site driveway location assumed on SE 15<sup>th</sup> Street

<sup>2</sup>There is approximately 525 feet between the southbound traffic signal stop bar at SE 15<sup>th</sup> Street and the conceptual site driveway location assumed on SE 192<sup>nd</sup> Avenue

As shown in Tables 5 and 6, at the intersection of SE 164<sup>th</sup> Avenue & SE 15<sup>th</sup> Street, the northbound left-turn queues are projected to experience 95<sup>th</sup> percentile queues that exceed the existing striped storage length during the weekday PM peak hour under 2032 background and total traffic conditions. Note that while only 150 feet of left-turn storage is striped, there is approximately 50 feet of additional storage available before the queue would block northbound through vehicles. Given that the proposed CPA and Zone Change does not change the projected northbound left-turn queue and does not add any additional trips to this movement, no mitigation is recommended at this time. Potential turn lane queue storage needs at the intersection can be revisited at the time of a future site development application.

At the intersection of SE 192<sup>nd</sup> Avenue & SE 15<sup>th</sup> Street, the eastbound left-turn queues are projected to experience 95<sup>th</sup> percentile queues that exceed the existing striped storage length during the weekday AM and PM peak hours under 2032 background and total traffic conditions. The proposed CPA and zone change does not impact the projected queue storage and thus does not need to be mitigated as a function of the site zoning. The queue projections indicate the eastbound left-turn lane at SE 192<sup>nd</sup> Avenue / SE 15<sup>th</sup> Street may need to be extended to provide up to 175 feet of storage based on the projections in this study. The actual turn lane storage length needs will depend in part on the density of site development that is proposed in the future and can be best assessed at the time of site plan application as required by the VMC. Subject to City of Vancouver direction and per standard City development review practice, future site development applications for the study site (as well as other development in the area) should continue to assess the need for additional eastbound left-turn lane queue storage on SE 15<sup>th</sup> Street at SE 192<sup>nd</sup> Avenue. The City of Vancouver can monitor turn lane storage length needs through the City's development review process and require an extension of the turn lane in conjunction with a future site plan application based on the documented turn lane storage needs at the time of site plan application in



accordance with the VMC. For these reasons, no queuing mitigation is recommended as a function of the proposed CPA and zone change.

The eastbound through and southbound through queues are not expected to extend past the anticipated site driveways on SE 15<sup>th</sup> Street and SE 192<sup>nd</sup> Avenue.

At the intersection of SE 192<sup>nd</sup> Avenue & SE Mill Plain Boulevard the eastbound left-turn and right-turn, westbound left-turn, and northbound left-turn queues are projected to experience 95<sup>th</sup> percentile queues that exceed the existing striped storage length regardless of the proposed CPA and zone change. Given the proposed CPA and Zone Change does not alter the projected queue lengths and does not add trips to the eastbound left-turn or westbound left-turn movements, no mitigation is recommended as a function of the proposed CPA and zone change. Potential turn lane queues storage needs at the intersection can be revisited at the time of a future site development application.

## Unsignalized Intersection Queuing Analysis

A 95<sup>th</sup> percentile queuing analysis was completed using HCM 6<sup>th</sup> Edition analysis at the unsignalized study intersections. All of the 95<sup>th</sup> percentile stop-controlled approach queues were projected to be one vehicle length or less and can be accommodated within available storage.

There is approximately 150 feet between SE 189<sup>th</sup> Avenue and the anticipated site driveway on SE 15<sup>th</sup> Street. The 95<sup>th</sup> percentile queues for the westbound left-turn at SE 189<sup>th</sup> Avenue and the eastbound left-turn at the anticipated site driveway were projected to be one vehicle length or less and therefore are not expected to back up through the adjacent driveway.

## Driveway Turn Lane Considerations

Right-turn and left-turn lane needs were evaluated at the anticipated site driveways, a right-in/right-out driveway along SE 192<sup>nd</sup> Avenue and a full access driveway along SE 15<sup>th</sup> Street, using WSDOT turn lane guidelines (Reference 6).

Under 2032 total traffic conditions, assuming the reasonable worst-case development under the proposed zoning, WSDOT volume-based criteria for providing turn lanes at the anticipated site driveways on SE 192<sup>nd</sup> Avenue and SE 15<sup>th</sup> Street are not met under either weekday AM or PM peak hour traffic conditions. Southbound volumes on SE 192<sup>nd</sup> Avenue do meet the criteria for considering a right-turn pocket or taper; however, installation of tapers is not recommended given the presence of the bicycle lane and intersection sight distance considerations. Potential turn lane needs at the site access driveways can be revisited at the time of a future site development application.

*Appendix "I" includes the WSDOT turn lane criteria at the anticipated site driveways.*

## FINDINGS AND RECOMMENDATIONS

Based on the results of this Traffic Impact Analysis, the proposed CPA and Zone Change can be approved while maintaining acceptable study intersection operations. The analysis developed the findings and recommendations listed below.

### Findings

- All of the study intersections were found to operate acceptably under opening year (2027) and five-year horizon (2032) traffic conditions with reasonable worst-case development of the site under both the existing (R-6) and proposed (R-22) zoning.
- The eastbound left-turn queues at SE 192<sup>nd</sup> Avenue / SE 15<sup>th</sup> Street are anticipated to exceed the currently available storage length under future five-year 2032 background (existing zoning) and total (proposed zoning) traffic conditions during the AM and PM peak hours assuming reasonable worst-case development of the site under both the existing (R-6) and proposed (R-22) zoning.
  - Subject to City of Vancouver direction and the specific traffic impacts of potential future site development, the eastbound left-turn lane at SE 192<sup>nd</sup> Avenue / SE 15<sup>th</sup> Street may need to be extended to provide up to 175 feet of storage based on the projections in this study.
  - The actual turn lane storage length needs will depend in part on the density of site development that is proposed in the future and can be best assessed at the time of site plan application as required by the VMC.
- No safety-based mitigation needs were identified based on review of historic crash data at the study intersections.
- WSDOT volume-based criteria for providing turn lanes at the anticipated site driveways on SE 192<sup>nd</sup> Avenue and SE 15<sup>th</sup> Street are not met under either weekday AM or PM peak hour traffic conditions. Southbound volumes on SE 192<sup>nd</sup> Avenue do meet the criteria for considering a right-turn pocket or taper; however, installation of tapers is not recommended given the presence of the bicycle lane and intersection sight distance considerations. Potential turn lane needs at the site access driveways can be revisited at the time of a future site development application.

### Recommendations

- Subject to City of Vancouver direction and per standard City development review practice, future site development applications for the study site (as well as other development in the area) should continue to assess the need for additional eastbound left-turn lane queue storage on SE 15<sup>th</sup> Street at SE 192<sup>nd</sup> Avenue. The City of Vancouver can monitor turn lane storage length needs through the City's development review process and require an extension of the turn lane in conjunction with a future site plan application based on the documented turn lane storage needs at the time of site plan application in accordance with the VMC.

We trust this transportation impact analysis adequately addresses the traffic impacts associated with the proposed SE 192<sup>nd</sup> Avenue CPA and Zone Change request. Please contact us at 503.535.7445 or [kconnolly@kittelson.com](mailto:kconnolly@kittelson.com) if you have questions or require additional information.

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## References

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1. City of Vancouver Washington. *Vancouver Municipal Code*. 2023.
2. Transportation Research Board. *2000 Highway Capacity Manual*. 2000.
3. Transportation Research Board. *Highway Capacity Manual 6<sup>th</sup> Edition*. 2016.
4. Institute of Transportation Engineers. *Trip Generation Manual, 11<sup>th</sup> Edition*. 2021.
5. Institute of Transportation Engineers. *Trip Generation Handbook, 3<sup>rd</sup> Edition*. 2017.
6. Washington State Department of Transportation. *Design Manual*. September 2022.

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## Appendices

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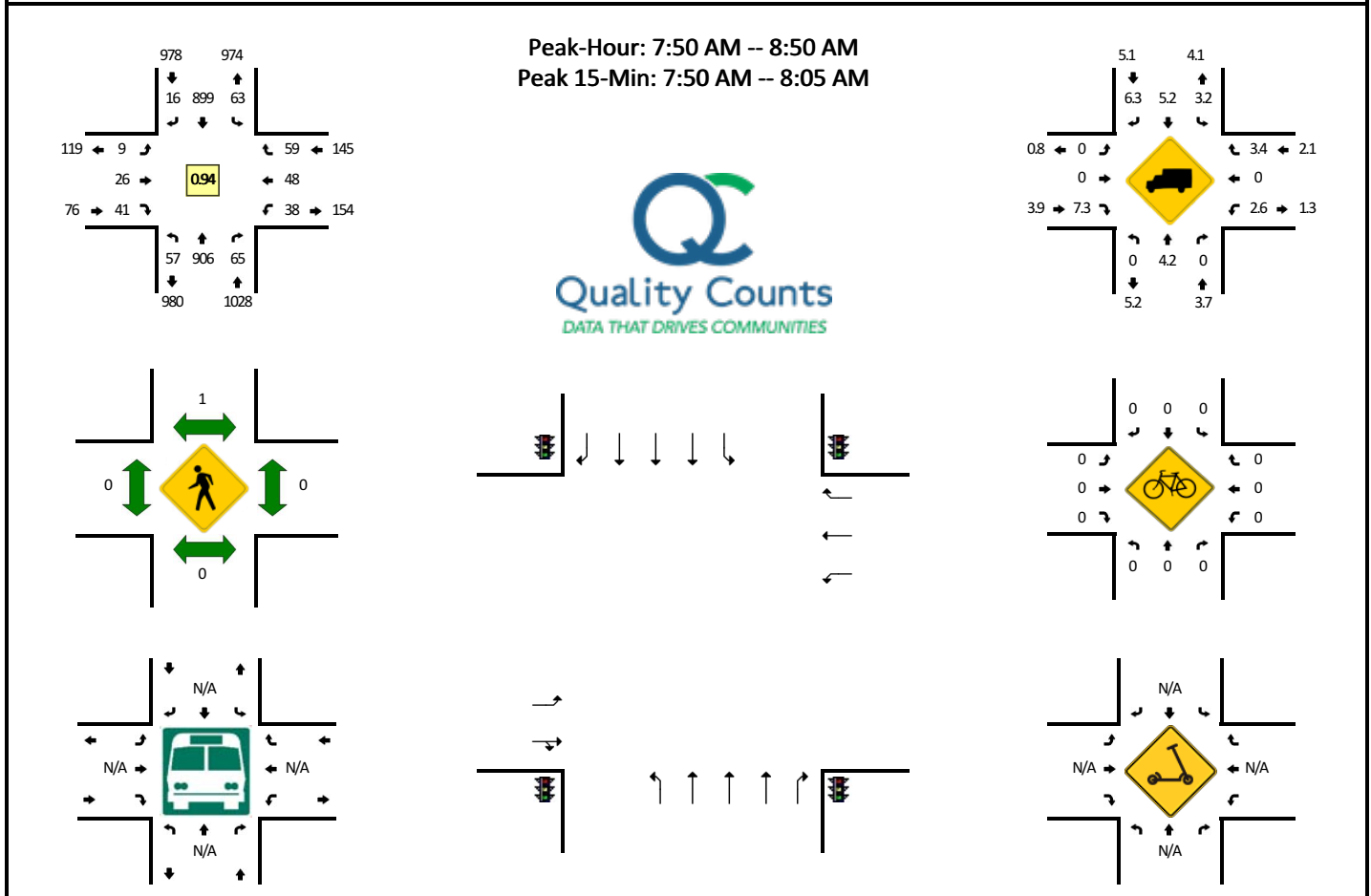
- A. Traffic Count Data
- B. WSDOT Crash Data
- C. 2023 Existing Operations Worksheets
- D. In-process Trips
- E. 2027 Background Operations (Existing Zoning) Worksheets
- F. 2027 Total Operations (Proposed Zoning) Worksheets
- G. 2032 Background Operations (Existing Zoning) Worksheets
- H. 2032 Total Operations (Proposed Zoning) Worksheets
- I. WSDOT Turn Lane Criteria

## Appendix A Traffic Count Data



**LOCATION:** SE 164th Ave -- SE 15th St  
**CITY/STATE:** Vancouver, WA

**QC JOB #:** 16228505  
**DATE:** Tue, Jun 6 2023

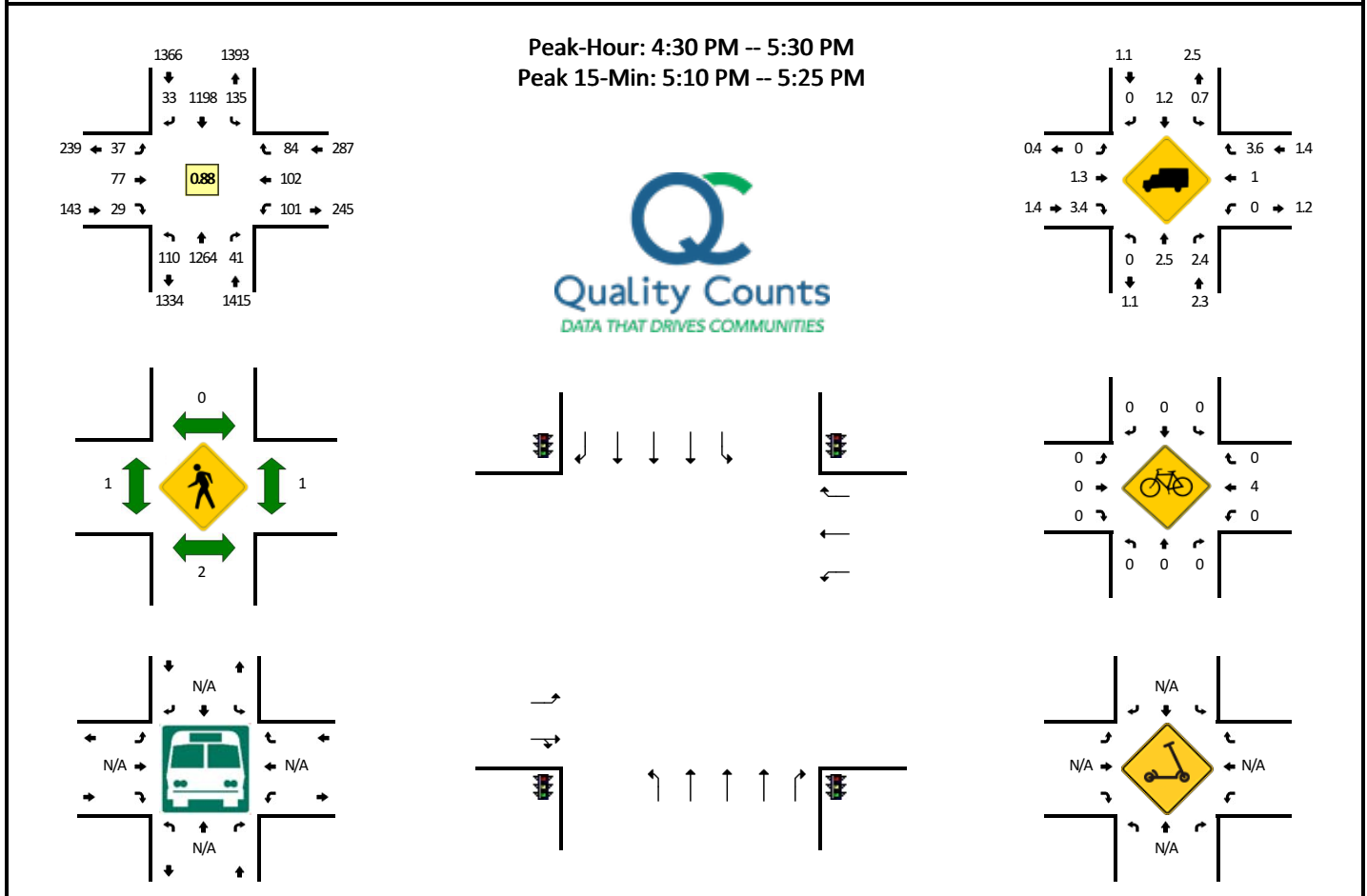


| 5-Min Count Period Beginning At | SE 164th Ave (Northbound) |      |       |   | SE 164th Ave (Southbound) |      |       |   | SE 15th St (Eastbound) |      |       |   | SE 15th St (Westbound) |      |       |   | Total | Hourly Totals |
|---------------------------------|---------------------------|------|-------|---|---------------------------|------|-------|---|------------------------|------|-------|---|------------------------|------|-------|---|-------|---------------|
|                                 | Left                      | Thru | Right | U | Left                      | Thru | Right | U | Left                   | Thru | Right | U | Left                   | Thru | Right | U |       |               |
| 7:00 AM                         | 0                         | 36   | 2     | 0 | 4                         | 66   | 2     | 0 | 1                      | 1    | 1     | 0 | 1                      | 0    | 6     | 0 | 120   |               |
| 7:05 AM                         | 5                         | 61   | 2     | 0 | 1                         | 41   | 1     | 0 | 2                      | 2    | 0     | 0 | 5                      | 1    | 3     | 0 | 124   |               |
| 7:10 AM                         | 1                         | 48   | 1     | 0 | 4                         | 57   | 1     | 0 | 0                      | 1    | 2     | 0 | 4                      | 2    | 6     | 0 | 127   |               |
| 7:15 AM                         | 1                         | 47   | 4     | 0 | 1                         | 51   | 0     | 0 | 1                      | 0    | 2     | 0 | 6                      | 3    | 9     | 0 | 125   |               |
| 7:20 AM                         | 0                         | 49   | 1     | 0 | 6                         | 63   | 0     | 0 | 2                      | 0    | 2     | 0 | 1                      | 5    | 7     | 0 | 136   |               |
| 7:25 AM                         | 4                         | 56   | 2     | 0 | 1                         | 46   | 0     | 0 | 0                      | 2    | 2     | 0 | 2                      | 3    | 11    | 0 | 129   |               |
| 7:30 AM                         | 1                         | 71   | 2     | 0 | 3                         | 69   | 1     | 0 | 1                      | 1    | 3     | 0 | 2                      | 0    | 6     | 0 | 160   |               |
| 7:35 AM                         | 0                         | 75   | 3     | 0 | 4                         | 49   | 1     | 0 | 0                      | 1    | 3     | 0 | 3                      | 1    | 4     | 0 | 144   |               |
| 7:40 AM                         | 3                         | 63   | 3     | 0 | 8                         | 74   | 0     | 0 | 0                      | 0    | 3     | 0 | 3                      | 1    | 3     | 0 | 161   |               |
| 7:45 AM                         | 6                         | 71   | 4     | 0 | 0                         | 74   | 3     | 0 | 4                      | 3    | 0     | 0 | 2                      | 0    | 9     | 0 | 176   |               |
| 7:50 AM                         | 2                         | 91   | 9     | 0 | 9                         | 74   | 2     | 0 | 1                      | 7    | 2     | 0 | 2                      | 5    | 6     | 0 | 210   |               |
| 7:55 AM                         | 4                         | 75   | 6     | 0 | 5                         | 75   | 4     | 0 | 0                      | 3    | 2     | 0 | 0                      | 2    | 7     | 0 | 183   | 1795          |
| 8:00 AM                         | 5                         | 76   | 7     | 0 | 5                         | 84   | 2     | 0 | 2                      | 1    | 4     | 0 | 5                      | 5    | 5     | 0 | 201   | 1876          |
| 8:05 AM                         | 4                         | 78   | 4     | 0 | 6                         | 62   | 0     | 0 | 0                      | 3    | 4     | 0 | 5                      | 6    | 3     | 0 | 175   | 1927          |
| 8:10 AM                         | 6                         | 64   | 8     | 0 | 6                         | 82   | 1     | 0 | 1                      | 2    | 1     | 0 | 6                      | 2    | 3     | 0 | 182   | 1982          |
| 8:15 AM                         | 7                         | 79   | 6     | 0 | 7                         | 70   | 1     | 0 | 0                      | 2    | 6     | 0 | 4                      | 6    | 1     | 0 | 189   | 2046          |
| 8:20 AM                         | 4                         | 67   | 7     | 0 | 4                         | 76   | 0     | 0 | 0                      | 0    | 4     | 0 | 1                      | 2    | 7     | 0 | 172   | 2082          |
| 8:25 AM                         | 8                         | 88   | 5     | 0 | 4                         | 50   | 1     | 0 | 3                      | 0    | 2     | 0 | 6                      | 2    | 8     | 0 | 177   | 2130          |
| 8:30 AM                         | 2                         | 62   | 2     | 0 | 3                         | 97   | 1     | 0 | 1                      | 1    | 7     | 0 | 0                      | 7    | 5     | 0 | 188   | 2158          |
| 8:35 AM                         | 2                         | 77   | 4     | 1 | 1                         | 61   | 2     | 0 | 0                      | 1    | 5     | 0 | 4                      | 2    | 3     | 0 | 163   | 2177          |
| 8:40 AM                         | 7                         | 69   | 1     | 1 | 6                         | 86   | 1     | 0 | 1                      | 3    | 4     | 0 | 1                      | 4    | 6     | 0 | 190   | 2206          |
| 8:45 AM                         | 4                         | 80   | 6     | 0 | 7                         | 82   | 1     | 0 | 0                      | 3    | 0     | 0 | 4                      | 5    | 5     | 0 | 197   | 2227          |
| 8:50 AM                         | 3                         | 82   | 4     | 0 | 9                         | 91   | 1     | 0 | 0                      | 0    | 2     | 0 | 5                      | 6    | 4     | 0 | 207   | 2224          |
| 8:55 AM                         | 9                         | 74   | 8     | 0 | 7                         | 62   | 3     | 0 | 1                      | 1    | 2     | 0 | 4                      | 3    | 5     | 0 | 179   | 2220          |
| Peak 15-Min Flowrates           | Northbound                |      |       |   | Southbound                |      |       |   | Eastbound              |      |       |   | Westbound              |      |       |   | Total |               |
|                                 | Left                      | Thru | Right | U | Left                      | Thru | Right | U | Left                   | Thru | Right | U | Left                   | Thru | Right | U |       |               |
| All Vehicles                    | 44                        | 968  | 88    | 0 | 76                        | 932  | 32    | 0 | 12                     | 44   | 32    | 0 | 28                     | 48   | 72    | 0 | 2376  |               |
| Heavy Trucks                    | 0                         | 32   | 0     | 0 | 0                         | 52   | 4     | 0 | 0                      | 0    | 4     | 0 | 0                      | 0    | 4     | 0 | 96    |               |
| Buses                           |                           |      |       |   |                           |      |       |   |                        |      |       |   |                        |      |       |   |       |               |
| Pedestrians                     | 0                         | 0    | 0     | 0 | 0                         | 0    | 0     | 0 | 0                      | 0    | 0     | 0 | 0                      | 0    | 0     | 0 | 0     |               |
| Bicycles                        | 0                         | 0    | 0     | 0 | 0                         | 0    | 0     | 0 | 0                      | 0    | 0     | 0 | 0                      | 0    | 0     | 0 | 0     |               |
| Scooters                        |                           |      |       |   |                           |      |       |   |                        |      |       |   |                        |      |       |   |       |               |

**Comments:**

**LOCATION:** SE 164th Ave -- SE 15th St  
**CITY/STATE:** Vancouver, WA

**QC JOB #:** 16228506  
**DATE:** Tue, Jun 6 2023

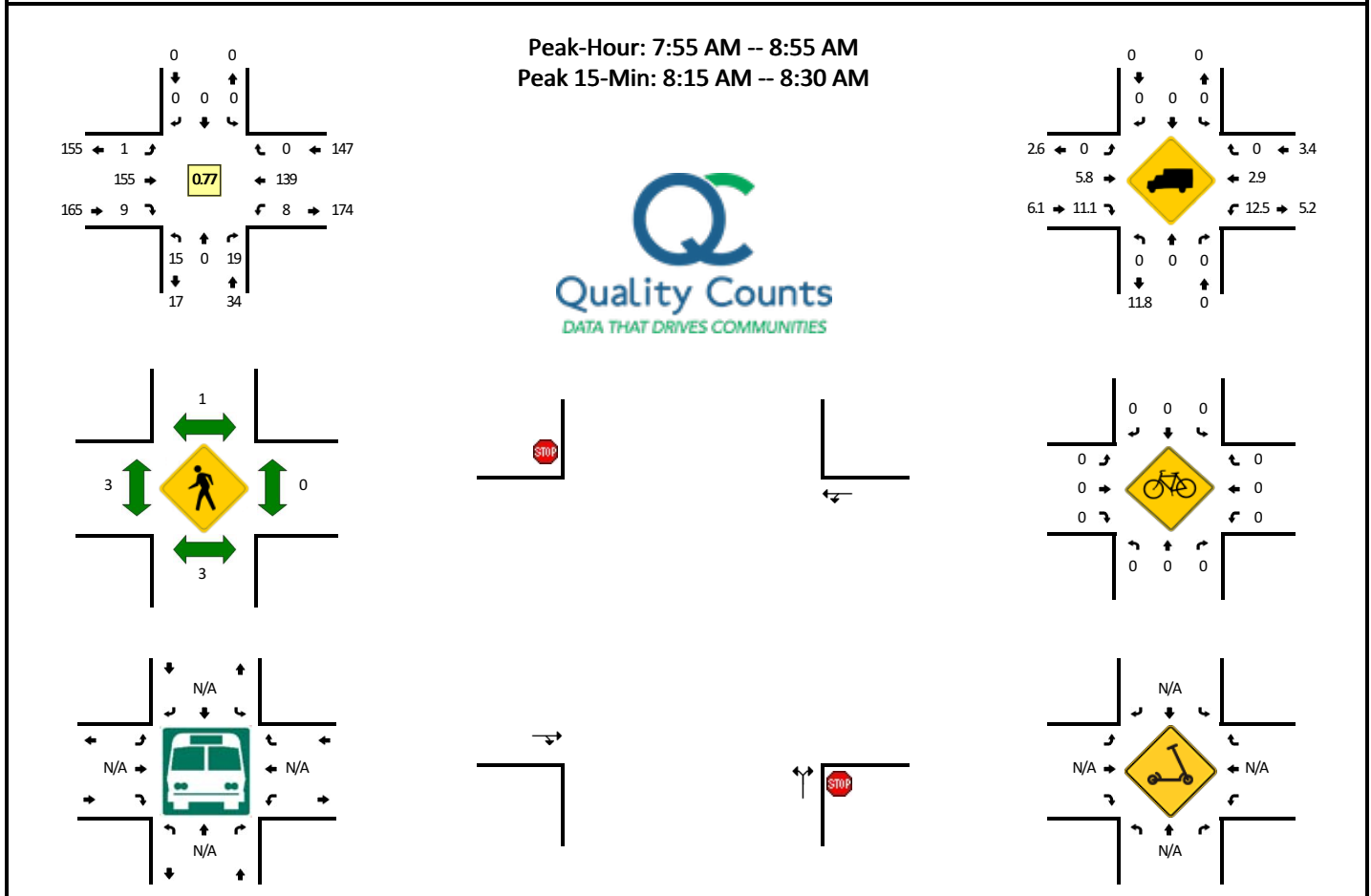


| 5-Min Count Period Beginning At | SE 164th Ave (Northbound) |      |       |   | SE 164th Ave (Southbound) |      |       |   | SE 15th St (Eastbound) |      |       |   | SE 15th St (Westbound) |      |       |   | Total | Hourly Totals |
|---------------------------------|---------------------------|------|-------|---|---------------------------|------|-------|---|------------------------|------|-------|---|------------------------|------|-------|---|-------|---------------|
|                                 | Left                      | Thru | Right | U | Left                      | Thru | Right | U | Left                   | Thru | Right | U | Left                   | Thru | Right | U |       |               |
| 4:00 PM                         | 5                         | 117  | 5     | 0 | 3                         | 100  | 2     | 0 | 4                      | 2    | 5     | 0 | 9                      | 6    | 3     | 0 | 261   |               |
| 4:05 PM                         | 13                        | 84   | 4     | 0 | 7                         | 64   | 3     | 0 | 6                      | 8    | 3     | 0 | 16                     | 4    | 6     | 0 | 218   |               |
| 4:10 PM                         | 8                         | 106  | 6     | 0 | 6                         | 119  | 5     | 0 | 6                      | 5    | 3     | 0 | 7                      | 2    | 11    | 0 | 284   |               |
| 4:15 PM                         | 9                         | 95   | 2     | 0 | 9                         | 87   | 1     | 0 | 2                      | 10   | 2     | 0 | 13                     | 6    | 9     | 0 | 245   |               |
| 4:20 PM                         | 6                         | 150  | 3     | 0 | 6                         | 110  | 1     | 0 | 3                      | 2    | 3     | 0 | 7                      | 4    | 9     | 0 | 304   |               |
| 4:25 PM                         | 5                         | 98   | 5     | 0 | 12                        | 73   | 3     | 0 | 3                      | 2    | 2     | 0 | 7                      | 8    | 4     | 0 | 222   |               |
| 4:30 PM                         | 6                         | 132  | 5     | 0 | 7                         | 79   | 3     | 0 | 2                      | 4    | 3     | 0 | 5                      | 6    | 9     | 0 | 261   |               |
| 4:35 PM                         | 6                         | 75   | 2     | 0 | 15                        | 88   | 0     | 1 | 3                      | 5    | 8     | 0 | 14                     | 6    | 4     | 0 | 227   |               |
| 4:40 PM                         | 11                        | 116  | 3     | 1 | 5                         | 114  | 1     | 2 | 0                      | 3    | 0     | 0 | 5                      | 13   | 6     | 0 | 280   |               |
| 4:45 PM                         | 7                         | 112  | 3     | 2 | 9                         | 71   | 1     | 1 | 2                      | 11   | 1     | 0 | 18                     | 6    | 8     | 0 | 252   |               |
| 4:50 PM                         | 12                        | 117  | 4     | 0 | 8                         | 95   | 2     | 0 | 2                      | 3    | 0     | 0 | 5                      | 10   | 9     | 0 | 267   |               |
| 4:55 PM                         | 4                         | 95   | 2     | 0 | 12                        | 78   | 2     | 1 | 1                      | 8    | 1     | 0 | 5                      | 10   | 7     | 0 | 226   |               |
| 5:00 PM                         | 6                         | 112  | 2     | 1 | 10                        | 114  | 7     | 1 | 3                      | 3    | 2     | 0 | 7                      | 5    | 6     | 0 | 279   | 3047          |
| 5:05 PM                         | 9                         | 86   | 2     | 0 | 11                        | 93   | 3     | 0 | 9                      | 9    | 4     | 0 | 12                     | 11   | 10    | 0 | 259   | 3065          |
| 5:10 PM                         | 8                         | 116  | 2     | 0 | 9                         | 147  | 5     | 2 | 5                      | 5    | 2     | 0 | 11                     | 3    | 4     | 0 | 319   | 3106          |
| 5:15 PM                         | 13                        | 88   | 6     | 1 | 17                        | 78   | 3     | 0 | 4                      | 8    | 2     | 0 | 11                     | 15   | 8     | 0 | 254   |               |
| 5:20 PM                         | 10                        | 137  | 3     | 0 | 10                        | 139  | 6     | 0 | 4                      | 9    | 5     | 0 | 4                      | 11   | 6     | 0 | 344   | 3141          |
| 5:25 PM                         | 12                        | 78   | 7     | 1 | 14                        | 102  | 0     | 0 | 2                      | 9    | 1     | 0 | 4                      | 6    | 7     | 0 | 243   | 3150          |
| 5:30 PM                         | 3                         | 91   | 4     | 0 | 8                         | 85   | 4     | 0 | 5                      | 8    | 11    | 0 | 5                      | 1    | 6     | 0 | 231   | 3190          |
| 5:35 PM                         | 4                         | 72   | 1     | 0 | 5                         | 67   | 4     | 1 | 1                      | 8    | 5     | 0 | 4                      | 5    | 6     | 0 | 183   | 3211          |
| 5:40 PM                         | 6                         | 97   | 6     | 0 | 6                         | 114  | 2     | 2 | 1                      | 3    | 7     | 0 | 1                      | 5    | 4     | 0 | 254   | 3088          |
| 5:45 PM                         | 11                        | 83   | 4     | 1 | 10                        | 82   | 1     | 0 | 3                      | 4    | 5     | 0 | 5                      | 10   | 10    | 0 | 229   | 3085          |
| 5:50 PM                         | 8                         | 111  | 2     | 0 | 7                         | 99   | 5     | 0 | 2                      | 6    | 6     | 0 | 7                      | 5    | 6     | 0 | 264   | 3031          |
| 5:55 PM                         | 4                         | 68   | 0     | 0 | 5                         | 70   | 3     | 0 | 4                      | 0    | 2     | 0 | 1                      | 11   | 4     | 0 | 172   |               |
| Peak 15-Min Flowrates           | Northbound                |      |       |   | Southbound                |      |       |   | Eastbound              |      |       |   | Westbound              |      |       |   | Total |               |
|                                 | Left                      | Thru | Right | U | Left                      | Thru | Right | U | Left                   | Thru | Right | U | Left                   | Thru | Right | U |       |               |
| All Vehicles                    | 124                       | 1364 | 44    | 4 | 144                       | 1456 | 56    | 8 | 52                     | 88   | 36    | 0 | 104                    | 116  | 72    | 0 | 3668  |               |
| Heavy Trucks                    | 0                         | 20   | 0     | 0 | 0                         | 16   | 0     | 0 | 0                      | 4    | 0     | 0 | 0                      | 0    | 4     | 0 | 44    |               |
| Buses                           |                           |      |       |   |                           |      |       |   |                        |      |       |   |                        |      |       |   |       |               |
| Pedestrians                     | 0                         | 0    | 0     | 0 | 0                         | 0    | 0     | 0 | 0                      | 0    | 0     | 0 | 0                      | 0    | 0     | 0 | 0     |               |
| Bicycles                        | 0                         | 0    | 0     | 0 | 0                         | 0    | 0     | 0 | 0                      | 0    | 0     | 0 | 0                      | 8    | 0     | 0 | 8     |               |
| Scooters                        |                           |      |       |   |                           |      |       |   |                        |      |       |   |                        |      |       |   |       |               |

Comments:

**LOCATION:** SE 189th Ave -- SE 15th St  
**CITY/STATE:** Vancouver, WA

**QC JOB #:** 16228503  
**DATE:** Tue, Jun 6 2023

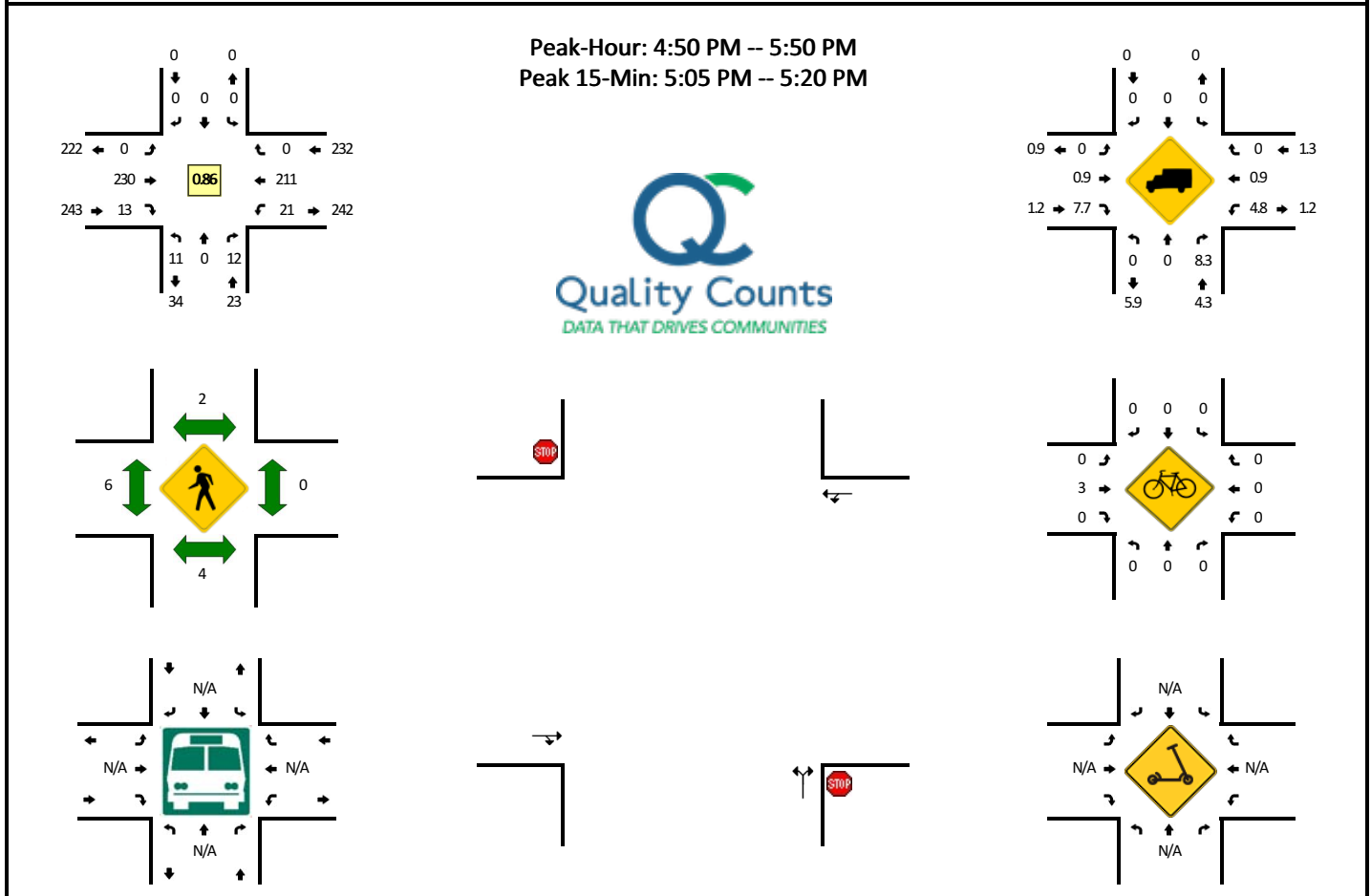


| 5-Min Count Period Beginning At | SE 189th Ave (Northbound) |      |       |   | SE 189th Ave (Southbound) |      |       |   | SE 15th St (Eastbound) |      |       |   | SE 15th St (Westbound) |      |       |   | Total | Hourly Totals |
|---------------------------------|---------------------------|------|-------|---|---------------------------|------|-------|---|------------------------|------|-------|---|------------------------|------|-------|---|-------|---------------|
|                                 | Left                      | Thru | Right | U | Left                      | Thru | Right | U | Left                   | Thru | Right | U | Left                   | Thru | Right | U |       |               |
| 7:00 AM                         | 0                         | 0    | 1     | 0 | 0                         | 0    | 0     | 0 | 0                      | 5    | 0     | 0 | 0                      | 2    | 0     | 0 | 8     |               |
| 7:05 AM                         | 0                         | 0    | 3     | 0 | 0                         | 0    | 0     | 0 | 0                      | 5    | 0     | 0 | 0                      | 6    | 0     | 0 | 14    |               |
| 7:10 AM                         | 0                         | 0    | 2     | 0 | 0                         | 0    | 0     | 0 | 0                      | 6    | 1     | 0 | 0                      | 6    | 0     | 0 | 15    |               |
| 7:15 AM                         | 1                         | 0    | 0     | 0 | 0                         | 0    | 0     | 0 | 0                      | 5    | 1     | 0 | 0                      | 7    | 0     | 0 | 14    |               |
| 7:20 AM                         | 0                         | 0    | 2     | 0 | 0                         | 0    | 0     | 0 | 0                      | 9    | 0     | 0 | 0                      | 6    | 0     | 0 | 18    |               |
| 7:25 AM                         | 1                         | 0    | 1     | 0 | 0                         | 0    | 0     | 0 | 0                      | 6    | 0     | 0 | 0                      | 4    | 0     | 0 | 13    |               |
| 7:30 AM                         | 0                         | 0    | 1     | 0 | 0                         | 0    | 0     | 0 | 0                      | 10   | 2     | 0 | 0                      | 6    | 0     | 0 | 20    |               |
| 7:35 AM                         | 3                         | 0    | 2     | 0 | 0                         | 0    | 0     | 0 | 0                      | 12   | 0     | 0 | 0                      | 4    | 0     | 0 | 23    |               |
| 7:40 AM                         | 0                         | 0    | 1     | 0 | 0                         | 0    | 0     | 0 | 0                      | 10   | 0     | 0 | 0                      | 4    | 0     | 0 | 16    |               |
| 7:45 AM                         | 1                         | 0    | 2     | 0 | 0                         | 0    | 0     | 0 | 0                      | 11   | 0     | 0 | 0                      | 11   | 0     | 0 | 28    |               |
| 7:50 AM                         | 1                         | 0    | 0     | 0 | 0                         | 0    | 0     | 0 | 0                      | 13   | 0     | 0 | 0                      | 8    | 0     | 0 | 23    |               |
| 7:55 AM                         | 0                         | 0    | 1     | 0 | 0                         | 0    | 0     | 0 | 0                      | 9    | 0     | 0 | 0                      | 18   | 0     | 0 | 29    | 221           |
| 8:00 AM                         | 1                         | 0    | 1     | 0 | 0                         | 0    | 0     | 0 | 0                      | 10   | 0     | 0 | 0                      | 13   | 0     | 0 | 25    | 238           |
| 8:05 AM                         | 1                         | 0    | 1     | 0 | 0                         | 0    | 0     | 0 | 0                      | 15   | 0     | 0 | 0                      | 9    | 0     | 0 | 27    | 251           |
| 8:10 AM                         | 2                         | 0    | 2     | 0 | 0                         | 0    | 0     | 0 | 0                      | 18   | 0     | 0 | 0                      | 12   | 0     | 0 | 34    | 270           |
| 8:15 AM                         | 2                         | 0    | 3     | 0 | 0                         | 0    | 0     | 0 | 0                      | 18   | 0     | 0 | 0                      | 8    | 0     | 0 | 32    | 288           |
| 8:20 AM                         | 0                         | 0    | 5     | 0 | 0                         | 0    | 0     | 0 | 0                      | 19   | 1     | 1 | 0                      | 9    | 0     | 0 | 35    | 305           |
| 8:25 AM                         | 2                         | 0    | 2     | 0 | 0                         | 0    | 0     | 0 | 0                      | 22   | 1     | 0 | 0                      | 18   | 0     | 0 | 45    | 337           |
| 8:30 AM                         | 2                         | 0    | 0     | 0 | 0                         | 0    | 0     | 0 | 0                      | 8    | 1     | 0 | 0                      | 4    | 0     | 0 | 15    | 332           |
| 8:35 AM                         | 1                         | 0    | 1     | 0 | 0                         | 0    | 0     | 0 | 0                      | 8    | 0     | 0 | 0                      | 11   | 0     | 0 | 24    | 333           |
| 8:40 AM                         | 0                         | 0    | 1     | 0 | 0                         | 0    | 0     | 0 | 0                      | 10   | 1     | 0 | 0                      | 11   | 0     | 0 | 23    | 340           |
| 8:45 AM                         | 3                         | 0    | 0     | 0 | 0                         | 0    | 0     | 0 | 0                      | 10   | 3     | 0 | 0                      | 10   | 0     | 0 | 26    | 338           |
| 8:50 AM                         | 1                         | 0    | 2     | 0 | 0                         | 0    | 0     | 0 | 0                      | 8    | 2     | 0 | 0                      | 16   | 0     | 0 | 31    | 346           |
| 8:55 AM                         | 2                         | 0    | 2     | 0 | 0                         | 0    | 0     | 0 | 0                      | 9    | 1     | 0 | 0                      | 14   | 0     | 0 | 28    | 345           |
| Peak 15-Min Flowrates           | Northbound                |      |       |   | Southbound                |      |       |   | Eastbound              |      |       |   | Westbound              |      |       |   | Total |               |
|                                 | Left                      | Thru | Right | U | Left                      | Thru | Right | U | Left                   | Thru | Right | U | Left                   | Thru | Right | U |       |               |
| All Vehicles                    | 16                        | 0    | 40    | 0 | 0                         | 0    | 0     | 0 | 0                      | 236  | 8     | 4 | 4                      | 140  | 0     | 0 | 448   |               |
| Heavy Trucks                    | 0                         | 0    | 0     | 0 | 0                         | 0    | 0     | 0 | 0                      | 20   | 0     | 0 | 0                      | 0    | 0     | 0 | 20    |               |
| Buses                           |                           |      |       |   |                           |      |       |   |                        |      |       |   |                        |      |       |   |       |               |
| Pedestrians                     |                           | 0    |       |   |                           | 0    |       |   |                        | 8    |       |   |                        | 0    |       |   | 8     |               |
| Bicycles                        | 0                         | 0    | 0     |   | 0                         | 0    | 0     |   | 0                      | 0    | 0     |   | 0                      | 0    | 0     |   | 0     |               |
| Scooters                        |                           |      |       |   |                           |      |       |   |                        |      |       |   |                        |      |       |   |       |               |

**Comments:**

**LOCATION:** SE 189th Ave -- SE 15th St  
**CITY/STATE:** Vancouver, WA

**QC JOB #:** 16228504  
**DATE:** Tue, Jun 6 2023



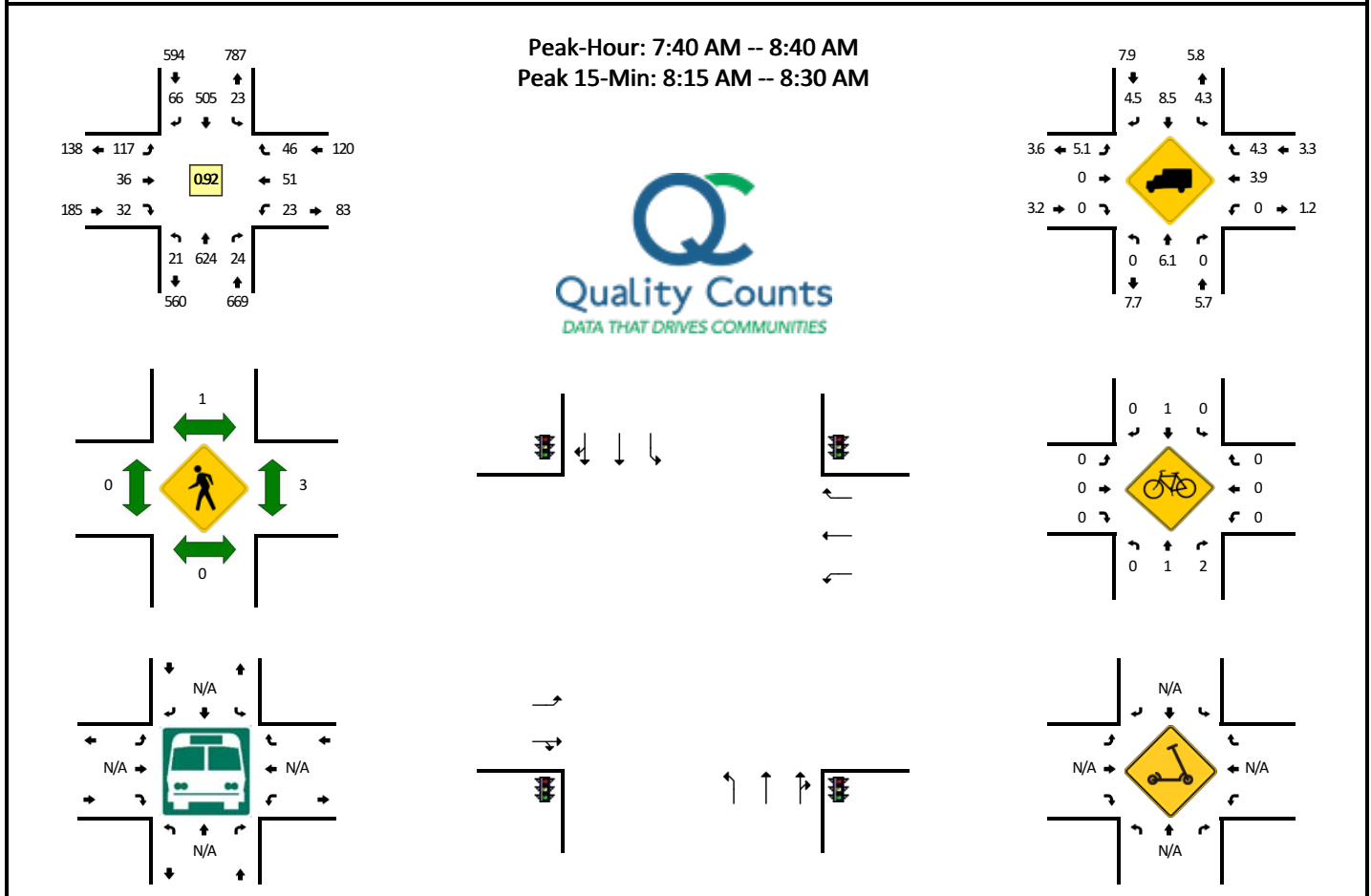
| 5-Min Count Period Beginning At | SE 189th Ave (Northbound) |      |       |   | SE 189th Ave (Southbound) |      |       |   | SE 15th St (Eastbound) |      |       |   | SE 15th St (Westbound) |      |       |   | Total | Hourly Totals |
|---------------------------------|---------------------------|------|-------|---|---------------------------|------|-------|---|------------------------|------|-------|---|------------------------|------|-------|---|-------|---------------|
|                                 | Left                      | Thru | Right | U | Left                      | Thru | Right | U | Left                   | Thru | Right | U | Left                   | Thru | Right | U |       |               |
| 4:00 PM                         | 2                         | 0    | 2     | 0 | 0                         | 0    | 0     | 0 | 0                      | 11   | 1     | 0 | 4                      | 28   | 0     | 0 | 48    |               |
| 4:05 PM                         | 1                         | 0    | 0     | 0 | 0                         | 0    | 0     | 0 | 0                      | 14   | 5     | 0 | 1                      | 18   | 0     | 0 | 39    |               |
| 4:10 PM                         | 1                         | 0    | 2     | 0 | 0                         | 0    | 0     | 0 | 0                      | 15   | 0     | 0 | 2                      | 25   | 0     | 0 | 45    |               |
| 4:15 PM                         | 2                         | 0    | 1     | 0 | 0                         | 0    | 0     | 0 | 0                      | 11   | 0     | 0 | 1                      | 17   | 0     | 0 | 32    |               |
| 4:20 PM                         | 1                         | 0    | 2     | 0 | 0                         | 0    | 0     | 0 | 0                      | 16   | 1     | 0 | 1                      | 10   | 0     | 0 | 31    |               |
| 4:25 PM                         | 1                         | 0    | 1     | 0 | 0                         | 0    | 0     | 0 | 0                      | 13   | 0     | 0 | 0                      | 12   | 0     | 0 | 27    |               |
| 4:30 PM                         | 0                         | 0    | 1     | 0 | 0                         | 0    | 0     | 0 | 0                      | 12   | 1     | 0 | 2                      | 16   | 0     | 0 | 32    |               |
| 4:35 PM                         | 0                         | 0    | 3     | 0 | 0                         | 0    | 0     | 0 | 0                      | 15   | 2     | 0 | 0                      | 14   | 0     | 0 | 34    |               |
| 4:40 PM                         | 0                         | 0    | 2     | 0 | 0                         | 0    | 0     | 0 | 0                      | 14   | 1     | 0 | 0                      | 18   | 0     | 0 | 35    |               |
| 4:45 PM                         | 2                         | 0    | 5     | 0 | 0                         | 0    | 0     | 0 | 0                      | 17   | 0     | 0 | 0                      | 14   | 0     | 0 | 38    |               |
| 4:50 PM                         | 1                         | 0    | 4     | 0 | 0                         | 0    | 0     | 0 | 0                      | 20   | 2     | 0 | 1                      | 20   | 0     | 0 | 48    |               |
| 4:55 PM                         | 2                         | 0    | 3     | 0 | 0                         | 0    | 0     | 0 | 0                      | 19   | 0     | 0 | 2                      | 15   | 0     | 0 | 41    | 450           |
| 5:00 PM                         | 1                         | 0    | 0     | 0 | 0                         | 0    | 0     | 0 | 0                      | 13   | 1     | 0 | 2                      | 12   | 0     | 0 | 29    | 431           |
| 5:05 PM                         | 1                         | 0    | 0     | 0 | 0                         | 0    | 0     | 0 | 0                      | 19   | 0     | 0 | 3                      | 28   | 0     | 0 | 51    | 443           |
| 5:10 PM                         | 0                         | 0    | 0     | 0 | 0                         | 0    | 0     | 0 | 0                      | 20   | 2     | 0 | 1                      | 19   | 0     | 0 | 42    | 440           |
| 5:15 PM                         | 1                         | 0    | 1     | 0 | 0                         | 0    | 0     | 0 | 0                      | 21   | 1     | 0 | 2                      | 25   | 0     | 0 | 51    | 459           |
| 5:20 PM                         | 1                         | 0    | 0     | 0 | 0                         | 0    | 0     | 0 | 0                      | 22   | 1     | 0 | 1                      | 21   | 0     | 0 | 46    | 474           |
| 5:25 PM                         | 1                         | 0    | 3     | 0 | 0                         | 0    | 0     | 0 | 0                      | 21   | 0     | 0 | 4                      | 9    | 0     | 0 | 38    | 485           |
| 5:30 PM                         | 1                         | 0    | 0     | 0 | 0                         | 0    | 0     | 0 | 0                      | 19   | 0     | 0 | 2                      | 9    | 0     | 0 | 31    | 484           |
| 5:35 PM                         | 0                         | 0    | 1     | 0 | 0                         | 0    | 0     | 0 | 0                      | 20   | 2     | 0 | 2                      | 14   | 0     | 0 | 39    | 489           |
| 5:40 PM                         | 1                         | 0    | 0     | 0 | 0                         | 0    | 0     | 0 | 0                      | 20   | 3     | 0 | 0                      | 18   | 0     | 0 | 42    | 496           |
| 5:45 PM                         | 1                         | 0    | 0     | 0 | 0                         | 0    | 0     | 0 | 0                      | 16   | 1     | 0 | 1                      | 21   | 0     | 0 | 40    | 498           |
| 5:50 PM                         | 2                         | 0    | 2     | 0 | 0                         | 0    | 0     | 0 | 0                      | 16   | 2     | 0 | 1                      | 12   | 0     | 0 | 35    | 485           |
| 5:55 PM                         | 1                         | 0    | 1     | 0 | 0                         | 0    | 0     | 0 | 0                      | 17   | 0     | 0 | 0                      | 19   | 0     | 0 | 38    | 482           |
| Peak 15-Min Flowrates           | Northbound                |      |       |   | Southbound                |      |       |   | Eastbound              |      |       |   | Westbound              |      |       |   | Total |               |
|                                 | Left                      | Thru | Right | U | Left                      | Thru | Right | U | Left                   | Thru | Right | U | Left                   | Thru | Right | U |       |               |
| All Vehicles                    | 8                         | 0    | 4     | 0 | 0                         | 0    | 0     | 0 | 0                      | 240  | 12    | 0 | 24                     | 288  | 0     | 0 | 576   |               |
| Heavy Trucks                    | 0                         | 0    | 0     | 0 | 0                         | 0    | 0     | 0 | 0                      | 4    | 0     | 0 | 0                      | 8    | 0     | 0 | 12    |               |
| Buses                           |                           |      |       |   |                           |      |       |   |                        |      |       |   |                        |      |       |   |       |               |
| Pedestrians                     |                           | 4    |       |   |                           | 0    |       |   |                        | 0    |       |   |                        | 0    |       |   | 4     |               |
| Bicycles                        | 0                         | 0    | 0     |   | 0                         | 0    | 0     |   | 0                      | 0    | 0     |   | 0                      | 0    | 0     |   | 0     |               |
| Scoters                         |                           |      |       |   |                           |      |       |   |                        |      |       |   |                        |      |       |   |       |               |

Comments:



**LOCATION:** SE 192nd Ave -- SE 15th St  
**CITY/STATE:** Vancouver, WA

**QC JOB #:** 16228501  
**DATE:** Tue, Jun 6 2023

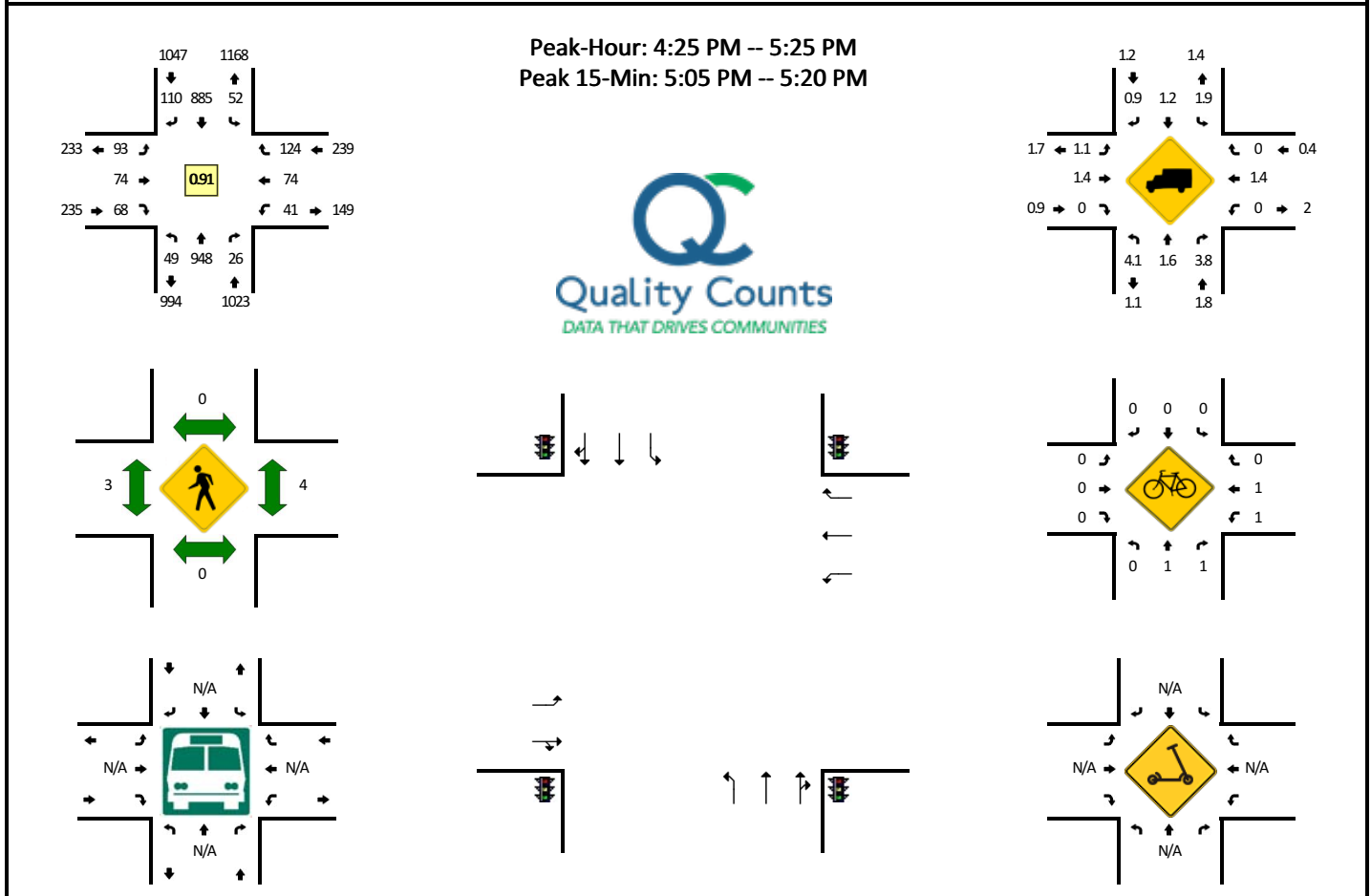


| 5-Min Count Period Beginning At | SE 192nd Ave (Northbound) |      |       |   | SE 192nd Ave (Southbound) |      |       |   | SE 15th St (Eastbound) |      |       |   | SE 15th St (Westbound) |      |       |   | Total | Hourly Totals |
|---------------------------------|---------------------------|------|-------|---|---------------------------|------|-------|---|------------------------|------|-------|---|------------------------|------|-------|---|-------|---------------|
|                                 | Left                      | Thru | Right | U | Left                      | Thru | Right | U | Left                   | Thru | Right | U | Left                   | Thru | Right | U |       |               |
| 7:00 AM                         | 1                         | 25   | 0     | 0 | 3                         | 29   | 1     | 0 | 1                      | 1    | 2     | 0 | 1                      | 0    | 2     | 0 | 66    |               |
| 7:05 AM                         | 1                         | 33   | 0     | 0 | 0                         | 35   | 4     | 0 | 3                      | 2    | 0     | 0 | 1                      | 0    | 2     | 0 | 81    |               |
| 7:10 AM                         | 0                         | 24   | 1     | 0 | 1                         | 32   | 4     | 0 | 5                      | 3    | 0     | 0 | 0                      | 2    | 3     | 0 | 75    |               |
| 7:15 AM                         | 1                         | 36   | 0     | 0 | 0                         | 52   | 4     | 0 | 2                      | 1    | 1     | 0 | 0                      | 2    | 2     | 0 | 101   |               |
| 7:20 AM                         | 1                         | 41   | 1     | 0 | 2                         | 32   | 3     | 0 | 3                      | 4    | 4     | 0 | 1                      | 3    | 2     | 0 | 97    |               |
| 7:25 AM                         | 0                         | 39   | 0     | 0 | 4                         | 40   | 3     | 0 | 2                      | 1    | 2     | 0 | 1                      | 2    | 2     | 0 | 96    |               |
| 7:30 AM                         | 3                         | 50   | 1     | 0 | 0                         | 31   | 4     | 0 | 7                      | 2    | 1     | 0 | 0                      | 1    | 2     | 0 | 102   |               |
| 7:35 AM                         | 2                         | 47   | 2     | 0 | 2                         | 35   | 1     | 0 | 11                     | 4    | 4     | 0 | 1                      | 3    | 0     | 0 | 112   |               |
| 7:40 AM                         | 2                         | 59   | 4     | 0 | 3                         | 34   | 1     | 0 | 6                      | 1    | 4     | 0 | 2                      | 2    | 3     | 0 | 121   |               |
| 7:45 AM                         | 1                         | 59   | 2     | 0 | 1                         | 43   | 8     | 0 | 10                     | 3    | 3     | 0 | 3                      | 5    | 5     | 0 | 143   |               |
| 7:50 AM                         | 4                         | 55   | 1     | 0 | 2                         | 57   | 5     | 0 | 12                     | 3    | 6     | 0 | 2                      | 2    | 4     | 0 | 153   |               |
| 7:55 AM                         | 2                         | 43   | 3     | 0 | 3                         | 41   | 10    | 0 | 2                      | 5    | 2     | 0 | 2                      | 8    | 5     | 0 | 126   | 1273          |
| 8:00 AM                         | 0                         | 46   | 3     | 0 | 3                         | 43   | 9     | 0 | 6                      | 3    | 2     | 0 | 1                      | 3    | 3     | 0 | 122   | 1329          |
| 8:05 AM                         | 2                         | 47   | 1     | 0 | 1                         | 35   | 5     | 0 | 11                     | 3    | 0     | 0 | 2                      | 3    | 3     | 0 | 113   | 1361          |
| 8:10 AM                         | 4                         | 42   | 1     | 0 | 1                         | 39   | 2     | 0 | 9                      | 3    | 6     | 0 | 0                      | 6    | 3     | 0 | 116   | 1402          |
| 8:15 AM                         | 0                         | 66   | 1     | 0 | 3                         | 39   | 4     | 0 | 16                     | 4    | 2     | 0 | 1                      | 5    | 6     | 0 | 147   | 1448          |
| 8:20 AM                         | 1                         | 56   | 2     | 0 | 0                         | 31   | 3     | 0 | 13                     | 3    | 3     | 0 | 4                      | 8    | 3     | 0 | 127   | 1478          |
| 8:25 AM                         | 3                         | 46   | 2     | 0 | 1                         | 52   | 9     | 0 | 20                     | 5    | 4     | 0 | 4                      | 5    | 2     | 0 | 153   | 1535          |
| 8:30 AM                         | 0                         | 48   | 2     | 0 | 2                         | 39   | 2     | 0 | 8                      | 1    | 0     | 0 | 0                      | 1    | 6     | 0 | 109   | 1542          |
| 8:35 AM                         | 2                         | 57   | 2     | 0 | 3                         | 52   | 8     | 0 | 4                      | 2    | 0     | 0 | 2                      | 3    | 3     | 0 | 138   | 1568          |
| 8:40 AM                         | 3                         | 39   | 0     | 0 | 2                         | 43   | 4     | 0 | 8                      | 1    | 3     | 0 | 1                      | 4    | 3     | 0 | 111   | 1558          |
| 8:45 AM                         | 6                         | 57   | 2     | 0 | 0                         | 47   | 1     | 0 | 7                      | 1    | 2     | 0 | 2                      | 4    | 1     | 0 | 130   | 1545          |
| 8:50 AM                         | 3                         | 41   | 1     | 0 | 5                         | 48   | 8     | 0 | 5                      | 2    | 2     | 0 | 1                      | 6    | 3     | 0 | 125   | 1517          |
| 8:55 AM                         | 4                         | 50   | 2     | 0 | 0                         | 51   | 8     | 0 | 5                      | 3    | 2     | 0 | 0                      | 2    | 6     | 0 | 133   | 1524          |
| Peak 15-Min Flowrates           | Northbound                |      |       |   | Southbound                |      |       |   | Eastbound              |      |       |   | Westbound              |      |       |   | Total |               |
|                                 | Left                      | Thru | Right | U | Left                      | Thru | Right | U | Left                   | Thru | Right | U | Left                   | Thru | Right | U |       |               |
| All Vehicles                    | 16                        | 672  | 20    | 0 | 16                        | 488  | 64    | 0 | 196                    | 48   | 36    | 0 | 36                     | 72   | 44    | 0 | 1708  |               |
| Heavy Trucks                    | 0                         | 44   | 0     | 0 | 0                         | 48   | 4     | 0 | 20                     | 0    | 0     | 0 | 0                      | 4    | 8     | 0 | 128   |               |
| Buses                           |                           |      |       |   |                           |      |       |   |                        |      |       |   |                        |      |       |   |       |               |
| Pedestrians                     |                           | 0    |       |   |                           | 0    |       |   |                        | 0    |       |   |                        | 0    |       |   | 0     |               |
| Bicycles                        | 0                         | 0    | 0     |   | 0                         | 0    | 0     |   | 0                      | 0    | 0     |   | 0                      | 0    | 0     |   | 0     |               |
| Scoters                         |                           |      |       |   |                           |      |       |   |                        |      |       |   |                        |      |       |   |       |               |

Comments:

**LOCATION:** SE 192nd Ave -- SE 15th St  
**CITY/STATE:** Vancouver, WA

**QC JOB #:** 16228502  
**DATE:** Tue, Jun 6 2023



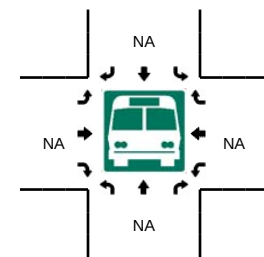
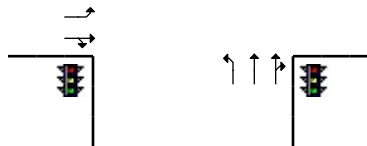
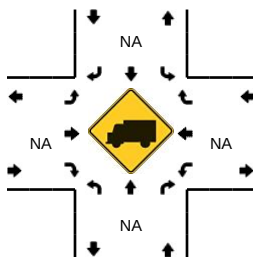
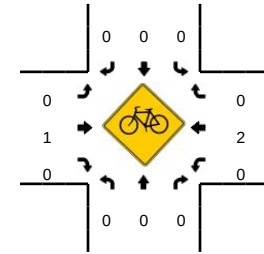
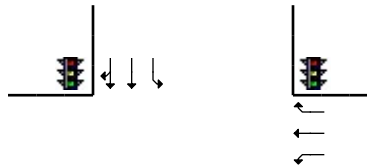
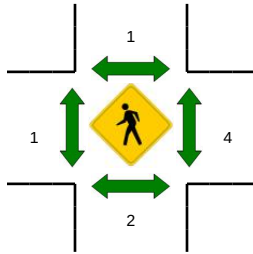
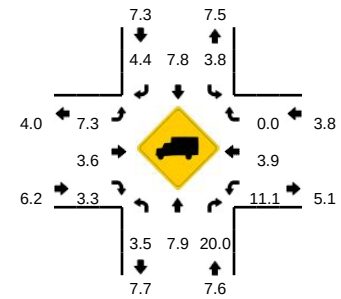
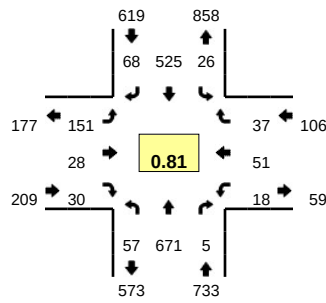
| 5-Min Count Period Beginning At | SE 192nd Ave (Northbound) |      |       |   | SE 192nd Ave (Southbound) |      |       |   | SE 15th St (Eastbound) |      |       |   | SE 15th St (Westbound) |      |       |   | Total | Hourly Totals |
|---------------------------------|---------------------------|------|-------|---|---------------------------|------|-------|---|------------------------|------|-------|---|------------------------|------|-------|---|-------|---------------|
|                                 | Left                      | Thru | Right | U | Left                      | Thru | Right | U | Left                   | Thru | Right | U | Left                   | Thru | Right | U |       |               |
| 4:00 PM                         | 7                         | 89   | 1     | 0 | 3                         | 86   | 13    | 0 | 5                      | 4    | 3     | 0 | 5                      | 7    | 5     | 0 | 228   |               |
| 4:05 PM                         | 5                         | 75   | 1     | 0 | 7                         | 75   | 8     | 0 | 6                      | 3    | 5     | 0 | 5                      | 7    | 17    | 0 | 214   |               |
| 4:10 PM                         | 9                         | 87   | 2     | 0 | 2                         | 67   | 10    | 0 | 6                      | 4    | 8     | 0 | 1                      | 6    | 6     | 0 | 208   |               |
| 4:15 PM                         | 7                         | 75   | 2     | 0 | 5                         | 57   | 2     | 0 | 4                      | 5    | 7     | 0 | 4                      | 6    | 6     | 0 | 180   |               |
| 4:20 PM                         | 4                         | 73   | 2     | 1 | 4                         | 62   | 2     | 2 | 7                      | 5    | 3     | 0 | 0                      | 6    | 11    | 0 | 182   |               |
| 4:25 PM                         | 3                         | 87   | 1     | 0 | 4                         | 78   | 5     | 0 | 4                      | 3    | 8     | 0 | 2                      | 4    | 9     | 0 | 208   |               |
| 4:30 PM                         | 7                         | 76   | 2     | 0 | 3                         | 71   | 8     | 1 | 5                      | 3    | 5     | 0 | 10                     | 6    | 7     | 0 | 204   |               |
| 4:35 PM                         | 1                         | 82   | 3     | 0 | 2                         | 61   | 7     | 0 | 10                     | 6    | 5     | 0 | 0                      | 3    | 15    | 0 | 195   |               |
| 4:40 PM                         | 5                         | 89   | 2     | 0 | 4                         | 84   | 6     | 0 | 6                      | 4    | 3     | 0 | 0                      | 9    | 8     | 0 | 220   |               |
| 4:45 PM                         | 5                         | 83   | 1     | 0 | 1                         | 71   | 7     | 0 | 12                     | 6    | 5     | 0 | 5                      | 3    | 9     | 0 | 208   |               |
| 4:50 PM                         | 4                         | 95   | 6     | 0 | 3                         | 64   | 4     | 0 | 15                     | 7    | 9     | 0 | 1                      | 10   | 8     | 0 | 226   |               |
| 4:55 PM                         | 5                         | 80   | 1     | 0 | 2                         | 69   | 7     | 0 | 8                      | 4    | 4     | 0 | 4                      | 7    | 15    | 0 | 206   | 2479          |
| 5:00 PM                         | 3                         | 60   | 2     | 0 | 4                         | 70   | 12    | 0 | 4                      | 4    | 5     | 0 | 4                      | 5    | 9     | 0 | 182   | 2433          |
| 5:05 PM                         | 4                         | 71   | 1     | 0 | 5                         | 89   | 12    | 0 | 6                      | 10   | 1     | 0 | 4                      | 10   | 16    | 0 | 229   | 2448          |
| 5:10 PM                         | 5                         | 80   | 4     | 0 | 11                        | 77   | 15    | 1 | 5                      | 10   | 5     | 0 | 1                      | 3    | 14    | 0 | 231   | 2471          |
| 5:15 PM                         | 7                         | 78   | 2     | 0 | 5                         | 82   | 20    | 1 | 10                     | 7    | 9     | 0 | 7                      | 2    | 6     | 0 | 236   | 2527          |
| 5:20 PM                         | 0                         | 67   | 1     | 0 | 5                         | 69   | 7     | 0 | 8                      | 10   | 9     | 0 | 3                      | 12   | 8     | 0 | 199   | 2544          |
| 5:25 PM                         | 6                         | 77   | 0     | 0 | 2                         | 72   | 7     | 0 | 10                     | 9    | 1     | 0 | 1                      | 1    | 7     | 0 | 193   | 2529          |
| 5:30 PM                         | 2                         | 84   | 3     | 0 | 0                         | 71   | 3     | 0 | 7                      | 7    | 6     | 0 | 0                      | 3    | 2     | 0 | 188   | 2513          |
| 5:35 PM                         | 3                         | 71   | 2     | 0 | 4                         | 68   | 10    | 0 | 7                      | 5    | 7     | 0 | 0                      | 6    | 2     | 0 | 185   | 2503          |
| 5:40 PM                         | 4                         | 73   | 7     | 0 | 4                         | 53   | 8     | 0 | 8                      | 5    | 5     | 0 | 1                      | 7    | 4     | 0 | 179   | 2462          |
| 5:45 PM                         | 2                         | 74   | 5     | 0 | 7                         | 74   | 9     | 0 | 10                     | 3    | 1     | 0 | 1                      | 7    | 4     | 0 | 197   | 2451          |
| 5:50 PM                         | 7                         | 78   | 1     | 0 | 4                         | 57   | 8     | 0 | 5                      | 4    | 5     | 0 | 1                      | 4    | 5     | 0 | 179   | 2404          |
| 5:55 PM                         | 1                         | 47   | 5     | 0 | 3                         | 47   | 5     | 0 | 6                      | 6    | 3     | 0 | 1                      | 3    | 5     | 0 | 132   | 2330          |
| Peak 15-Min Flowrates           | Northbound                |      |       |   | Southbound                |      |       |   | Eastbound              |      |       |   | Westbound              |      |       |   | Total |               |
|                                 | Left                      | Thru | Right | U | Left                      | Thru | Right | U | Left                   | Thru | Right | U | Left                   | Thru | Right | U |       |               |
| All Vehicles                    | 64                        | 916  | 28    | 0 | 84                        | 992  | 188   | 8 | 84                     | 108  | 60    | 0 | 48                     | 60   | 144   | 0 | 2784  |               |
| Heavy Trucks                    | 0                         | 16   | 4     |   | 0                         | 4    | 4     |   | 0                      | 4    | 0     |   | 0                      | 0    | 0     |   | 32    |               |
| Buses                           |                           |      |       |   |                           |      |       |   |                        |      |       |   |                        |      |       |   |       |               |
| Pedestrians                     |                           | 0    |       |   |                           | 0    |       |   |                        | 0    |       |   |                        | 8    |       |   | 8     |               |
| Bicycles                        | 0                         | 0    | 0     |   | 0                         | 0    | 0     |   | 0                      | 0    | 0     |   | 0                      | 0    | 0     |   | 0     |               |
| Scoters                         |                           |      |       |   |                           |      |       |   |                        |      |       |   |                        |      |       |   |       |               |

Comments:

**LOCATION:** SE 192nd Ave -- SE 15th St  
**CITY/STATE:** Camas, WA

**QC JOB #:** 14421313  
**DATE:** Thu, Jun 08 2017

**Peak-Hour: 7:30 AM -- 8:30 AM**  
**Peak 15-Min: 7:45 AM -- 8:00 AM**



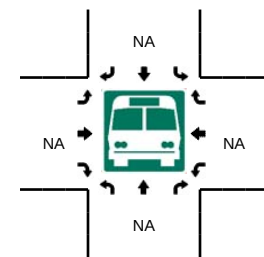
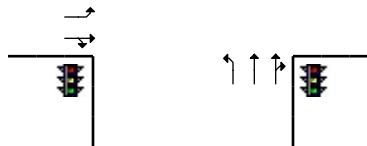
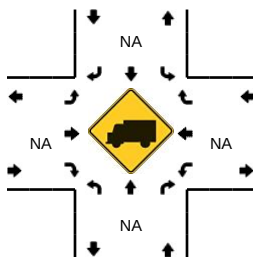
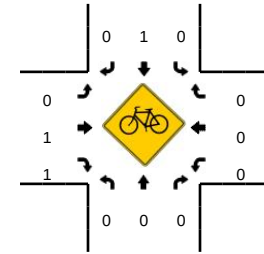
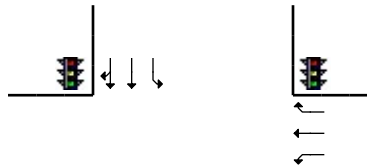
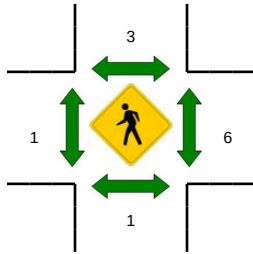
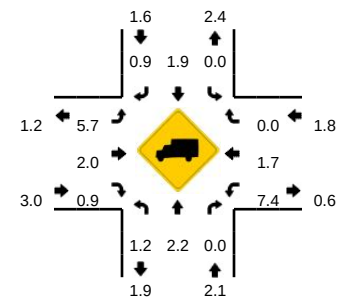
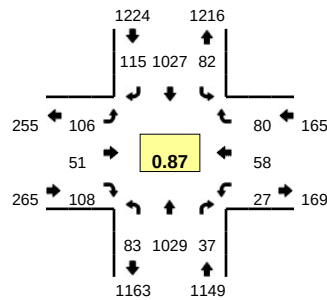
| 5-Min Count Period Beginning At | SE 192nd Ave (Northbound) |      |       |   | SE 192nd Ave (Southbound) |      |       |   | SE 15th St (Eastbound) |      |       |   | SE 15th St (Westbound) |      |       |   | Total | Hourly Totals |
|---------------------------------|---------------------------|------|-------|---|---------------------------|------|-------|---|------------------------|------|-------|---|------------------------|------|-------|---|-------|---------------|
|                                 | Left                      | Thru | Right | U | Left                      | Thru | Right | U | Left                   | Thru | Right | U | Left                   | Thru | Right | U |       |               |
| 7:00 AM                         | 5                         | 37   | 2     | 0 | 5                         | 40   | 1     | 0 | 3                      | 1    | 1     | 0 | 0                      | 2    | 0     | 0 | 97    |               |
| 7:05 AM                         | 0                         | 40   | 0     | 0 | 4                         | 30   | 0     | 0 | 3                      | 3    | 5     | 0 | 2                      | 1    | 0     | 0 | 88    |               |
| 7:10 AM                         | 1                         | 38   | 0     | 0 | 1                         | 16   | 1     | 0 | 2                      | 3    | 6     | 0 | 1                      | 3    | 5     | 0 | 77    |               |
| 7:15 AM                         | 3                         | 37   | 0     | 0 | 2                         | 34   | 6     | 0 | 3                      | 3    | 3     | 0 | 5                      | 2    | 5     | 0 | 103   |               |
| 7:20 AM                         | 5                         | 40   | 1     | 0 | 0                         | 43   | 4     | 0 | 3                      | 0    | 0     | 0 | 1                      | 3    | 0     | 0 | 100   |               |
| 7:25 AM                         | 5                         | 43   | 0     | 0 | 2                         | 27   | 2     | 0 | 2                      | 2    | 2     | 0 | 2                      | 2    | 0     | 0 | 89    |               |
| 7:30 AM                         | 4                         | 58   | 0     | 0 | 0                         | 28   | 0     | 0 | 11                     | 0    | 5     | 0 | 1                      | 2    | 2     | 0 | 111   |               |
| 7:35 AM                         | 2                         | 67   | 1     | 0 | 2                         | 39   | 7     | 0 | 16                     | 1    | 0     | 0 | 1                      | 2    | 3     | 0 | 141   |               |
| 7:40 AM                         | 4                         | 62   | 0     | 0 | 2                         | 43   | 6     | 0 | 13                     | 3    | 5     | 0 | 1                      | 6    | 6     | 0 | 151   |               |
| 7:45 AM                         | 6                         | 61   | 1     | 0 | 0                         | 51   | 6     | 0 | 12                     | 4    | 4     | 0 | 2                      | 7    | 5     | 0 | 159   |               |
| 7:50 AM                         | 4                         | 72   | 0     | 0 | 3                         | 67   | 7     | 0 | 17                     | 1    | 0     | 0 | 2                      | 6    | 3     | 0 | 182   |               |
| 7:55 AM                         | 5                         | 67   | 2     | 0 | 5                         | 62   | 9     | 0 | 8                      | 1    | 3     | 0 | 5                      | 7    | 1     | 0 | 175   | 1473          |
| 8:00 AM                         | 11                        | 63   | 0     | 0 | 2                         | 49   | 10    | 0 | 14                     | 2    | 3     | 0 | 1                      | 3    | 1     | 0 | 159   |               |
| 8:05 AM                         | 4                         | 38   | 1     | 0 | 5                         | 46   | 8     | 0 | 9                      | 4    | 1     | 0 | 0                      | 7    | 5     | 0 | 128   | 1575          |
| 8:10 AM                         | 3                         | 40   | 0     | 0 | 1                         | 39   | 3     | 0 | 11                     | 4    | 1     | 0 | 2                      | 3    | 6     | 0 | 113   | 1611          |
| 8:15 AM                         | 4                         | 49   | 0     | 0 | 0                         | 25   | 4     | 0 | 13                     | 4    | 3     | 0 | 1                      | 2    | 2     | 0 | 107   | 1615          |
| 8:20 AM                         | 7                         | 39   | 0     | 0 | 4                         | 43   | 4     | 0 | 12                     | 1    | 2     | 1 | 2                      | 2    | 2     | 0 | 119   | 1634          |
| 8:25 AM                         | 3                         | 55   | 0     | 0 | 2                         | 33   | 4     | 0 | 14                     | 3    | 3     | 0 | 0                      | 4    | 1     | 0 | 122   | 1667          |
| 8:30 AM                         | 6                         | 36   | 0     | 0 | 0                         | 39   | 5     | 0 | 9                      | 2    | 2     | 0 | 0                      | 2    | 1     | 0 | 102   | 1658          |
| 8:35 AM                         | 2                         | 44   | 0     | 0 | 0                         | 45   | 8     | 0 | 7                      | 4    | 1     | 0 | 3                      | 0    | 3     | 0 | 117   | 1634          |
| 8:40 AM                         | 7                         | 55   | 0     | 0 | 1                         | 43   | 10    | 0 | 6                      | 1    | 2     | 0 | 1                      | 2    | 4     | 0 | 132   | 1615          |
| 8:45 AM                         | 3                         | 51   | 0     | 0 | 1                         | 45   | 11    | 0 | 5                      | 0    | 1     | 0 | 1                      | 6    | 2     | 0 | 126   | 1582          |
| 8:50 AM                         | 6                         | 60   | 0     | 0 | 0                         | 56   | 2     | 0 | 5                      | 1    | 6     | 0 | 4                      | 5    | 4     | 0 | 149   | 1549          |
| 8:55 AM                         | 7                         | 68   | 1     | 0 | 0                         | 41   | 3     | 0 | 9                      | 0    | 4     | 0 | 1                      | 7    | 3     | 0 | 144   | 1518          |
| Peak 15-Min Flowrates           | Northbound                |      |       |   | Southbound                |      |       |   | Eastbound              |      |       |   | Westbound              |      |       |   | Total |               |
|                                 | Left                      | Thru | Right | U | Left                      | Thru | Right | U | Left                   | Thru | Right | U | Left                   | Thru | Right | U |       |               |
| All Vehicles                    | 60                        | 800  | 12    | 0 | 32                        | 720  | 88    | 0 | 148                    | 24   | 28    | 0 | 36                     | 80   | 36    | 0 | 2064  |               |
| Heavy Trucks                    | 0                         | 44   | 0     | 0 | 0                         | 48   | 4     | 0 | 4                      | 0    | 0     | 0 | 0                      | 0    | 0     | 0 | 100   |               |
| Pedestrians                     | 8                         |      |       |   | 4                         |      |       |   | 0                      |      |       |   | 8                      |      |       |   | 20    |               |
| Bicycles                        | 0                         | 0    | 0     | 0 | 0                         | 0    | 0     | 0 | 0                      | 1    | 0     | 0 | 0                      | 2    | 0     | 0 | 3     |               |
| Railroad                        |                           |      |       |   |                           |      |       |   |                        |      |       |   |                        |      |       |   |       |               |
| Stopped Buses                   |                           |      |       |   |                           |      |       |   |                        |      |       |   |                        |      |       |   |       |               |

Comments:

**LOCATION:** SE 192nd Ave -- SE 15th St  
**CITY/STATE:** Camas, WA

**QC JOB #:** 14421314  
**DATE:** Thu, Jun 08 2017

**Peak-Hour: 4:30 PM -- 5:30 PM**  
**Peak 15-Min: 5:10 PM -- 5:25 PM**



| 5-Min Count Period Beginning At | SE 192nd Ave (Northbound) |      |       |   | SE 192nd Ave (Southbound) |      |       |   | SE 15th St (Eastbound) |      |       |   | SE 15th St (Westbound) |      |       |   | Total | Hourly Totals |
|---------------------------------|---------------------------|------|-------|---|---------------------------|------|-------|---|------------------------|------|-------|---|------------------------|------|-------|---|-------|---------------|
|                                 | Left                      | Thru | Right | U | Left                      | Thru | Right | U | Left                   | Thru | Right | U | Left                   | Thru | Right | U |       |               |
| 4:00 PM                         | 3                         | 89   | 0     | 1 | 2                         | 85   | 14    | 0 | 5                      | 7    | 8     | 0 | 2                      | 7    | 1     | 0 | 224   |               |
| 4:05 PM                         | 5                         | 87   | 5     | 0 | 4                         | 79   | 14    | 0 | 6                      | 4    | 2     | 0 | 5                      | 8    | 6     | 0 | 225   |               |
| 4:10 PM                         | 10                        | 87   | 3     | 0 | 2                         | 97   | 10    | 0 | 7                      | 7    | 9     | 0 | 4                      | 8    | 6     | 0 | 250   |               |
| 4:15 PM                         | 3                         | 84   | 3     | 0 | 8                         | 79   | 16    | 0 | 6                      | 7    | 5     | 0 | 0                      | 2    | 3     | 0 | 216   |               |
| 4:20 PM                         | 10                        | 75   | 0     | 0 | 4                         | 82   | 12    | 0 | 12                     | 6    | 7     | 0 | 2                      | 3    | 2     | 0 | 215   |               |
| 4:25 PM                         | 3                         | 89   | 3     | 0 | 4                         | 70   | 4     | 0 | 8                      | 2    | 8     | 0 | 3                      | 2    | 6     | 0 | 202   |               |
| 4:30 PM                         | 5                         | 98   | 6     | 0 | 5                         | 90   | 8     | 0 | 10                     | 5    | 9     | 0 | 1                      | 5    | 2     | 0 | 244   |               |
| 4:35 PM                         | 5                         | 81   | 1     | 0 | 6                         | 69   | 7     | 0 | 9                      | 5    | 7     | 0 | 3                      | 2    | 10    | 0 | 205   |               |
| 4:40 PM                         | 10                        | 87   | 2     | 0 | 7                         | 81   | 9     | 0 | 6                      | 4    | 5     | 0 | 5                      | 1    | 1     | 0 | 218   |               |
| 4:45 PM                         | 8                         | 85   | 2     | 1 | 11                        | 75   | 12    | 0 | 10                     | 1    | 6     | 0 | 1                      | 5    | 7     | 0 | 224   |               |
| 4:50 PM                         | 7                         | 72   | 2     | 0 | 6                         | 71   | 12    | 0 | 14                     | 6    | 16    | 0 | 0                      | 7    | 7     | 0 | 220   |               |
| 4:55 PM                         | 7                         | 90   | 2     | 0 | 4                         | 77   | 5     | 0 | 10                     | 2    | 7     | 0 | 4                      | 4    | 7     | 0 | 219   |               |
| 5:00 PM                         | 5                         | 87   | 6     | 0 | 7                         | 83   | 8     | 0 | 5                      | 1    | 8     | 0 | 1                      | 3    | 6     | 0 | 220   | 2662          |
| 5:05 PM                         | 10                        | 75   | 2     | 0 | 6                         | 87   | 5     | 0 | 11                     | 7    | 12    | 0 | 3                      | 6    | 10    | 0 | 234   | 2658          |
| 5:10 PM                         | 10                        | 110  | 7     | 0 | 8                         | 113  | 13    | 0 | 7                      | 4    | 5     | 0 | 2                      | 4    | 6     | 0 | 289   | 2667          |
| 5:15 PM                         | 7                         | 78   | 2     | 0 | 11                        | 96   | 14    | 0 | 5                      | 4    | 14    | 0 | 4                      | 11   | 4     | 0 | 250   | 2706          |
| 5:20 PM                         | 5                         | 89   | 4     | 0 | 4                         | 103  | 14    | 1 | 11                     | 9    | 10    | 0 | 0                      | 6    | 13    | 0 | 269   | 2740          |
| 5:25 PM                         | 3                         | 77   | 1     | 0 | 6                         | 82   | 8     | 0 | 8                      | 3    | 9     | 0 | 3                      | 4    | 7     | 0 | 211   | 2794          |
| 5:30 PM                         | 5                         | 76   | 3     | 0 | 0                         | 73   | 7     | 0 | 8                      | 5    | 5     | 0 | 1                      | 4    | 6     | 0 | 193   | 2803          |
| 5:35 PM                         | 4                         | 76   | 0     | 0 | 4                         | 79   | 4     | 0 | 10                     | 8    | 5     | 0 | 0                      | 7    | 3     | 0 | 200   | 2752          |
| 5:40 PM                         | 7                         | 96   | 2     | 0 | 3                         | 98   | 4     | 0 | 7                      | 3    | 8     | 0 | 1                      | 0    | 8     | 0 | 237   | 2747          |
| 5:45 PM                         | 5                         | 81   | 6     | 1 | 3                         | 86   | 9     | 0 | 9                      | 3    | 8     | 0 | 3                      | 5    | 3     | 0 | 222   | 2766          |
| 5:50 PM                         | 6                         | 84   | 5     | 0 | 4                         | 67   | 8     | 0 | 6                      | 5    | 5     | 0 | 2                      | 1    | 5     | 0 | 198   | 2764          |
| 5:55 PM                         | 1                         | 81   | 2     | 0 | 4                         | 66   | 8     | 0 | 6                      | 5    | 4     | 0 | 1                      | 4    | 5     | 0 | 187   | 2742          |
| Peak 15-Min Flowrates           | Northbound                |      |       |   | Southbound                |      |       |   | Eastbound              |      |       |   | Westbound              |      |       |   | Total |               |
|                                 | Left                      | Thru | Right | U | Left                      | Thru | Right | U | Left                   | Thru | Right | U | Left                   | Thru | Right | U |       |               |
| All Vehicles                    | 88                        | 1108 | 52    | 0 | 92                        | 1248 | 164   | 4 | 92                     | 68   | 116   | 0 | 24                     | 84   | 92    | 0 | 3232  |               |
| Heavy Trucks                    | 0                         | 20   | 0     |   | 0                         | 36   | 0     |   | 8                      | 4    | 4     |   | 0                      | 0    | 0     |   | 72    |               |
| Pedestrians                     | 0                         | 0    | 0     |   | 0                         | 0    | 0     |   | 0                      | 0    | 0     |   | 0                      | 0    | 0     |   | 0     |               |
| Bicycles                        | 0                         | 0    | 0     |   | 0                         | 1    | 0     |   | 0                      | 0    | 0     |   | 0                      | 0    | 0     |   | 1     |               |
| Railroad                        |                           |      |       |   |                           |      |       |   |                        |      |       |   |                        |      |       |   |       |               |
| Stopped Buses                   |                           |      |       |   |                           |      |       |   |                        |      |       |   |                        |      |       |   |       |               |

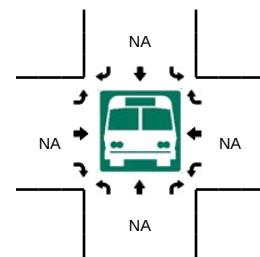
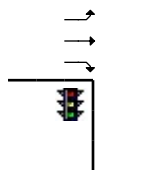
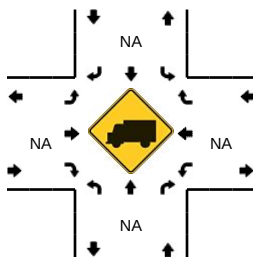
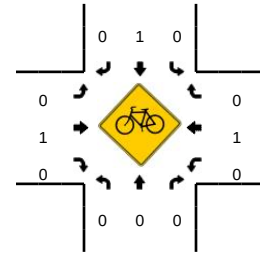
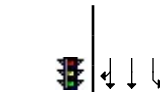
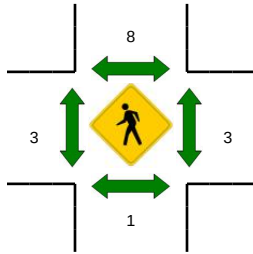
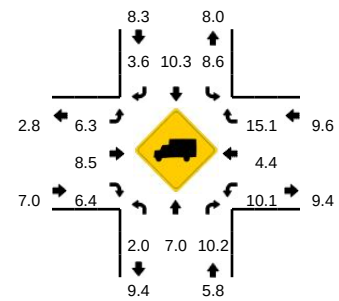
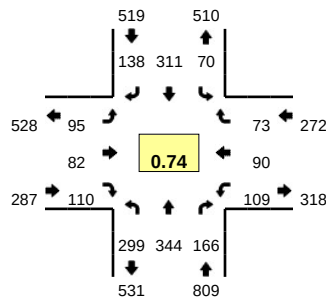
Comments:



**LOCATION:** SE 192nd Ave -- Mill Plain Blvd  
**CITY/STATE:** Vancouver, WA

**QC JOB #:** 14493301  
**DATE:** Tue, Sep 26 2017

**Peak-Hour: 7:30 AM -- 8:30 AM**  
**Peak 15-Min: 7:40 AM -- 7:55 AM**

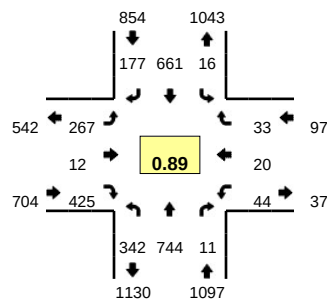


| 5-Min Count Period Beginning At | SE 192nd Ave (Northbound) |      |       |   | SE 192nd Ave (Southbound) |      |       |   | Mill Plain Blvd (Eastbound) |      |       |   | Mill Plain Blvd (Westbound) |      |       |   | Total        | Hourly Totals |
|---------------------------------|---------------------------|------|-------|---|---------------------------|------|-------|---|-----------------------------|------|-------|---|-----------------------------|------|-------|---|--------------|---------------|
|                                 | Left                      | Thru | Right | U | Left                      | Thru | Right | U | Left                        | Thru | Right | U | Left                        | Thru | Right | U |              |               |
| 7:00 AM                         | 13                        | 10   | 3     | 0 | 2                         | 21   | 2     | 0 | 2                           | 2    | 9     | 0 | 1                           | 0    | 0     | 0 | 65           |               |
| 7:05 AM                         | 8                         | 22   | 4     | 0 | 4                         | 19   | 5     | 0 | 7                           | 2    | 4     | 0 | 1                           | 0    | 0     | 0 | 76           |               |
| 7:10 AM                         | 24                        | 23   | 3     | 0 | 2                         | 22   | 2     | 0 | 3                           | 1    | 6     | 0 | 0                           | 0    | 1     | 0 | 87           |               |
| 7:15 AM                         | 25                        | 18   | 3     | 0 | 3                         | 15   | 7     | 0 | 8                           | 3    | 14    | 0 | 0                           | 0    | 1     | 0 | 97           |               |
| 7:20 AM                         | 24                        | 29   | 7     | 0 | 2                         | 22   | 11    | 0 | 8                           | 2    | 7     | 0 | 0                           | 0    | 1     | 0 | 113          |               |
| 7:25 AM                         | 19                        | 25   | 6     | 0 | 7                         | 21   | 8     | 0 | 6                           | 2    | 9     | 0 | 4                           | 0    | 1     | 0 | 108          |               |
| 7:30 AM                         | 15                        | 26   | 24    | 0 | 10                        | 24   | 8     | 0 | 5                           | 6    | 7     | 1 | 7                           | 3    | 2     | 0 | 138          |               |
| 7:35 AM                         | 24                        | 13   | 31    | 0 | 8                         | 9    | 11    | 0 | 1                           | 17   | 7     | 0 | 17                          | 5    | 5     | 0 | 148          |               |
| 7:40 AM                         | 42                        | 29   | 37    | 1 | 18                        | 32   | 17    | 0 | 1                           | 12   | 4     | 0 | 11                          | 16   | 7     | 0 | 227          |               |
| 7:45 AM                         | 23                        | 20   | 11    | 0 | 11                        | 32   | 13    | 0 | 7                           | 6    | 11    | 1 | 12                          | 13   | 15    | 0 | 175          |               |
| 7:50 AM                         | 33                        | 28   | 36    | 0 | 10                        | 19   | 12    | 0 | 13                          | 15   | 12    | 0 | 22                          | 13   | 20    | 0 | 233          |               |
| 7:55 AM                         | 32                        | 21   | 14    | 0 | 6                         | 34   | 13    | 0 | 12                          | 23   | 15    | 0 | 19                          | 23   | 14    | 0 | 226          | 1693          |
| 8:00 AM                         | 22                        | 25   | 4     | 0 | 3                         | 22   | 10    | 0 | 6                           | 2    | 9     | 0 | 13                          | 10   | 3     | 0 | 129          | 1757          |
| 8:05 AM                         | 21                        | 32   | 1     | 0 | 3                         | 25   | 9     | 0 | 9                           | 1    | 5     | 0 | 6                           | 4    | 1     | 0 | 117          | 1798          |
| 8:10 AM                         | 24                        | 38   | 3     | 0 | 0                         | 26   | 9     | 0 | 9                           | 0    | 8     | 0 | 1                           | 2    | 2     | 0 | 122          | 1833          |
| 8:15 AM                         | 14                        | 36   | 2     | 0 | 0                         | 35   | 15    | 0 | 12                          | 0    | 6     | 0 | 1                           | 1    | 2     | 0 | 124          | 1860          |
| 8:20 AM                         | 33                        | 33   | 1     | 0 | 1                         | 25   | 4     | 0 | 3                           | 0    | 15    | 0 | 0                           | 0    | 1     | 0 | 116          | 1863          |
| 8:25 AM                         | 15                        | 43   | 2     | 0 | 0                         | 28   | 17    | 0 | 15                          | 0    | 11    | 0 | 0                           | 0    | 1     | 0 | 132          | 1887          |
| 8:30 AM                         | 14                        | 38   | 0     | 0 | 2                         | 45   | 15    | 0 | 8                           | 0    | 4     | 0 | 1                           | 0    | 0     | 0 | 127          | 1876          |
| 8:35 AM                         | 20                        | 31   | 0     | 0 | 0                         | 37   | 16    | 0 | 13                          | 3    | 12    | 0 | 0                           | 1    | 0     | 0 | 133          | 1861          |
| 8:40 AM                         | 29                        | 33   | 0     | 0 | 0                         | 30   | 8     | 0 | 4                           | 0    | 4     | 0 | 0                           | 1    | 0     | 0 | 109          | 1743          |
| 8:45 AM                         | 20                        | 27   | 0     | 0 | 2                         | 42   | 18    | 0 | 1                           | 1    | 9     | 0 | 0                           | 1    | 2     | 0 | 123          | 1691          |
| 8:50 AM                         | 32                        | 25   | 1     | 0 | 0                         | 24   | 15    | 0 | 5                           | 1    | 11    | 0 | 2                           | 1    | 1     | 0 | 118          | 1576          |
| 8:55 AM                         | 29                        | 33   | 1     | 0 | 1                         | 24   | 6     | 0 | 7                           | 1    | 11    | 0 | 1                           | 0    | 0     | 0 | 114          | 1464          |
| <b>Peak 15-Min Flowrates</b>    | <b>Northbound</b>         |      |       |   | <b>Southbound</b>         |      |       |   | <b>Eastbound</b>            |      |       |   | <b>Westbound</b>            |      |       |   | <b>Total</b> |               |
| All Vehicles                    | 392                       | 308  | 336   | 4 | 156                       | 332  | 168   | 0 | 84                          | 132  | 108   | 4 | 180                         | 168  | 168   | 0 | 2540         |               |
| Heavy Trucks                    | 12                        | 20   | 48    |   | 16                        | 32   | 0     |   | 4                           | 8    | 0     |   | 28                          | 8    | 40    |   | 216          |               |
| Pedestrians                     | 0                         | 0    | 0     |   | 8                         | 0    | 0     |   | 0                           | 0    | 0     |   | 0                           | 0    | 0     |   | 8            |               |
| Bicycles                        | 0                         | 0    | 0     |   | 0                         | 0    | 0     |   | 0                           | 1    | 0     |   | 0                           | 0    | 0     |   | 1            |               |
| Railroad                        |                           |      |       |   |                           |      |       |   |                             |      |       |   |                             |      |       |   |              |               |
| Stopped Buses                   |                           |      |       |   |                           |      |       |   |                             |      |       |   |                             |      |       |   |              |               |

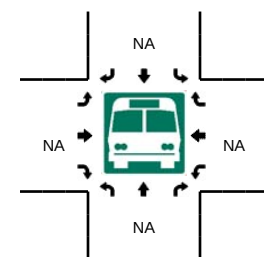
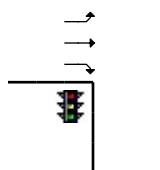
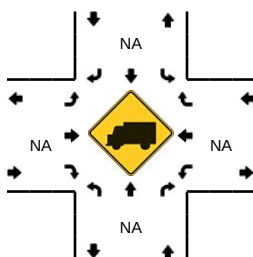
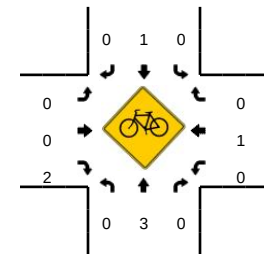
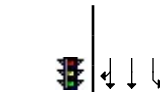
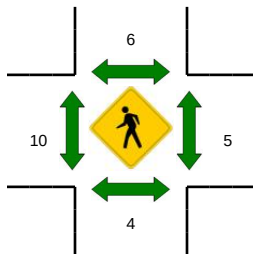
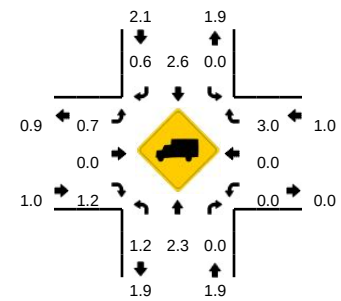
**Comments:**

**LOCATION:** SE 192nd Ave -- Mill Plain Blvd  
**CITY/STATE:** Vancouver, WA

**QC JOB #:** 14493302  
**DATE:** Tue, Sep 26 2017



**Peak-Hour: 4:35 PM -- 5:35 PM**  
**Peak 15-Min: 5:00 PM -- 5:15 PM**



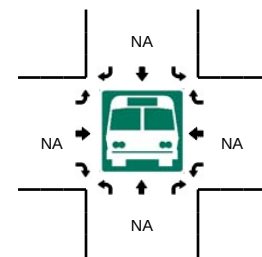
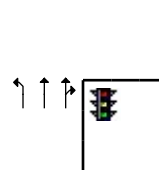
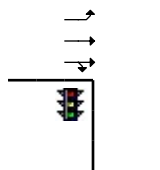
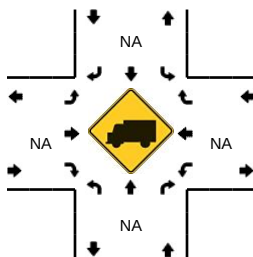
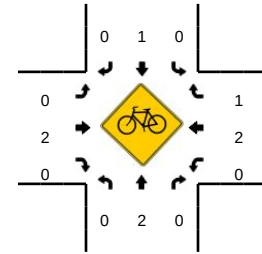
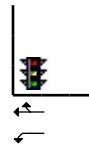
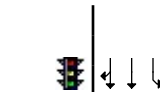
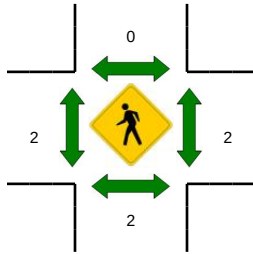
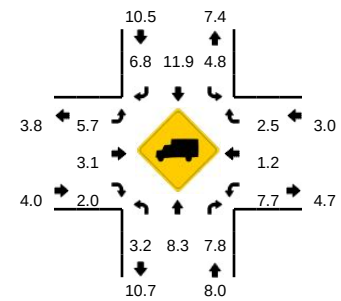
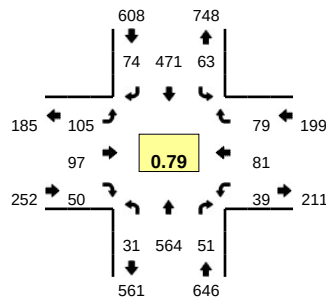
| 5-Min Count Period Beginning At | SE 192nd Ave (Northbound) |      |       |   | SE 192nd Ave (Southbound) |      |       |   | Mill Plain Blvd (Eastbound) |      |       |   | Mill Plain Blvd (Westbound) |      |       |   | Total        | Hourly Totals |
|---------------------------------|---------------------------|------|-------|---|---------------------------|------|-------|---|-----------------------------|------|-------|---|-----------------------------|------|-------|---|--------------|---------------|
|                                 | Left                      | Thru | Right | U | Left                      | Thru | Right | U | Left                        | Thru | Right | U | Left                        | Thru | Right | U |              |               |
| 4:00 PM                         | 23                        | 60   | 2     | 0 | 2                         | 56   | 15    | 1 | 23                          | 2    | 28    | 0 | 12                          | 7    | 5     | 0 | 236          |               |
| 4:05 PM                         | 28                        | 59   | 1     | 0 | 2                         | 59   | 11    | 0 | 26                          | 1    | 34    | 0 | 4                           | 2    | 3     | 0 | 230          |               |
| 4:10 PM                         | 33                        | 48   | 3     | 0 | 3                         | 57   | 16    | 0 | 19                          | 1    | 21    | 0 | 6                           | 4    | 1     | 0 | 212          |               |
| 4:15 PM                         | 22                        | 44   | 0     | 0 | 0                         | 53   | 14    | 0 | 26                          | 5    | 28    | 0 | 5                           | 4    | 1     | 0 | 202          |               |
| 4:20 PM                         | 15                        | 52   | 3     | 0 | 0                         | 45   | 15    | 0 | 23                          | 2    | 32    | 1 | 4                           | 3    | 5     | 0 | 200          |               |
| 4:25 PM                         | 28                        | 35   | 0     | 0 | 0                         | 55   | 19    | 0 | 18                          | 0    | 21    | 0 | 5                           | 1    | 7     | 0 | 189          |               |
| 4:30 PM                         | 30                        | 56   | 1     | 0 | 2                         | 41   | 10    | 0 | 14                          | 2    | 28    | 0 | 1                           | 1    | 7     | 0 | 193          |               |
| 4:35 PM                         | 31                        | 62   | 2     | 0 | 2                         | 42   | 14    | 0 | 14                          | 0    | 30    | 0 | 11                          | 4    | 7     | 0 | 219          |               |
| 4:40 PM                         | 24                        | 53   | 0     | 0 | 1                         | 58   | 13    | 0 | 26                          | 1    | 36    | 0 | 10                          | 5    | 10    | 0 | 237          |               |
| 4:45 PM                         | 26                        | 67   | 1     | 0 | 2                         | 46   | 14    | 1 | 18                          | 2    | 30    | 0 | 2                           | 0    | 0     | 0 | 209          |               |
| 4:50 PM                         | 25                        | 56   | 3     | 0 | 3                         | 64   | 11    | 0 | 18                          | 3    | 27    | 0 | 1                           | 1    | 3     | 0 | 215          |               |
| 4:55 PM                         | 31                        | 56   | 0     | 0 | 2                         | 57   | 17    | 0 | 29                          | 1    | 30    | 1 | 5                           | 1    | 3     | 0 | 233          | 2575          |
| 5:00 PM                         | 29                        | 55   | 2     | 0 | 2                         | 60   | 16    | 0 | 14                          | 1    | 34    | 1 | 6                           | 4    | 2     | 0 | 226          | 2565          |
| 5:05 PM                         | 24                        | 71   | 2     | 0 | 0                         | 74   | 13    | 0 | 30                          | 1    | 54    | 0 | 6                           | 0    | 1     | 0 | 276          | 2611          |
| 5:10 PM                         | 30                        | 72   | 0     | 0 | 0                         | 66   | 16    | 1 | 30                          | 0    | 51    | 0 | 2                           | 1    | 2     | 0 | 271          | 2670          |
| 5:15 PM                         | 32                        | 64   | 1     | 0 | 0                         | 47   | 20    | 0 | 12                          | 2    | 39    | 0 | 1                           | 0    | 2     | 0 | 220          | 2688          |
| 5:20 PM                         | 35                        | 72   | 0     | 0 | 0                         | 49   | 15    | 0 | 31                          | 1    | 34    | 0 | 0                           | 1    | 2     | 0 | 240          | 2728          |
| 5:25 PM                         | 29                        | 57   | 0     | 0 | 2                         | 40   | 12    | 0 | 21                          | 0    | 25    | 0 | 0                           | 3    | 1     | 0 | 190          | 2729          |
| 5:30 PM                         | 26                        | 59   | 0     | 0 | 0                         | 58   | 16    | 0 | 21                          | 0    | 35    | 1 | 0                           | 0    | 0     | 0 | 216          | 2752          |
| 5:35 PM                         | 23                        | 56   | 0     | 0 | 0                         | 47   | 17    | 0 | 29                          | 1    | 32    | 0 | 0                           | 0    | 0     | 0 | 205          | 2738          |
| 5:40 PM                         | 24                        | 61   | 0     | 0 | 2                         | 67   | 18    | 0 | 21                          | 1    | 25    | 0 | 0                           | 0    | 1     | 0 | 220          | 2721          |
| 5:45 PM                         | 24                        | 51   | 2     | 0 | 1                         | 46   | 12    | 0 | 24                          | 0    | 32    | 0 | 1                           | 0    | 0     | 0 | 193          | 2705          |
| 5:50 PM                         | 23                        | 53   | 0     | 0 | 0                         | 61   | 19    | 0 | 26                          | 1    | 28    | 0 | 0                           | 0    | 0     | 0 | 211          | 2701          |
| 5:55 PM                         | 23                        | 48   | 1     | 0 | 0                         | 51   | 13    | 0 | 16                          | 2    | 28    | 0 | 0                           | 0    | 1     | 0 | 183          | 2651          |
| <b>Peak 15-Min Flowrates</b>    | <b>Northbound</b>         |      |       |   | <b>Southbound</b>         |      |       |   | <b>Eastbound</b>            |      |       |   | <b>Westbound</b>            |      |       |   | <b>Total</b> |               |
| All Vehicles                    | 332                       | 792  | 16    | 0 | 8                         | 800  | 180   | 4 | 296                         | 8    | 556   | 4 | 56                          | 20   | 20    | 0 | 3092         |               |
| Heavy Trucks                    | 0                         | 16   | 0     | 0 | 0                         | 12   | 0     | 0 | 0                           | 0    | 4     | 0 | 0                           | 0    | 0     | 0 | 32           |               |
| Pedestrians                     | 12                        |      |       |   | 12                        |      |       |   | 0                           |      |       |   | 16                          |      |       |   | 40           |               |
| Bicycles                        | 0                         | 1    | 0     | 0 | 0                         | 1    | 0     | 0 | 0                           | 0    | 0     | 0 | 0                           | 0    | 0     | 0 | 2            |               |
| Railroad                        |                           |      |       |   |                           |      |       |   |                             |      |       |   |                             |      |       |   |              |               |
| Stopped Buses                   |                           |      |       |   |                           |      |       |   |                             |      |       |   |                             |      |       |   |              |               |

**Comments:**

**LOCATION:** SE 192nd Ave -- SE 20th St  
**CITY/STATE:** Camas, WA

**QC JOB #:** 14421305  
**DATE:** Thu, May 25 2017

**Peak-Hour: 7:30 AM -- 8:30 AM**  
**Peak 15-Min: 7:45 AM -- 8:00 AM**



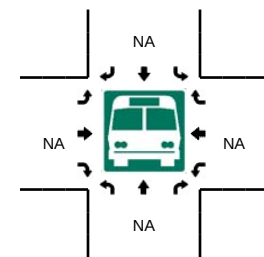
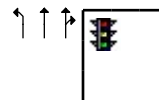
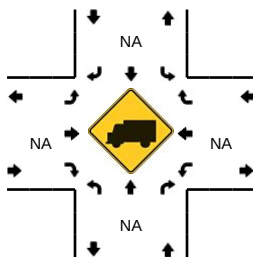
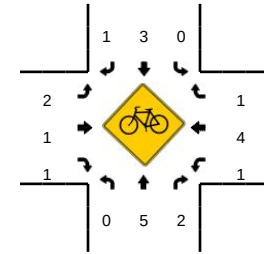
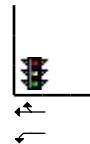
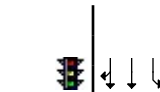
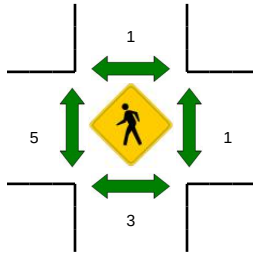
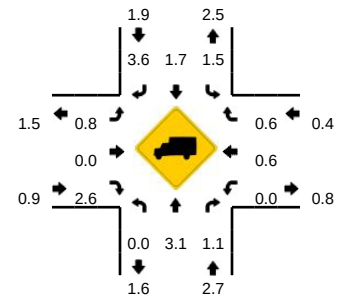
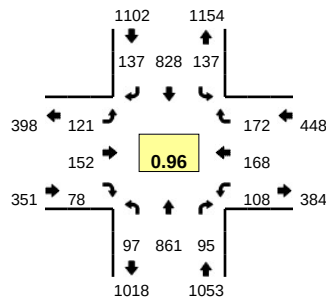
| 5-Min Count Period Beginning At | SE 192nd Ave (Northbound) |      |       |   | SE 192nd Ave (Southbound) |      |       |   | SE 20th St (Eastbound) |      |       |   | SE 20th St (Westbound) |      |       |   | Total | Hourly Totals |
|---------------------------------|---------------------------|------|-------|---|---------------------------|------|-------|---|------------------------|------|-------|---|------------------------|------|-------|---|-------|---------------|
|                                 | Left                      | Thru | Right | U | Left                      | Thru | Right | U | Left                   | Thru | Right | U | Left                   | Thru | Right | U |       |               |
| 7:00 AM                         | 2                         | 28   | 1     | 0 | 8                         | 22   | 0     | 0 | 1                      | 14   | 0     | 0 | 0                      | 7    | 3     | 0 | 86    |               |
| 7:05 AM                         | 5                         | 33   | 3     | 0 | 7                         | 18   | 4     | 0 | 1                      | 1    | 5     | 0 | 1                      | 8    | 7     | 0 | 93    |               |
| 7:10 AM                         | 1                         | 31   | 2     | 0 | 4                         | 23   | 2     | 0 | 3                      | 2    | 8     | 0 | 2                      | 7    | 1     | 0 | 86    |               |
| 7:15 AM                         | 1                         | 32   | 1     | 0 | 2                         | 25   | 4     | 0 | 1                      | 6    | 2     | 0 | 1                      | 4    | 5     | 0 | 84    |               |
| 7:20 AM                         | 1                         | 29   | 1     | 0 | 2                         | 26   | 2     | 0 | 2                      | 5    | 7     | 0 | 4                      | 8    | 2     | 0 | 89    |               |
| 7:25 AM                         | 3                         | 38   | 3     | 0 | 0                         | 40   | 2     | 0 | 6                      | 5    | 5     | 0 | 2                      | 7    | 2     | 0 | 113   |               |
| 7:30 AM                         | 1                         | 51   | 4     | 0 | 3                         | 22   | 5     | 0 | 7                      | 11   | 5     | 0 | 2                      | 5    | 7     | 0 | 123   |               |
| 7:35 AM                         | 2                         | 59   | 0     | 0 | 4                         | 39   | 8     | 0 | 16                     | 9    | 5     | 0 | 3                      | 8    | 12    | 0 | 165   |               |
| 7:40 AM                         | 2                         | 43   | 8     | 0 | 5                         | 38   | 6     | 0 | 9                      | 10   | 5     | 0 | 2                      | 10   | 7     | 0 | 145   |               |
| 7:45 AM                         | 7                         | 55   | 11    | 0 | 5                         | 61   | 9     | 0 | 16                     | 9    | 2     | 0 | 2                      | 4    | 11    | 0 | 192   |               |
| 7:50 AM                         | 4                         | 69   | 6     | 0 | 11                        | 47   | 10    | 0 | 12                     | 9    | 2     | 0 | 1                      | 5    | 5     | 0 | 181   |               |
| 7:55 AM                         | 3                         | 45   | 4     | 0 | 10                        | 47   | 9     | 0 | 9                      | 13   | 5     | 0 | 2                      | 6    | 11    | 0 | 164   | 1521          |
| 8:00 AM                         | 2                         | 39   | 3     | 0 | 8                         | 46   | 8     | 0 | 3                      | 7    | 3     | 0 | 6                      | 4    | 7     | 0 | 136   | 1571          |
| 8:05 AM                         | 4                         | 38   | 4     | 0 | 3                         | 35   | 5     | 0 | 12                     | 8    | 2     | 0 | 5                      | 10   | 7     | 0 | 133   | 1611          |
| 8:10 AM                         | 1                         | 40   | 1     | 1 | 1                         | 33   | 4     | 0 | 4                      | 4    | 2     | 0 | 3                      | 3    | 0     | 0 | 97    | 1622          |
| 8:15 AM                         | 1                         | 36   | 3     | 0 | 4                         | 30   | 1     | 0 | 7                      | 8    | 5     | 0 | 3                      | 7    | 6     | 0 | 111   | 1649          |
| 8:20 AM                         | 2                         | 40   | 5     | 0 | 4                         | 36   | 7     | 0 | 5                      | 3    | 7     | 0 | 5                      | 9    | 3     | 0 | 126   | 1686          |
| 8:25 AM                         | 1                         | 49   | 2     | 0 | 5                         | 37   | 2     | 0 | 5                      | 6    | 7     | 0 | 5                      | 10   | 3     | 0 | 132   | 1705          |
| 8:30 AM                         | 4                         | 37   | 4     | 1 | 5                         | 31   | 3     | 0 | 2                      | 5    | 7     | 0 | 8                      | 0    | 3     | 0 | 110   | 1692          |
| 8:35 AM                         | 4                         | 48   | 6     | 0 | 2                         | 30   | 6     | 0 | 3                      | 5    | 4     | 0 | 7                      | 5    | 5     | 0 | 125   | 1652          |
| 8:40 AM                         | 2                         | 32   | 2     | 0 | 0                         | 44   | 0     | 0 | 7                      | 5    | 3     | 0 | 9                      | 13   | 3     | 0 | 120   | 1627          |
| 8:45 AM                         | 3                         | 49   | 3     | 0 | 10                        | 27   | 3     | 0 | 9                      | 10   | 5     | 0 | 2                      | 8    | 6     | 0 | 135   | 1570          |
| 8:50 AM                         | 3                         | 54   | 4     | 0 | 1                         | 29   | 4     | 0 | 2                      | 7    | 12    | 0 | 6                      | 10   | 7     | 0 | 139   | 1528          |
| 8:55 AM                         | 2                         | 43   | 4     | 0 | 8                         | 46   | 5     | 0 | 9                      | 7    | 11    | 0 | 4                      | 10   | 11    | 0 | 160   | 1524          |
| Peak 15-Min Flowrates           | Northbound                |      |       |   | Southbound                |      |       |   | Eastbound              |      |       |   | Westbound              |      |       |   | Total |               |
|                                 | Left                      | Thru | Right | U | Left                      | Thru | Right | U | Left                   | Thru | Right | U | Left                   | Thru | Right | U |       |               |
| All Vehicles                    | 56                        | 676  | 84    | 0 | 104                       | 620  | 112   | 0 | 148                    | 124  | 36    | 0 | 20                     | 60   | 108   | 0 | 2148  |               |
| Heavy Trucks                    | 0                         | 40   | 0     |   | 4                         | 60   | 4     |   | 0                      | 0    | 0     |   | 0                      | 0    | 4     |   | 112   |               |
| Pedestrians                     | 0                         | 0    | 0     |   | 0                         | 0    | 0     |   | 0                      | 0    | 0     |   | 0                      | 0    | 0     |   | 0     |               |
| Bicycles                        | 0                         | 0    | 0     |   | 0                         | 0    | 0     |   | 0                      | 1    | 0     |   | 0                      | 1    | 0     |   | 2     |               |
| Railroad                        |                           |      |       |   |                           |      |       |   |                        |      |       |   |                        |      |       |   |       |               |
| Stopped Buses                   |                           |      |       |   |                           |      |       |   |                        |      |       |   |                        |      |       |   |       |               |

Comments:

**LOCATION:** SE 192nd Ave -- SE 20th St  
**CITY/STATE:** Camas, WA

**QC JOB #:** 14421306  
**DATE:** Wed, May 24 2017

**Peak-Hour: 4:35 PM -- 5:35 PM**  
**Peak 15-Min: 5:00 PM -- 5:15 PM**



| 5-Min Count Period<br>Beginning At | SE 192nd Ave (Northbound) |      |       |   | SE 192nd Ave (Southbound) |      |       |   | SE 20th St (Eastbound) |      |       |   | SE 20th St (Westbound) |      |       |   | Total        | Hourly Totals |
|------------------------------------|---------------------------|------|-------|---|---------------------------|------|-------|---|------------------------|------|-------|---|------------------------|------|-------|---|--------------|---------------|
|                                    | Left                      | Thru | Right | U | Left                      | Thru | Right | U | Left                   | Thru | Right | U | Left                   | Thru | Right | U |              |               |
| 4:00 PM                            | 8                         | 53   | 4     | 0 | 12                        | 60   | 14    | 0 | 13                     | 8    | 4     | 0 | 7                      | 14   | 9     | 0 | 206          |               |
| 4:05 PM                            | 6                         | 66   | 4     | 0 | 7                         | 73   | 13    | 0 | 11                     | 16   | 6     | 0 | 10                     | 13   | 11    | 0 | 236          |               |
| 4:10 PM                            | 7                         | 58   | 3     | 0 | 7                         | 72   | 8     | 0 | 6                      | 8    | 4     | 0 | 3                      | 12   | 8     | 0 | 196          |               |
| 4:15 PM                            | 7                         | 49   | 2     | 0 | 10                        | 62   | 6     | 0 | 15                     | 14   | 5     | 0 | 6                      | 12   | 10    | 0 | 198          |               |
| 4:20 PM                            | 12                        | 78   | 6     | 0 | 10                        | 77   | 12    | 0 | 11                     | 12   | 5     | 0 | 7                      | 11   | 6     | 0 | 247          |               |
| 4:25 PM                            | 11                        | 74   | 6     | 1 | 10                        | 67   | 10    | 0 | 11                     | 18   | 9     | 0 | 11                     | 9    | 6     | 0 | 243          |               |
| 4:30 PM                            | 7                         | 60   | 2     | 1 | 14                        | 77   | 16    | 0 | 13                     | 11   | 3     | 0 | 8                      | 10   | 11    | 0 | 233          |               |
| 4:35 PM                            | 9                         | 80   | 8     | 0 | 9                         | 82   | 7     | 0 | 7                      | 7    | 5     | 0 | 10                     | 12   | 22    | 0 | 258          |               |
| 4:40 PM                            | 9                         | 49   | 6     | 0 | 7                         | 70   | 20    | 0 | 7                      | 12   | 8     | 0 | 9                      | 11   | 13    | 0 | 221          |               |
| 4:45 PM                            | 7                         | 71   | 9     | 1 | 11                        | 58   | 14    | 0 | 12                     | 14   | 9     | 0 | 10                     | 14   | 15    | 0 | 245          |               |
| 4:50 PM                            | 11                        | 76   | 9     | 0 | 13                        | 56   | 12    | 0 | 6                      | 16   | 3     | 0 | 6                      | 13   | 3     | 0 | 224          |               |
| 4:55 PM                            | 6                         | 71   | 10    | 1 | 13                        | 72   | 16    | 0 | 14                     | 12   | 7     | 0 | 7                      | 15   | 13    | 0 | 257          | 2764          |
| 5:00 PM                            | 6                         | 63   | 6     | 1 | 9                         | 64   | 13    | 0 | 15                     | 11   | 8     | 0 | 9                      | 17   | 7     | 0 | 229          | 2787          |
| 5:05 PM                            | 8                         | 81   | 6     | 1 | 9                         | 75   | 13    | 0 | 9                      | 19   | 3     | 0 | 13                     | 23   | 16    | 0 | 276          | 2827          |
| 5:10 PM                            | 3                         | 71   | 4     | 0 | 15                        | 92   | 12    | 0 | 7                      | 14   | 6     | 0 | 12                     | 16   | 16    | 0 | 268          | 2899          |
| 5:15 PM                            | 11                        | 66   | 6     | 0 | 9                         | 72   | 4     | 0 | 8                      | 9    | 6     | 0 | 9                      | 7    | 18    | 0 | 225          | 2926          |
| 5:20 PM                            | 9                         | 73   | 13    | 0 | 13                        | 59   | 9     | 0 | 17                     | 11   | 15    | 0 | 5                      | 18   | 15    | 0 | 257          | 2936          |
| 5:25 PM                            | 5                         | 86   | 9     | 0 | 14                        | 61   | 11    | 0 | 6                      | 17   | 4     | 0 | 9                      | 10   | 15    | 0 | 247          | 2940          |
| 5:30 PM                            | 9                         | 74   | 9     | 0 | 15                        | 67   | 6     | 0 | 13                     | 10   | 4     | 0 | 9                      | 12   | 19    | 0 | 247          | 2954          |
| 5:35 PM                            | 7                         | 68   | 6     | 0 | 15                        | 61   | 9     | 0 | 14                     | 17   | 8     | 0 | 5                      | 17   | 9     | 0 | 236          | 2932          |
| 5:40 PM                            | 6                         | 61   | 4     | 0 | 8                         | 86   | 5     | 0 | 13                     | 9    | 4     | 0 | 6                      | 15   | 5     | 0 | 222          | 2933          |
| 5:45 PM                            | 9                         | 50   | 5     | 0 | 10                        | 82   | 9     | 0 | 10                     | 15   | 9     | 0 | 7                      | 10   | 14    | 0 | 230          | 2918          |
| 5:50 PM                            | 6                         | 65   | 5     | 0 | 4                         | 67   | 10    | 0 | 15                     | 6    | 2     | 0 | 9                      | 14   | 8     | 0 | 211          | 2905          |
| 5:55 PM                            | 8                         | 43   | 3     | 0 | 10                        | 68   | 6     | 0 | 9                      | 9    | 3     | 0 | 3                      | 5    | 5     | 0 | 172          | 2820          |
| <b>Peak 15-Min Flowrates</b>       | <b>Northbound</b>         |      |       |   | <b>Southbound</b>         |      |       |   | <b>Eastbound</b>       |      |       |   | <b>Westbound</b>       |      |       |   | <b>Total</b> |               |
| All Vehicles                       | 68                        | 860  | 64    | 8 | 132                       | 924  | 152   | 0 | 124                    | 176  | 68    | 0 | 136                    | 224  | 156   | 0 | 3092         |               |
| Heavy Trucks                       | 0                         | 20   | 0     |   | 4                         | 16   | 4     |   | 4                      | 0    | 0     |   | 0                      | 0    | 0     |   | 48           |               |
| Pedestrians                        |                           | 4    |       |   |                           | 0    |       |   |                        | 0    |       |   |                        | 0    |       |   | 4            |               |
| Bicycles                           | 0                         | 2    | 0     |   | 0                         | 2    | 0     |   | 1                      | 0    | 0     |   | 0                      | 0    | 0     |   | 5            |               |
| Railroad                           |                           |      |       |   |                           |      |       |   |                        |      |       |   |                        |      |       |   |              |               |
| Stopped Buses                      |                           |      |       |   |                           |      |       |   |                        |      |       |   |                        |      |       |   |              |               |

**Comments:**



## Appendix B WSDOT Crash Data

OFFICER REPORTED CRASHES THAT OCCURRED at OR in the vicinity of MULTIPLE INTERSECTIONS IN THE CITY OF VANCOUVER

01/01/2017 - 12/31/2021 See 2nd tab below for road information

Under 23 U.S. Code § 148 and 23 U.S. Code § 407, safety data, reports, surveys, schedules, lists compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential crash sites, hazardous roadway conditions, or railway-highway crossings are not subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

| JURISDICTION | COUNTY | CITY      | PRIMARY TRAFFICWAY | BLOCK NUMBER | INTERSECTING TRAFFICWAY | DIST FROM REF POINT | M or FT | COMP DIR FROM REF POINT | REFERENCE POINT NAME | MILEPOST | A / B | SR ONLY HISTORY/ SUSPENSE | REPORT NUMBER | DATE  | TIME                     | MOST SEVERE INJURY TYPE | # I N J U R I E S | # F A T A L I T I E S | # V E H I C L E S | # P E R S O N S | VEHICLE 1 TYPE                                | VEHICLE 2 TYPE                                | JUNCTION RELATIONSHIP                        |
|--------------|--------|-----------|--------------------|--------------|-------------------------|---------------------|---------|-------------------------|----------------------|----------|-------|---------------------------|---------------|-------|--------------------------|-------------------------|-------------------|-----------------------|-------------------|-----------------|-----------------------------------------------|-----------------------------------------------|----------------------------------------------|
| City Street  | Clark  | Vancouver | SE 15TH ST         | 0            | SE 189TH AVE            |                     |         |                         |                      |          | No    | E820956                   | 07/23/2018    | 13:04 | Suspected Serious Injury | 2                       | 0                 | 2                     | 0                 | 0               | Passenger Car                                 | Pickup,Panel Truck or Vanette under 10,000 lb | At Intersection and Related                  |
| City Street  | Clark  | Vancouver | SE 15TH ST         |              | SE 192ND AVE            |                     |         |                         |                      |          | No    | E999464                   | 01/02/2020    | 15:52 | No Apparent Injury       | 0                       | 0                 | 2                     | 0                 | 0               | Passenger Car                                 | Passenger Car                                 | At Intersection and Related                  |
| City Street  | Clark  | Vancouver | SE 15TH ST         | 0            | SE 192ND AVE            |                     |         |                         |                      |          | No    | E744865                   | 12/08/2017    | 02:14 | Possible Injury          | 1                       | 0                 | 1                     | 0                 | 0               | Passenger Car                                 |                                               | At Intersection and Related                  |
| City Street  | Clark  | Vancouver | SE 15TH ST         | 9900         | SE 192ND AVE            |                     |         |                         |                      |          | No    | E735632                   | 11/14/2017    | 15:40 | Possible Injury          | 3                       | 0                 | 2                     | 0                 | 0               | Truck (Flatbad,Van,etc)                       | Passenger Car                                 | At Intersection and Related                  |
| City Street  | Clark  | Vancouver | SE 15TH ST         | 16200        |                         | 150                 | F       | E                       | SE 164TH AVE         |          | No    | E837473                   | 09/11/2018    | 23:23 | No Apparent Injury       | 0                       | 0                 | 1                     | 0                 | 0               | Pickup,Panel Truck or Vanette under 10,000 lb |                                               | Intersection Related but Not at Intersection |
| City Street  | Clark  | Vancouver | SE 164TH AVE       | 0            | SE 15TH ST              |                     |         |                         |                      |          | No    | E788423                   | 04/07/2018    | 16:00 | No Apparent Injury       | 0                       | 0                 | 2                     | 0                 | 0               | Pickup,Panel Truck or Vanette under 10,000 lb | Not Stated                                    | At Intersection and Related                  |
| City Street  | Clark  | Vancouver | SE 164TH AVE       | 0            | SE 15TH ST              |                     |         |                         |                      |          | No    | E903320                   | 03/16/2019    | 21:25 | No Apparent Injury       | 0                       | 0                 | 2                     | 0                 | 0               | Passenger Car                                 | Pickup,Panel Truck or Vanette under 10,000 lb | At Intersection and Related                  |
| City Street  | Clark  | Vancouver | SE 164TH AVE       | 0            | SE 15TH ST              |                     |         |                         |                      |          | No    | E996754                   | 12/23/2019    | 08:55 | No Apparent Injury       | 0                       | 0                 | 2                     | 0                 | 0               | Passenger Car                                 | Pickup,Panel Truck or Vanette under 10,000 lb | At Intersection and Related                  |
| City Street  | Clark  | Vancouver | SE 164TH AVE       | 0            | SE 15TH ST              |                     |         |                         |                      |          | No    | EA10410                   | 02/02/2020    | 14:47 | Died in Hospital         | 0                       | 1                 | 2                     | 0                 | 0               | Motorcycle                                    | Pickup,Panel Truck or Vanette under 10,000 lb | At Intersection and Related                  |
| City Street  | Clark  | Vancouver | SE 164TH AVE       | 0            | SE 15TH ST              |                     |         |                         |                      |          | No    | E958122                   | 09/04/2019    | 18:24 | No Apparent Injury       | 0                       | 0                 | 3                     | 0                 | 0               | Passenger Car                                 | Pickup,Panel Truck or Vanette under 10,000 lb | At Intersection and Related                  |
| City Street  | Clark  | Vancouver | SE 164TH AVE       | 0            | SE 15TH ST              |                     |         |                         |                      |          | No    | E870893                   | 12/05/2018    | 10:05 | No Apparent Injury       | 0                       | 0                 | 3                     | 0                 | 0               | Passenger Car                                 | Pickup,Panel Truck or Vanette under 10,000 lb | At Intersection and Related                  |
| City Street  | Clark  | Vancouver | SE 164TH AVE       | 1415         | SE 15TH ST              |                     |         |                         |                      |          | No    | EA68616                   | 10/01/2020    | 10:29 | Possible Injury          | 1                       | 0                 | 2                     | 0                 | 0               | Passenger Car                                 | Pickup,Panel Truck or Vanette under 10,000 lb | At Intersection and Related                  |
| City Street  | Clark  | Vancouver | SE 164TH AVE       | 1411         | SE 15TH ST              |                     |         |                         |                      |          | No    | EA59678                   | 08/31/2020    | 03:28 | Suspected Minor Injury   | 2                       | 0                 | 3                     | 0                 | 0               | Passenger Car                                 | Passenger Car                                 | At Intersection and Related                  |
| City Street  | Clark  | Vancouver | SE 164TH AVE       | 1400         |                         | 201                 | F       | N                       | SE 15TH ST           |          | No    | EA86193                   | 11/20/2020    | 13:55 | No Apparent Injury       | 0                       | 0                 | 2                     | 0                 | 0               | Passenger Car                                 | Pickup,Panel Truck or Vanette under 10,000 lb | Not at Intersection and Not Related          |
| City Street  | Clark  | Vancouver | SE 164TH AVE       | 1500         |                         | 257                 | F       | S                       | SE 15TH ST           |          | No    | E819663                   | 07/10/2018    | 18:38 | No Apparent Injury       | 0                       | 0                 | 1                     | 0                 | 0               | Pickup,Panel Truck or Vanette under 10,000 lb |                                               | Not at Intersection and Not Related          |
| City Street  | Clark  | Vancouver | SE 164TH AVE       | 1400         |                         | 158                 | F       | N                       | SE 15TH ST           |          | No    | E877511                   | 12/29/2018    | 15:30 | Possible Injury          | 1                       | 0                 | 3                     | 0                 | 0               | Passenger Car                                 | Pickup,Panel Truck or Vanette under 10,000 lb | Not at Intersection and Not Related          |
| City Street  | Clark  | Vancouver | SE 164TH AVE       | 1400         |                         | 306                 | F       | N                       | SE 15TH ST           |          | No    | E653226                   | 03/17/2017    | 22:26 | No Apparent Injury       | 0                       | 0                 | 2                     | 0                 | 0               | Pickup,Panel Truck or Vanette under 10,000 lb | Passenger Car                                 | Not at Intersection and Not Related          |
| City Street  | Clark  | Vancouver | SE 164TH AVE       | 1500         |                         | 44                  | F       | S                       | SE 15TH ST           |          | No    | E884544                   | 01/17/2019    | 18:14 | No Apparent Injury       | 0                       | 0                 | 2                     | 0                 | 0               | Not Stated                                    | Passenger Car                                 | Not at Intersection and Not Related          |
| City Street  | Clark  | Vancouver | SE 164TH AVE       | 1500         |                         | 105                 | F       | S                       | SE 15TH ST           |          | No    | E924809                   | 05/28/2019    | 13:05 | No Apparent Injury       | 0                       | 0                 | 3                     | 0                 | 0               | Pickup,Panel Truck or Vanette under 10,000 lb | Pickup,Panel Truck or Vanette under 10,000 lb | Intersection Related but Not at Intersection |
| City Street  | Clark  | Vancouver | SE 164TH AVE       | 1000         |                         | 0.25                | M       | N                       | SE 15TH ST           |          | No    | E741189                   | 11/25/2017    | 01:59 | No Apparent Injury       | 0                       | 0                 | 1                     | 0                 | 0               | Pickup,Panel Truck or Vanette under 10,000 lb |                                               | Not at Intersection and Not Related          |
| City Street  | Clark  | Vancouver | SE 164TH AVE       | 1400         |                         | 201                 | F       | N                       | SE 15TH ST           |          | No    | E794893                   | 04/25/2018    | 14:58 | No Apparent Injury       | 0                       | 0                 | 2                     | 0                 | 0               | Pickup,Panel Truck or Vanette under 10,000 lb | Pickup,Panel Truck or Vanette under 10,000 lb | Not at Intersection and Not Related          |
| City Street  | Clark  | Vancouver | SE 164TH AVE       | 1500         |                         | 162                 | F       | S                       | SE 15TH ST           |          | No    | E683023                   | 06/19/2017    | 13:25 | No Apparent Injury       | 0                       | 0                 | 2                     | 0                 | 0               | Pickup,Panel Truck or Vanette under 10,000 lb | Passenger Car                                 | Intersection Related but Not at Intersection |
| City Street  | Clark  | Vancouver | SE 164TH AVE       | 1400         |                         | 100                 | F       | NE                      | SE 15TH ST           |          | No    | EA07058                   | 01/24/2020    | 13:40 | No Apparent Injury       | 0                       | 0                 | 2                     | 0                 | 0               | Passenger Car                                 | Pickup,Panel Truck or Vanette under 10,000 lb | Not at Intersection and Not Related          |
| City Street  | Clark  | Vancouver | SE 192ND AVE       | 0            | SE 15TH ST              |                     |         |                         |                      |          | No    | E795421                   | 05/07/2018    | 09:56 | No Apparent Injury       | 0                       | 0                 | 2                     | 0                 | 0               | Passenger Car                                 | Pickup,Panel Truck or Vanette under 10,000 lb | At Intersection and Related                  |
| City Street  | Clark  | Vancouver | SE 192ND AVE       | 0            | SE 15TH ST              |                     |         |                         |                      |          | No    | E880276                   | 01/07/2019    | 19:05 | No Apparent Injury       | 0                       | 0                 | 2                     | 0                 | 0               | Passenger Car                                 | Passenger Car                                 | At Intersection and Related                  |
| City Street  | Clark  | Vancouver | SE 192ND AVE       | 0            | SE 15TH ST              |                     |         |                         |                      |          | No    | EA07064                   | 01/15/2020    | 16:40 | No Apparent Injury       | 0                       | 0                 | 2                     | 0                 | 0               | Pickup,Panel Truck or Vanette under 10,000 lb | Passenger Car                                 | At Intersection and Related                  |
| City Street  | Clark  | Vancouver | SE 192ND AVE       | 0            | SE 15TH ST              |                     |         |                         |                      |          | No    | E908184                   | 04/04/2019    | 11:56 | Suspected Minor Injury   | 1                       | 0                 | 2                     | 0                 | 0               | Passenger Car                                 | Pickup,Panel Truck or Vanette under 10,000 lb | At Intersection and Related                  |
| City Street  | Clark  | Vancouver | SE 192ND AVE       | 9900         | SE 20TH ST              |                     |         |                         |                      |          | No    | E697125                   | 07/13/2017    | 10:45 | No Apparent Injury       | 0                       | 0                 | 2                     | 0                 | 0               | Passenger Car                                 | Passenger Car                                 | At Intersection and Related                  |
| City Street  | Clark  | Vancouver | SE 192ND AVE       | 2000         | SE 20TH ST              |                     |         |                         |                      |          | No    | EB49012                   | 07/15/2021    | 14:21 | Possible Injury          | 1                       | 0                 | 2                     | 0                 | 0               | Passenger Car                                 | Pickup,Panel Truck or Vanette under 10,000 lb | At Intersection and Related                  |
| City Street  | Clark  | Vancouver | SE 192ND AVE       | 0            | SE 20TH ST              |                     |         |                         |                      |          | No    | EA53822                   | 07/31/2020    | 09:46 | No Apparent Injury       | 0                       | 0                 | 2                     | 0                 | 0               | Truck (Flatbad,Van,etc)                       | Pickup,Panel Truck or Vanette under 10,000 lb | At Intersection and Related                  |
| City Street  | Clark  | Vancouver | SE 192ND AVE       | 0            | SE 20TH ST              |                     |         |                         |                      |          | No    | E995917                   | 12/03/2019    | 12:49 | No Apparent Injury       | 0                       | 0                 | 1                     | 0                 | 0               | Passenger Car                                 |                                               | At Intersection and Related                  |
| City Street  | Clark  | Vancouver | SE 192ND AVE       | 400          | SE MILL PLAIN BLVD      |                     |         |                         |                      |          | No    | EB22831                   | 04/17/2021    | 08:42 | Possible Injury          | 1                       | 0                 | 2                     | 0                 | 0               | Pickup,Panel Truck or Vanette under 10,000 lb | Passenger Car                                 | At Intersection and Related                  |
| City Street  | Clark  | Vancouver | SE 192ND AVE       | 0            | SE MILL PLAIN BLVD      |                     |         |                         |                      |          | No    | E938013                   | 07/07/2019    | 15:12 | No Apparent Injury       | 0                       | 0                 | 2                     | 0                 | 0               | Pickup,Panel Truck or Vanette under 10,000 lb | Passenger Car                                 | At Intersection and Related                  |
| City Street  | Clark  | Vancouver | SE 192ND AVE       | 0            | SE MILL PLAIN BLVD      |                     |         |                         |                      |          | No    | E951144                   | 08/16/2019    | 23:05 | Possible Injury          | 1                       | 0                 | 2                     | 0                 | 0               | Passenger Car                                 | Passenger Car                                 | At Intersection and Related                  |
| City Street  | Clark  | Vancouver | SE 192ND AVE       |              | SE MILL PLAIN BLVD      |                     |         |                         |                      |          | No    | EA76264                   | 10/26/2020    | 13:35 | Possible Injury          | 1                       | 0                 | 2                     | 0                 | 0               | Passenger Car                                 | Passenger Car                                 | At Intersection and Related                  |
| City Street  | Clark  | Vancouver | SE 192ND AVE       | 0            | SE MILL PLAIN BLVD      |                     |         |                         |                      |          | No    | E641871                   | 02/09/2017    | 17:06 | No Apparent Injury       | 0                       | 0                 | 2                     | 0                 | 0               | Pickup,Panel Truck or Vanette under 10,000 lb | Pickup,Panel Truck or Vanette under 10,000 lb | At Intersection and Related                  |
| City Street  | Clark  | Vancouver | SE 192ND AVE       | 1400         |                         | 93                  | F       | N                       | SE 15TH ST           |          | No    | E988844                   | 12/02/2019    | 13:40 | Possible Injury          | 1                       | 0                 | 3                     | 0                 | 0               | Passenger Car                                 | Passenger Car                                 | Intersection Related but Not at Intersection |
| City Street  | Clark  | Vancouver | SE 192ND AVE       | 1600         |                         | 318                 | F       | S                       | SE 15TH ST           |          | No    | E785221                   | 04/03/2018    | 16:10 | No Apparent Injury       | 0                       | 0                 | 2                     | 0                 | 0               | Pickup,Panel Truck or Vanette under 10,000 lb | Passenger Car                                 | Intersection Related but Not at Intersection |
| City Street  | Clark  | Vancouver | SE 192ND AVE       | 1900         |                         | 114                 | F       | N                       | SE 20TH ST           |          | No    | E653540                   | 03/20/2017    | 12:40 | No Apparent Injury       | 0                       | 0                 | 3                     | 0                 | 0               | Truck (Flatbad,Van,etc)                       | Pickup,Panel Truck or Vanette under 10,000 lb | Intersection Related but Not at Intersection |
| City Street  | Clark  | Vancouver | SE 192ND AVE       | 1900         |                         | 44                  | F       | N                       | SE 20TH ST           |          | No    | E917443                   | 05/03/2019    | 13:44 | No Apparent Injury       | 0                       | 0                 | 2                     | 0                 | 0               | Passenger Car                                 | Passenger Car                                 | Not at Intersection and Not Related          |
| City Street  | Clark  | Vancouver | SE 192ND AVE       | 1900         |                         | 162                 | F       | N                       | SE 20TH ST           |          | No    | E788428                   | 04/12/2018    | 17:02 | No Apparent Injury       | 0                       | 0                 | 2                     | 0                 | 0               | Passenger Car                                 | Pickup,Panel Truck or Vanette under 10,000 lb | Intersection Related but Not at Intersection |
| City Street  | Clark  | Vancouver | SE 192ND AVE       | 2000         |                         | 54                  | F       | SE                      | SE 20TH ST           |          | No    | E762873                   | 01/26/2018    | 10:57 | Possible Injury          | 2                       | 0                 | 2                     | 0                 | 0               | Passenger Car                                 | Passenger Car                                 | Intersection Related but Not at Intersection |
| City Street  | Clark  | Vancouver | SE 192ND AVE       | 1700         |                         | 492                 | F       | N                       | SE 20TH ST           |          | No    | E841909                   | 09/19/2018    | 16:04 | No Apparent Injury       | 0                       | 0                 | 2                     | 0                 | 0               | Pickup,Panel Truck or Vanette under 10,000 lb | Pickup,Panel Truck or Vanette under 10,000 lb | Intersection Related but Not at Intersection |
| City Street  | Clark  | Vancouver | SE 192ND AVE       | 2000         |                         | 117                 | F       | S                       | SE 20TH ST           |          | No    | E786001                   | 04/06/2018    | 08:59 | No Apparent Injury       | 0                       | 0                 | 3                     | 0                 | 0               | Pickup,Panel Truck or Vanette under 10,000 lb | Passenger Car                                 | Intersection Related but Not at Intersection |
| City Street  | Clark  | Vancouver | SE 192ND AVE       | 400          |                         | 109                 | F       | N                       | SE MILL PLAIN BLVD   |          | No    | E853517                   | 10/25/2018    | 12:15 | No Apparent Injury       | 0                       | 0                 | 1                     | 0                 | 0               | Passenger Car                                 |                                               | Intersection Related but Not at Intersection |
| City Street  | Clark  | Vancouver | SE 192ND AVE       | 400          |                         | 197                 | F       | N                       | SE MILL PLAIN BLVD   |          | No    | E715983                   | 09/25/2017    | 15:35 | No Apparent Injury       | 0                       | 0                 | 2                     | 0                 | 0               | Pickup,Panel Truck or Vanette under 10,000 lb | Pickup,Panel Truck or Vanette under 10,000 lb | Intersection Related but Not at Intersection |
| City Street  | Clark  | Vancouver | SE 20TH ST         | 0            | SE 192ND AVE            |                     |         |                         |                      |          | No    | E707718                   | 08/30/2017    | 17:38 | Suspected Minor Injury   | 1                       | 0                 | 1                     | 0                 | 1               | Passenger Car                                 |                                               | At Intersection and Related                  |
| City Street  | Clark  | Vancouver | SE 20TH ST         | 2000         | SE 192ND AVE            |                     |         |                         |                      |          | No    | EA91782                   | 12/20/2020    | 19:29 | Possible Injury          | 2                       | 0                 | 2                     | 0                 | 0               | Passenger Car                                 | Passenger Car                                 | At Intersection and Related                  |
| City Street  | Clark  | Vancouver | SE MILL PLAIN BLVD | 19200        |                         | 281                 | F       | W                       | SE 192ND AVE         |          | No    | E809763                   | 06/19/2018    | 10:28 | No Apparent Injury       | 0                       | 0                 | 2                     | 0                 | 0               | Truck Tractor                                 | Passenger Car                                 | At Driveway                                  |
| City Street  | Clark  | Vancouver | SE MILL PLAIN BLVD | 19100        |                         | 284                 | F       | W                       | SE 192ND AVE         |          | No    | E849322                   | 10/10/2018    | 15:53 | No Apparent Injury       | 0                       | 0                 | 2                     | 0                 | 0               | Passenger Car                                 | Pickup,Panel Truck or Vanette under 10,000 lb | At Driveway                                  |
| City Street  | Clark  | Vancouver | SE MILL PLAIN BLVD | 19200        |                         | 319                 | F       | W                       | SE 192ND AVE         |          | No    | E894254                   | 02/17/2019    | 15:47 | Possible Injury          | 1                       | 0                 | 2                     | 0                 | 0               | Pickup,Panel Truck or Vanette under 10,000 lb | Passenger Car                                 | At Driveway                                  |

| WEATHER                | ROADWAY<br>SURFACE<br>CONDITION | LIGHTING CONDITION     | FIRST COLLISION TYPE / OBJECT STRUCK                                | VEHICLE 1 ACTION               | VEHICLE 2 ACTION               | VEHICLE 1<br>COMPASS<br>DIRECTION FROM | VEHICLE 1<br>COMPASS<br>DIRECTION TO | VEHICLE 2<br>COMPASS<br>DIRECTION FROM | VEHICLE 2<br>COMPASS<br>DIRECTION TO | MV DRIVER CONTRIBUTING<br>CIRCUMSTANCE 1 (UNIT 1) | MV DRIVER CONTRIBUTING<br>CIRCUMSTANCE 2 (UNIT 1) |
|------------------------|---------------------------------|------------------------|---------------------------------------------------------------------|--------------------------------|--------------------------------|----------------------------------------|--------------------------------------|----------------------------------------|--------------------------------------|---------------------------------------------------|---------------------------------------------------|
| Clear or Partly Cloudy | Dry                             | Daylight               | Entering at angle                                                   | Making Left Turn               | Going Straight Ahead           | South                                  | West                                 | West                                   | East                                 | Did Not Grant RW to Vehicle                       |                                                   |
| Raining                | Wet                             | Dark-Street Lights On  | Entering at angle                                                   | Going Straight Ahead           | Going Straight Ahead           | North                                  | South                                | East                                   | West                                 | Disregard Traffic Sign and Signals                |                                                   |
| Clear or Partly Cloudy | Dry                             | Dark-Street Lights On  | Utility Box                                                         | Making Right Turn              |                                | West                                   | South                                |                                        |                                      | Under Influence of Alcohol                        |                                                   |
| Clear or Partly Cloudy | Dry                             | Dusk                   | Entering at angle                                                   | Going Straight Ahead           | Going Straight Ahead           | South                                  | North                                | West                                   | East                                 | Inattention                                       |                                                   |
| Raining                | Wet                             | Dark-Street Lights On  | Tree or Stump (stationary)                                          | Making Left Turn               |                                | North                                  | East                                 |                                        |                                      | Operating Defective Equipment                     | Other Contributing Circ Not Listed                |
| Raining                | Wet                             | Daylight               | From same direction - both going straight - one stopped - rear-end  | Stopped at Signal or Stop Sign | Other*                         | Vehicle Stopped                        | Vehicle Stopped                      | South                                  | North                                | None                                              |                                                   |
| Clear or Partly Cloudy | Dry                             | Dark-Street Lights On  | Entering at angle                                                   | Going Straight Ahead           | Making Left Turn               | North                                  | South                                | East                                   | Southwest                            | Disregard Stop and Go Light                       |                                                   |
| Clear or Partly Cloudy | Dry                             | Daylight               | From same direction - both going straight - one stopped - rear-end  | Going Straight Ahead           | Stopped at Signal or Stop Sign | South                                  | North                                | Vehicle Stopped                        | Vehicle Stopped                      | Under Influence of Alcohol                        |                                                   |
| Clear                  | Dry                             | Daylight               | Entering at angle                                                   | Going Straight Ahead           | Going Straight Ahead           | North                                  | South                                | East                                   | West                                 | Exceeding Stated Speed Limit                      |                                                   |
| Clear or Partly Cloudy | Dry                             | Daylight               | Entering at angle                                                   | Other*                         | Going Straight Ahead           | North                                  | South                                | West                                   | East                                 | Under Influence of Alcohol                        |                                                   |
| Clear or Partly Cloudy | Dry                             | Daylight               | Entering at angle                                                   | Going Straight Ahead           | Making Left Turn               | North                                  | South                                | East                                   | South                                | Disregard Stop and Go Light                       |                                                   |
| Overcast               | Dry                             | Daylight               | Entering at angle                                                   | Going Straight Ahead           | Going Straight Ahead           | North                                  | South                                | East                                   | West                                 | Other Contributing Circ Not Listed                |                                                   |
| Clear                  | Dry                             | Dark-Street Lights On  | Entering at angle                                                   | Going Straight Ahead           | Going Straight Ahead           | East                                   | West                                 | North                                  | South                                | Other Contributing Circ Not Listed                |                                                   |
| Clear or Partly Cloudy | Dry                             | Daylight               | From same direction - both going straight - one stopped - rear-end  | Going Straight Ahead           | Stopped for Traffic            | South                                  | North                                | Vehicle Stopped                        | Vehicle Stopped                      | Unknown Distraction                               | Follow Too Closely                                |
| Clear or Partly Cloudy | Dry                             | Daylight               | Street Light Pole or Base                                           | Going Straight Ahead           |                                | South                                  | North                                |                                        |                                      | Under Influence of Alcohol                        |                                                   |
| Raining                | Wet                             | Daylight               | From same direction - both going straight - both moving - sideswipe | Changing Lanes                 | Going Straight Ahead           | North                                  | South                                | North                                  | South                                | Did Not Grant RW to Vehicle                       |                                                   |
| Overcast               | Wet                             | Dark-Street Lights On  | From same direction - both going straight - both moving - rear-end  | Changing Lanes                 | Slowing                        | North                                  | South                                | North                                  | South                                | Under Influence of Alcohol                        | Follow Too Closely                                |
| Raining                | Wet                             | Dark-Street Lights On  | From same direction - both going straight - both moving - rear-end  | Going Straight Ahead           | Going Straight Ahead           |                                        |                                      | South                                  | North                                | Other Contributing Circ Not Listed                |                                                   |
| Clear or Partly Cloudy | Dry                             | Daylight               | From same direction - both going straight - one stopped - rear-end  | Slowing                        | Stopped for Traffic            | South                                  | North                                | South                                  | Vehicle Stopped                      | Follow Too Closely                                |                                                   |
| Clear or Partly Cloudy | Dry                             | Dark-Street Lights On  | Street Light Pole or Base                                           | Going Straight Ahead           |                                | Northwest                              | North                                |                                        |                                      | Under Influence of Alcohol                        |                                                   |
| Clear or Partly Cloudy | Dry                             | Daylight               | From same direction - both going straight - both moving - rear-end  | Changing Lanes                 | Slowing                        | South                                  | North                                | South                                  | North                                | Follow Too Closely                                |                                                   |
| Clear or Partly Cloudy | Dry                             | Daylight               | From same direction - both going straight - one stopped - sideswipe | Other*                         | Stopped for Traffic            |                                        |                                      | Vehicle Stopped                        | Vehicle Stopped                      | Other Contributing Circ Not Listed                |                                                   |
| Overcast               | Wet                             | Daylight               | From same direction - both going straight - one stopped - rear-end  | Going Straight Ahead           | Stopped for Traffic            | South                                  | North                                | Vehicle Stopped                        | Vehicle Stopped                      | Follow Too Closely                                |                                                   |
| Overcast               | Dry                             | Daylight               | Entering at angle                                                   | Going Straight Ahead           | Going Straight Ahead           | South                                  | North                                | East                                   | West                                 | Disregard Stop and Go Light                       |                                                   |
| Clear or Partly Cloudy | Dry                             | Dark-Street Lights On  | From same direction - both going straight - one stopped - rear-end  | Going Straight Ahead           | Stopped at Signal or Stop Sign | North                                  | South                                | Vehicle Stopped                        | Vehicle Stopped                      | Other Contributing Circ Not Listed                |                                                   |
| Raining                | Wet                             | Dark-Street Lights On  | Entering at angle                                                   | Going Straight Ahead           | Going Straight Ahead           | North                                  | South                                | East                                   | West                                 | Lost in Thought / Day Dreaming                    |                                                   |
| Clear or Partly Cloudy | Ice                             | Daylight               | From opposite direction - one left turn - one straight              | Going Straight Ahead           | Making Left Turn               | South                                  | North                                | North                                  | East                                 | Inattention                                       |                                                   |
| Overcast               | Dry                             | Daylight               | From same direction - both going straight - both moving - rear-end  | Slowing                        | Slowing                        | South                                  | North                                | South                                  | North                                | Operating Defective Equipment                     |                                                   |
| Clear or Partly Cloudy | Dry                             | Daylight               | Entering at angle                                                   | Going Straight Ahead           | Going Straight Ahead           | North                                  | South                                | West                                   | East                                 | Disregard Traffic Sign and Signals                |                                                   |
| Clear or Partly Cloudy | Dry                             | Daylight               | From same direction - both going straight - one stopped - rear-end  | Going Straight Ahead           | Stopped for Traffic            | South                                  | North                                | South                                  | East                                 | Follow Too Closely                                |                                                   |
| Clear                  | Dry                             | Daylight               | Signal Pole                                                         | Going Straight Ahead           |                                | North                                  | South                                |                                        |                                      | Under Influence of Alcohol                        |                                                   |
| Clear or Partly Cloudy | Dry                             | Daylight               | From same direction - both going straight - one stopped - rear-end  | Going Straight Ahead           | Stopped at Signal or Stop Sign | North                                  | South                                | Vehicle Stopped                        | Vehicle Stopped                      | Distracted by Adjusting Vehicle Cntrl             |                                                   |
| Overcast               | Dry                             | Daylight               | From opposite direction - one left turn - one straight              | Going Straight Ahead           | Making Left Turn               | North                                  | South                                | South                                  | West                                 | Disregard Stop and Go Light                       | Inattention                                       |
| Clear or Partly Cloudy | Dry                             | Dark-Street Lights On  | From same direction - both going straight - one stopped - rear-end  | Going Straight Ahead           | Stopped at Signal or Stop Sign | North                                  | South                                | North                                  | Vehicle Stopped                      | Follow Too Closely                                |                                                   |
| Clear or Partly Cloudy | Dry                             | Daylight               | From opposite direction - one left turn - one straight              | Going Straight Ahead           | Making Left Turn               | North                                  | South                                | South                                  | West                                 | Disregard Traffic Sign and Signals                |                                                   |
| Raining                | Wet                             | Dusk                   | From same direction - both going straight - one stopped - rear-end  | Slowing                        | Stopped at Signal or Stop Sign | South                                  | North                                | South                                  | Vehicle Stopped                      | Under Influence of Alcohol                        |                                                   |
| Overcast               | Wet                             | Daylight               | From same direction - both going straight - one stopped - rear-end  | Going Straight Ahead           | Stopped for Traffic            | North                                  | South                                | North                                  | South                                | Eating or Drinking                                |                                                   |
| Clear or Partly Cloudy | Dry                             | Daylight               | From same direction - both going straight - one stopped - rear-end  | Going Straight Ahead           | Stopped for Traffic            | North                                  | South                                | Vehicle Stopped                        | Vehicle Stopped                      | Inattention                                       |                                                   |
| Overcast               | Dry                             | Daylight               | From same direction - both going straight - one stopped - rear-end  | Going Straight Ahead           | Stopped for Traffic            | North                                  | South                                | Vehicle Stopped                        | Vehicle Stopped                      | Inattention                                       |                                                   |
| Overcast               | Wet                             | Daylight               | From opposite direction - all others                                | Going Straight Ahead           | Stopped for Traffic            | South                                  | North                                | Vehicle Stopped                        | Vehicle Stopped                      | None                                              |                                                   |
| Overcast               | Dry                             | Daylight               | From same direction - both going straight - one stopped - rear-end  | Stopped for Traffic            | Going Straight Ahead           | Vehicle Stopped                        | Vehicle Stopped                      | South                                  | North                                | None                                              |                                                   |
| Clear or Partly Cloudy | Dry                             | Daylight               | From same direction - both going straight - one stopped - rear-end  | Stopped for Traffic            | Going Straight Ahead           | Vehicle Stopped                        | Vehicle Stopped                      | North                                  | South                                | None                                              |                                                   |
| Raining                | Wet                             | Daylight               | From same direction - both going straight - one stopped - rear-end  | Going Straight Ahead           | Stopped for Traffic            | South                                  | North                                | Vehicle Stopped                        | Vehicle Stopped                      | Disregard Stop and Go Light                       | Inattention                                       |
| Raining                | Wet                             | Daylight               | Tree or Stump (stationary)                                          | Making Left Turn               |                                | West                                   | North                                |                                        |                                      | Inattention                                       |                                                   |
| Clear or Partly Cloudy | Dry                             | Daylight               | From same direction - both going straight - one stopped - rear-end  | Stopped at Signal or Stop Sign | Going Straight Ahead           | Vehicle Stopped                        | Vehicle Stopped                      | North                                  | South                                | None                                              |                                                   |
| Clear or Partly Cloudy | Dry                             | Daylight               | Vehicle - Pedalcyclist                                              | Making Right Turn              |                                | West                                   | South                                |                                        |                                      | Other Contributing Circ Not Listed                |                                                   |
| Raining                | Wet                             | Dark-Street Lights Off | From opposite direction - one left turn - one straight              | Going Straight Ahead           | Making Left Turn               | West                                   | East                                 | East                                   | South                                | Other Contributing Circ Not Listed                |                                                   |
| Clear or Partly Cloudy | Dry                             | Daylight               | Same direction -- both turning right -- both moving -- sideswipe    | Making Right Turn              | Making Right Turn              | East                                   | North                                | East                                   | North                                | Inattention                                       |                                                   |
| Clear or Partly Cloudy | Dry                             | Daylight               | Entering at angle                                                   | Making Right Turn              | Stopped at Signal or Stop Sign | West                                   | South                                | Vehicle Stopped                        | Vehicle Stopped                      | Under Influence of Alcohol                        | Improper Turn/Merge                               |
| Overcast               | Dry                             | Daylight               | Entering at angle                                                   | Making Right Turn              | Going Straight Ahead           | North                                  | West                                 | East                                   | West                                 | Improper Turn/Merge                               | Inattention                                       |

| MV DRIVER CONTRIBUTING CIRCUMSTANCE 3 (UNIT 1) | MV DRIVER CONTRIBUTING CIRCUMSTANCE 1 (UNIT 2) | MV DRIVER CONTRIBUTING CIRCUMSTANCE 2 (UNIT 2) | MV DRIVER CONTRIBUTING CIRCUMSTANCE 3 (UNIT 2) | BICYCLIST CONTRIBUTING CIRCUMSTANCE 1 (UNIT 1) | BICYCLIST CONTRIBUTING CIRCUMSTANCE 2 (UNIT 1) | BICYCLIST CONTRIBUTING CIRCUMSTANCE 3 (UNIT 1) | BICYCLIST CONTRIBUTING CIRCUMSTANCE 1 (UNIT 2) | BICYCLIST CONTRIBUTING CIRCUMSTANCE 2 (UNIT 2) | BICYCLIST CONTRIBUTING CIRCUMSTANCE 3 (UNIT 2) | FIRST IMPACT LOCATION (City, County & Misc Trafficways - 2010 forward) | WA STATE PLANE SOUTH - X 2010 - FORWARD | WA STATE PLANE SOUTH - Y 2010 - FORWARD |
|------------------------------------------------|------------------------------------------------|------------------------------------------------|------------------------------------------------|------------------------------------------------|------------------------------------------------|------------------------------------------------|------------------------------------------------|------------------------------------------------|------------------------------------------------|------------------------------------------------------------------------|-----------------------------------------|-----------------------------------------|
|                                                | None                                           |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 107262.09                               |
|                                                | None                                           |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 107246                                  |
|                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Past the Outside Shoulder of Primary Trafficway                        | #####                                   | 107246.01                               |
|                                                | None                                           |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 107244.68                               |
| Exceeding Reas. Safe Speed                     |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Past the Outside Shoulder of Primary Trafficway                        | #####                                   | 107447.65                               |
|                                                | Other Contributing Circ Not Listed             |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 107463.95                               |
|                                                | None                                           |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 107463.95                               |
|                                                | None                                           |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 107463.94                               |
|                                                | None                                           |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 107463.94                               |
|                                                | None                                           |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 107463.95                               |
|                                                | None                                           |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 107463.95                               |
|                                                | None                                           |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 107463.94                               |
|                                                | None                                           |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 107463.94                               |
|                                                | None                                           |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 107664.61                               |
|                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Past the Outside Shoulder of Primary Trafficway                        | #####                                   | 107206.13                               |
|                                                | None                                           |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 107610.87                               |
|                                                | None                                           |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 107763.98                               |
|                                                | None                                           |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 107419.67                               |
|                                                | Follow Too Closely                             |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 107357.55                               |
|                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Past the Outside Shoulder of Primary Trafficway                        | #####                                   | 108783.65                               |
|                                                | None                                           |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 107664.04                               |
|                                                | None                                           |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 107301                                  |
|                                                | None                                           |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 107546.94                               |
|                                                | None                                           |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 107244.69                               |
|                                                | None                                           |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 107246.01                               |
|                                                | None                                           |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 107246                                  |
|                                                | None                                           |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 107244.69                               |
|                                                | None                                           |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 106040.18                               |
|                                                | None                                           |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 106043.19                               |
|                                                | None                                           |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | 1134715.4                               | 106044.3                                |
|                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Past the Outside Shoulder of Primary Trafficway                        | 1134715.4                               | 106044.3                                |
|                                                | None                                           |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 109835.36                               |
|                                                | None                                           |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 109748.15                               |
|                                                | None                                           |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 109777.29                               |
|                                                | None                                           |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 109748.14                               |
|                                                | None                                           |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 109748.15                               |
|                                                | Follow Too Closely                             |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 107338.59                               |
|                                                | None                                           |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 106925.8                                |
|                                                | None                                           |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 106158.53                               |
|                                                | Inattention                                    |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 106087.97                               |
|                                                | None                                           |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 106201.88                               |
|                                                | Exceeding Reas. Safe Speed                     |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 106001.97                               |
|                                                | Follow Too Closely                             |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 106536.85                               |
|                                                | None                                           |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 105927.02                               |
|                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Median of Primary Trafficway                                           | 1134783.6                               | 109885.6                                |
|                                                | Other Contributing Circ Not Listed             |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | 1134784.2                               | 109973.53                               |
|                                                |                                                |                                                |                                                |                                                |                                                |                                                | None                                           |                                                |                                                | Lane of Primary Trafficway                                             | 1134715.4                               | 106044.31                               |
|                                                | None                                           |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | #####                                   | 106043.61                               |
|                                                | Inattention                                    |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Intersecting Trafficway                                                | 1134498.6                               | 109786.52                               |
|                                                | None                                           |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Intersecting Trafficway                                                | #####                                   | 109749.48                               |
| Did Not Grant RW to Vehicle                    | None                                           |                                                |                                                |                                                |                                                |                                                |                                                |                                                |                                                | Lane of Primary Trafficway                                             | 1134462.6                               | 109787.42                               |



## Appendix C 2023 Existing Operations Worksheets

## Queues

1: SE 164th Ave &amp; SE 15th St

## Existing Traffic Conditions

AM Peak Hour Conditions

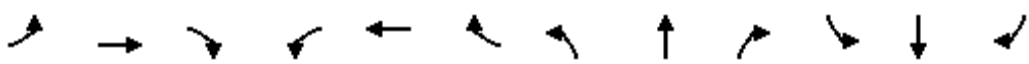
|                         |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                               | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Group Flow (vph)   | 10                                                                                | 72                                                                                | 40                                                                                | 51                                                                                | 63                                                                                | 61                                                                                | 964                                                                                 | 69                                                                                  | 67                                                                                  | 956                                                                                 | 17                                                                                  |
| v/c Ratio               | 0.01                                                                              | 0.09                                                                              | 0.06                                                                              | 0.05                                                                              | 0.07                                                                              | 0.43                                                                              | 0.76                                                                                | 0.14                                                                                | 0.47                                                                                | 0.75                                                                                | 0.04                                                                                |
| Control Delay           | 16.1                                                                              | 11.7                                                                              | 15.7                                                                              | 18.6                                                                              | 1.7                                                                               | 61.4                                                                              | 45.0                                                                                | 2.9                                                                                 | 62.1                                                                                | 44.4                                                                                | 0.1                                                                                 |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 16.1                                                                              | 11.7                                                                              | 15.7                                                                              | 18.6                                                                              | 1.7                                                                               | 61.4                                                                              | 45.0                                                                                | 2.9                                                                                 | 62.1                                                                                | 44.4                                                                                | 0.1                                                                                 |
| Queue Length 50th (ft)  | 3                                                                                 | 12                                                                                | 14                                                                                | 18                                                                                | 0                                                                                 | 46                                                                                | 253                                                                                 | 0                                                                                   | 50                                                                                  | 249                                                                                 | 0                                                                                   |
| Queue Length 95th (ft)  | 14                                                                                | 48                                                                                | 38                                                                                | 54                                                                                | 11                                                                                | 89                                                                                | 281                                                                                 | 16                                                                                  | 95                                                                                  | 276                                                                                 | 0                                                                                   |
| Internal Link Dist (ft) |                                                                                   | 600                                                                               |                                                                                   | 638                                                                               |                                                                                   |                                                                                   | 842                                                                                 |                                                                                     |                                                                                     | 586                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 100                                                                               |                                                                                   | 250                                                                               |                                                                                   | 325                                                                               | 150                                                                               |                                                                                     | 150                                                                                 | 230                                                                                 |                                                                                     | 230                                                                                 |
| Base Capacity (vph)     | 799                                                                               | 817                                                                               | 728                                                                               | 1026                                                                              | 881                                                                               | 166                                                                               | 1995                                                                                | 706                                                                                 | 165                                                                                 | 1976                                                                                | 669                                                                                 |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.01                                                                              | 0.09                                                                              | 0.05                                                                              | 0.05                                                                              | 0.07                                                                              | 0.37                                                                              | 0.48                                                                                | 0.10                                                                                | 0.41                                                                                | 0.48                                                                                | 0.03                                                                                |
| Intersection Summary    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM Signalized Intersection Capacity Analysis

1: SE 164th Ave & SE 15th St

## Existing Traffic Conditions

AM Peak Hour Conditions

|                                   |  |                                                                                   |       |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|-----------------------------------|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                                | EBT                                                                               | EBR   | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |   |  |       |  |  |  |  |  |  |  |  |  |
| Traffic Volume (vph)              | 9                                                                                  | 26                                                                                | 41    | 38                                                                                | 48                                                                                | 59                                                                                | 57                                                                                 | 906                                                                                 | 65                                                                                  | 63                                                                                  | 899                                                                                 | 16                                                                                  |
| Future Volume (vph)               | 9                                                                                  | 26                                                                                | 41    | 38                                                                                | 48                                                                                | 59                                                                                | 57                                                                                 | 906                                                                                 | 65                                                                                  | 63                                                                                  | 899                                                                                 | 16                                                                                  |
| Ideal Flow (vphpl)                | 1900                                                                               | 1900                                                                              | 1900  | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 4.5                                                                                | 5.0                                                                               |       | 4.5                                                                               | 5.0                                                                               | 5.0                                                                               | 4.5                                                                                | 5.0                                                                                 | 5.0                                                                                 | 4.5                                                                                 | 5.0                                                                                 | 5.0                                                                                 |
| Lane Util. Factor                 | 1.00                                                                               | 1.00                                                                              |       | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                               | 0.91                                                                                | 1.00                                                                                | 1.00                                                                                | 0.91                                                                                | 1.00                                                                                |
| Frpb, ped/bikes                   | 1.00                                                                               | 1.00                                                                              |       | 1.00                                                                              | 1.00                                                                              | 0.99                                                                              | 1.00                                                                               | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Flpb, ped/bikes                   | 1.00                                                                               | 1.00                                                                              |       | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                               | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Frt                               | 1.00                                                                               | 0.91                                                                              |       | 1.00                                                                              | 1.00                                                                              | 0.85                                                                              | 1.00                                                                               | 1.00                                                                                | 0.85                                                                                | 1.00                                                                                | 1.00                                                                                | 0.85                                                                                |
| Flt Protected                     | 0.95                                                                               | 1.00                                                                              |       | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                               | 1.00                                                                                | 1.00                                                                                | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                |
| Satd. Flow (prot)                 | 1802                                                                               | 1655                                                                              |       | 1752                                                                              | 1900                                                                              | 1546                                                                              | 1805                                                                               | 4988                                                                                | 1615                                                                                | 1752                                                                                | 4940                                                                                | 1524                                                                                |
| Flt Permitted                     | 0.72                                                                               | 1.00                                                                              |       | 0.66                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                               | 1.00                                                                                | 1.00                                                                                | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                |
| Satd. Flow (perm)                 | 1373                                                                               | 1655                                                                              |       | 1212                                                                              | 1900                                                                              | 1546                                                                              | 1805                                                                               | 4988                                                                                | 1615                                                                                | 1752                                                                                | 4940                                                                                | 1524                                                                                |
| Peak-hour factor, PHF             | 0.94                                                                               | 0.94                                                                              | 0.94  | 0.94                                                                              | 0.94                                                                              | 0.94                                                                              | 0.94                                                                               | 0.94                                                                                | 0.94                                                                                | 0.94                                                                                | 0.94                                                                                | 0.94                                                                                |
| Adj. Flow (vph)                   | 10                                                                                 | 28                                                                                | 44    | 40                                                                                | 51                                                                                | 63                                                                                | 61                                                                                 | 964                                                                                 | 69                                                                                  | 67                                                                                  | 956                                                                                 | 17                                                                                  |
| RTOR Reduction (vph)              | 0                                                                                  | 24                                                                                | 0     | 0                                                                                 | 0                                                                                 | 31                                                                                | 0                                                                                  | 0                                                                                   | 51                                                                                  | 0                                                                                   | 0                                                                                   | 13                                                                                  |
| Lane Group Flow (vph)             | 10                                                                                 | 48                                                                                | 0     | 40                                                                                | 51                                                                                | 32                                                                                | 61                                                                                 | 964                                                                                 | 18                                                                                  | 67                                                                                  | 956                                                                                 | 4                                                                                   |
| Confl. Peds. (#/hr)               | 1                                                                                  |                                                                                   |       |                                                                                   |                                                                                   | 1                                                                                 |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Heavy Vehicles (%)                | 0%                                                                                 | 0%                                                                                | 7%    | 3%                                                                                | 0%                                                                                | 3%                                                                                | 0%                                                                                 | 4%                                                                                  | 0%                                                                                  | 3%                                                                                  | 5%                                                                                  | 6%                                                                                  |
| Turn Type                         | pm+pt                                                                              | NA                                                                                |       | pm+pt                                                                             | NA                                                                                | Perm                                                                              | Prot                                                                               | NA                                                                                  | Perm                                                                                | Prot                                                                                | NA                                                                                  | Perm                                                                                |
| Protected Phases                  | 5                                                                                  | 2                                                                                 |       | 1                                                                                 | 6                                                                                 |                                                                                   | 7                                                                                  | 4                                                                                   |                                                                                     | 3                                                                                   | 8                                                                                   |                                                                                     |
| Permitted Phases                  | 2                                                                                  |                                                                                   |       | 6                                                                                 |                                                                                   | 6                                                                                 |                                                                                    |                                                                                     | 4                                                                                   |                                                                                     |                                                                                     | 8                                                                                   |
| Actuated Green, G (s)             | 57.2                                                                               | 55.9                                                                              |       | 66.2                                                                              | 60.4                                                                              | 60.4                                                                              | 8.2                                                                                | 30.6                                                                                | 30.6                                                                                | 8.7                                                                                 | 31.1                                                                                | 31.1                                                                                |
| Effective Green, g (s)            | 57.2                                                                               | 55.9                                                                              |       | 66.2                                                                              | 60.4                                                                              | 60.4                                                                              | 8.2                                                                                | 30.6                                                                                | 30.6                                                                                | 8.7                                                                                 | 31.1                                                                                | 31.1                                                                                |
| Actuated g/C Ratio                | 0.48                                                                               | 0.47                                                                              |       | 0.55                                                                              | 0.50                                                                              | 0.50                                                                              | 0.07                                                                               | 0.26                                                                                | 0.26                                                                                | 0.07                                                                                | 0.26                                                                                | 0.26                                                                                |
| Clearance Time (s)                | 4.5                                                                                | 5.0                                                                               |       | 4.5                                                                               | 5.0                                                                               | 5.0                                                                               | 4.5                                                                                | 5.0                                                                                 | 5.0                                                                                 | 4.5                                                                                 | 5.0                                                                                 | 5.0                                                                                 |
| Vehicle Extension (s)             | 3.0                                                                                | 2.0                                                                               |       | 3.0                                                                               | 2.0                                                                               | 2.0                                                                               | 3.0                                                                                | 2.0                                                                                 | 2.0                                                                                 | 3.0                                                                                 | 2.0                                                                                 | 2.0                                                                                 |
| Lane Grp Cap (vph)                | 659                                                                                | 770                                                                               |       | 694                                                                               | 956                                                                               | 778                                                                               | 123                                                                                | 1271                                                                                | 411                                                                                 | 127                                                                                 | 1280                                                                                | 394                                                                                 |
| v/s Ratio Prot                    | 0.00                                                                               | c0.03                                                                             |       | c0.00                                                                             | 0.03                                                                              |                                                                                   | 0.03                                                                               | 0.19                                                                                |                                                                                     | c0.04                                                                               | c0.19                                                                               |                                                                                     |
| v/s Ratio Perm                    | 0.01                                                                               |                                                                                   |       | 0.03                                                                              |                                                                                   | 0.02                                                                              |                                                                                    |                                                                                     | 0.01                                                                                |                                                                                     |                                                                                     | 0.00                                                                                |
| v/c Ratio                         | 0.02                                                                               | 0.06                                                                              |       | 0.06                                                                              | 0.05                                                                              | 0.04                                                                              | 0.50                                                                               | 0.76                                                                                | 0.04                                                                                | 0.53                                                                                | 0.75                                                                                | 0.01                                                                                |
| Uniform Delay, d1                 | 16.5                                                                               | 17.6                                                                              |       | 12.4                                                                              | 15.2                                                                              | 15.1                                                                              | 53.9                                                                               | 41.3                                                                                | 33.7                                                                                | 53.7                                                                                | 40.8                                                                                | 33.0                                                                                |
| Progression Factor                | 1.00                                                                               | 1.00                                                                              |       | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                               | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Incremental Delay, d2             | 0.0                                                                                | 0.2                                                                               |       | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 3.1                                                                                | 2.4                                                                                 | 0.0                                                                                 | 3.9                                                                                 | 2.1                                                                                 | 0.0                                                                                 |
| Delay (s)                         | 16.5                                                                               | 17.8                                                                              |       | 12.5                                                                              | 15.2                                                                              | 15.1                                                                              | 57.0                                                                               | 43.6                                                                                | 33.7                                                                                | 57.6                                                                                | 43.0                                                                                | 33.0                                                                                |
| Level of Service                  | B                                                                                  | B                                                                                 |       | B                                                                                 | B                                                                                 | B                                                                                 | E                                                                                  | D                                                                                   | C                                                                                   | E                                                                                   | D                                                                                   | C                                                                                   |
| Approach Delay (s)                |                                                                                    | 17.6                                                                              |       |                                                                                   | 14.5                                                                              |                                                                                   |                                                                                    | 43.8                                                                                |                                                                                     |                                                                                     | 43.7                                                                                |                                                                                     |
| Approach LOS                      |                                                                                    | B                                                                                 |       |                                                                                   | B                                                                                 |                                                                                   |                                                                                    | D                                                                                   |                                                                                     |                                                                                     | D                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                    |                                                                                   |       |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                    |                                                                                   | 40.9  |                                                                                   |                                                                                   |                                                                                   | HCM 2000 Level of Service                                                          |                                                                                     |                                                                                     | D                                                                                   |                                                                                     |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                    |                                                                                   | 0.31  |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                    |                                                                                   | 120.0 |                                                                                   |                                                                                   |                                                                                   | Sum of lost time (s)                                                               |                                                                                     |                                                                                     | 19.0                                                                                |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                    |                                                                                   | 46.3% |                                                                                   |                                                                                   |                                                                                   | ICU Level of Service                                                               |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                    |                                                                                   | 15    |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                    |                                                                                   |       |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

HCM 6th TWSC  
2: SE 189th Ave & SE 15th St

Existing Traffic Conditions  
AM Peak Hour Conditions

| Intersection             |                                                                                   |      |        |                                                                                   |        |                                                                                   |
|--------------------------|-----------------------------------------------------------------------------------|------|--------|-----------------------------------------------------------------------------------|--------|-----------------------------------------------------------------------------------|
| Int Delay, s/veh         | 1.2                                                                               |      |        |                                                                                   |        |                                                                                   |
| Movement                 | EBT                                                                               | EBR  | WBL    | WBT                                                                               | NBL    | NBR                                                                               |
| Lane Configurations      |  |      |        |  |        |  |
| Traffic Vol, veh/h       | 155                                                                               | 9    | 8      | 139                                                                               | 15     | 19                                                                                |
| Future Vol, veh/h        | 155                                                                               | 9    | 8      | 139                                                                               | 15     | 19                                                                                |
| Conflicting Peds, #/hr   | 0                                                                                 | 3    | 3      | 0                                                                                 | 3      | 0                                                                                 |
| Sign Control             | Free                                                                              | Free | Free   | Free                                                                              | Stop   | Stop                                                                              |
| RT Channelized           | -                                                                                 | None | -      | None                                                                              | -      | None                                                                              |
| Storage Length           | -                                                                                 | -    | -      | -                                                                                 | 0      | -                                                                                 |
| Veh in Median Storage, # | 0                                                                                 | -    | -      | 0                                                                                 | 0      | -                                                                                 |
| Grade, %                 | 0                                                                                 | -    | -      | 0                                                                                 | 0      | -                                                                                 |
| Peak Hour Factor         | 77                                                                                | 77   | 77     | 77                                                                                | 77     | 77                                                                                |
| Heavy Vehicles, %        | 6                                                                                 | 11   | 12     | 3                                                                                 | 0      | 0                                                                                 |
| Mvmt Flow                | 201                                                                               | 12   | 10     | 181                                                                               | 19     | 25                                                                                |
|                          |                                                                                   |      |        |                                                                                   |        |                                                                                   |
| Major/Minor              | Major1                                                                            |      | Major2 |                                                                                   | Minor1 |                                                                                   |
| Conflicting Flow All     | 0                                                                                 | 0    | 216    | 0                                                                                 | 414    | 210                                                                               |
| Stage 1                  | -                                                                                 | -    | -      | -                                                                                 | 210    | -                                                                                 |
| Stage 2                  | -                                                                                 | -    | -      | -                                                                                 | 204    | -                                                                                 |
| Critical Hdwy            | -                                                                                 | -    | 4.22   | -                                                                                 | 6.4    | 6.2                                                                               |
| Critical Hdwy Stg 1      | -                                                                                 | -    | -      | -                                                                                 | 5.4    | -                                                                                 |
| Critical Hdwy Stg 2      | -                                                                                 | -    | -      | -                                                                                 | 5.4    | -                                                                                 |
| Follow-up Hdwy           | -                                                                                 | -    | 2.308  | -                                                                                 | 3.5    | 3.3                                                                               |
| Pot Cap-1 Maneuver       | -                                                                                 | -    | 1297   | -                                                                                 | 599    | 835                                                                               |
| Stage 1                  | -                                                                                 | -    | -      | -                                                                                 | 830    | -                                                                                 |
| Stage 2                  | -                                                                                 | -    | -      | -                                                                                 | 835    | -                                                                                 |
| Platoon blocked, %       | -                                                                                 | -    |        | -                                                                                 |        |                                                                                   |
| Mov Cap-1 Maneuver       | -                                                                                 | -    | 1293   | -                                                                                 | 590    | 833                                                                               |
| Mov Cap-2 Maneuver       | -                                                                                 | -    | -      | -                                                                                 | 590    | -                                                                                 |
| Stage 1                  | -                                                                                 | -    | -      | -                                                                                 | 828    | -                                                                                 |
| Stage 2                  | -                                                                                 | -    | -      | -                                                                                 | 825    | -                                                                                 |
|                          |                                                                                   |      |        |                                                                                   |        |                                                                                   |
| Approach                 | EB                                                                                |      | WB     |                                                                                   | NB     |                                                                                   |
| HCM Control Delay, s     | 0                                                                                 |      | 0.4    |                                                                                   | 10.4   |                                                                                   |
| HCM LOS                  | B                                                                                 |      |        |                                                                                   |        |                                                                                   |
|                          |                                                                                   |      |        |                                                                                   |        |                                                                                   |
| Minor Lane/Major Mvmt    | NBLn1                                                                             | EBT  | EBR    | WBL                                                                               | WBT    |                                                                                   |
| Capacity (veh/h)         | 705                                                                               | -    | -      | 1293                                                                              | -      |                                                                                   |
| HCM Lane V/C Ratio       | 0.063                                                                             | -    | -      | 0.008                                                                             | -      |                                                                                   |
| HCM Control Delay (s)    | 10.4                                                                              | -    | -      | 7.8                                                                               | 0      |                                                                                   |
| HCM Lane LOS             | B                                                                                 | -    | -      | A                                                                                 | A      |                                                                                   |
| HCM 95th %tile Q(veh)    | 0.2                                                                               | -    | -      | 0                                                                                 | -      |                                                                                   |



Queues  
3: SE 192nd Ave & SE 15th St

Existing Traffic Conditions  
AM Peak Hour Conditions

|                         |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                               | NBT                                                                                 | SBL                                                                                 | SBT                                                                                 |
| Lane Group Flow (vph)   | 127                                                                               | 74                                                                                | 25                                                                                | 55                                                                                | 50                                                                                | 23                                                                                | 704                                                                                 | 25                                                                                  | 621                                                                                 |
| v/c Ratio               | 0.68                                                                              | 0.20                                                                              | 0.25                                                                              | 0.31                                                                              | 0.15                                                                              | 0.19                                                                              | 0.36                                                                                | 0.26                                                                                | 0.31                                                                                |
| Control Delay           | 60.6                                                                              | 18.9                                                                              | 51.3                                                                              | 43.2                                                                              | 1.0                                                                               | 39.0                                                                              | 13.2                                                                                | 51.7                                                                                | 14.7                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 60.6                                                                              | 18.9                                                                              | 51.3                                                                              | 43.2                                                                              | 1.0                                                                               | 39.0                                                                              | 13.2                                                                                | 51.7                                                                                | 14.7                                                                                |
| Queue Length 50th (ft)  | 79                                                                                | 20                                                                                | 16                                                                                | 35                                                                                | 0                                                                                 | 15                                                                                | 90                                                                                  | 16                                                                                  | 72                                                                                  |
| Queue Length 95th (ft)  | 133                                                                               | 48                                                                                | 42                                                                                | 59                                                                                | 0                                                                                 | m23                                                                               | 159                                                                                 | 42                                                                                  | 237                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 318                                                                               |                                                                                   | 1016                                                                              |                                                                                   |                                                                                   | 1126                                                                                |                                                                                     | 227                                                                                 |
| Turn Bay Length (ft)    | 115                                                                               |                                                                                   | 110                                                                               |                                                                                   | 110                                                                               | 150                                                                               |                                                                                     | 475                                                                                 |                                                                                     |
| Base Capacity (vph)     | 222                                                                               | 497                                                                               | 252                                                                               | 493                                                                               | 383                                                                               | 181                                                                               | 1957                                                                                | 156                                                                                 | 1987                                                                                |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.57                                                                              | 0.15                                                                              | 0.10                                                                              | 0.11                                                                              | 0.13                                                                              | 0.13                                                                              | 0.36                                                                                | 0.16                                                                                | 0.31                                                                                |

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

# HCM Signalized Intersection Capacity Analysis

## 3: SE 192nd Ave & SE 15th St

Existing Traffic Conditions  
AM Peak Hour Conditions

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Traffic Volume (vph)              | 117                                                                               | 36                                                                                | 32                                                                                | 23                                                                                | 51                                                                                | 46                                                                                | 21                                                                                  | 624                                                                                 | 24                                                                                  | 23                                                                                  | 505                                                                                 | 66                                                                                  |
| Future Volume (vph)               | 117                                                                               | 36                                                                                | 32                                                                                | 23                                                                                | 51                                                                                | 46                                                                                | 21                                                                                  | 624                                                                                 | 24                                                                                  | 23                                                                                  | 505                                                                                 | 66                                                                                  |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                                 | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Lane Util. Factor                 | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 0.95                                                                                |                                                                                     | 1.00                                                                                | 0.95                                                                                |                                                                                     |
| Frpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 0.99                                                                              | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Flpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Frt                               | 1.00                                                                              | 0.93                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 0.85                                                                              | 1.00                                                                                | 0.99                                                                                |                                                                                     | 1.00                                                                                | 0.98                                                                                |                                                                                     |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                                | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (prot)                 | 1719                                                                              | 1765                                                                              |                                                                                   | 1805                                                                              | 1827                                                                              | 1539                                                                              | 1805                                                                                | 3390                                                                                |                                                                                     | 1736                                                                                | 3260                                                                                |                                                                                     |
| Flt Permitted                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                                | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (perm)                 | 1719                                                                              | 1765                                                                              |                                                                                   | 1805                                                                              | 1827                                                                              | 1539                                                                              | 1805                                                                                | 3390                                                                                |                                                                                     | 1736                                                                                | 3260                                                                                |                                                                                     |
| Peak-hour factor, PHF             | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Adj. Flow (vph)                   | 127                                                                               | 39                                                                                | 35                                                                                | 25                                                                                | 55                                                                                | 50                                                                                | 23                                                                                  | 678                                                                                 | 26                                                                                  | 25                                                                                  | 549                                                                                 | 72                                                                                  |
| RTOR Reduction (vph)              | 0                                                                                 | 28                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 43                                                                                | 0                                                                                   | 2                                                                                   | 0                                                                                   | 0                                                                                   | 7                                                                                   | 0                                                                                   |
| Lane Group Flow (vph)             | 127                                                                               | 46                                                                                | 0                                                                                 | 25                                                                                | 55                                                                                | 7                                                                                 | 23                                                                                  | 702                                                                                 | 0                                                                                   | 25                                                                                  | 614                                                                                 | 0                                                                                   |
| Confl. Peds. (#/hr)               | 1                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 1                                                                                   |                                                                                     |                                                                                     | 3                                                                                   |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     | 1                                                                                   |                                                                                     |                                                                                     | 1                                                                                   |
| Heavy Vehicles (%)                | 5%                                                                                | 0%                                                                                | 0%                                                                                | 0%                                                                                | 4%                                                                                | 4%                                                                                | 0%                                                                                  | 6%                                                                                  | 0%                                                                                  | 4%                                                                                  | 9%                                                                                  | 5%                                                                                  |
| Turn Type                         | Prot                                                                              | NA                                                                                |                                                                                   | Prot                                                                              | NA                                                                                | pm+ov                                                                             | Prot                                                                                | NA                                                                                  |                                                                                     | Prot                                                                                | NA                                                                                  |                                                                                     |
| Protected Phases                  | 5                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 6                                                                                 | 3                                                                                 | 7                                                                                   | 4                                                                                   |                                                                                     | 3                                                                                   | 8                                                                                   |                                                                                     |
| Permitted Phases                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 6                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Green, G (s)             | 12.8                                                                              | 19.2                                                                              |                                                                                   | 2.5                                                                               | 8.9                                                                               | 13.5                                                                              | 3.9                                                                                 | 53.7                                                                                |                                                                                     | 4.6                                                                                 | 54.4                                                                                |                                                                                     |
| Effective Green, g (s)            | 12.8                                                                              | 19.2                                                                              |                                                                                   | 2.5                                                                               | 8.9                                                                               | 13.5                                                                              | 3.9                                                                                 | 53.7                                                                                |                                                                                     | 4.6                                                                                 | 54.4                                                                                |                                                                                     |
| Actuated g/C Ratio                | 0.13                                                                              | 0.19                                                                              |                                                                                   | 0.02                                                                              | 0.09                                                                              | 0.14                                                                              | 0.04                                                                                | 0.54                                                                                |                                                                                     | 0.05                                                                                | 0.54                                                                                |                                                                                     |
| Clearance Time (s)                | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                                 | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Vehicle Extension (s)             | 1.0                                                                               | 1.0                                                                               |                                                                                   | 1.0                                                                               | 1.0                                                                               | 1.0                                                                               | 1.0                                                                                 | 1.0                                                                                 |                                                                                     | 1.0                                                                                 | 1.0                                                                                 |                                                                                     |
| Lane Grp Cap (vph)                | 220                                                                               | 338                                                                               |                                                                                   | 45                                                                                | 162                                                                               | 207                                                                               | 70                                                                                  | 1820                                                                                |                                                                                     | 79                                                                                  | 1773                                                                                |                                                                                     |
| v/s Ratio Prot                    | c0.07                                                                             | 0.03                                                                              |                                                                                   | 0.01                                                                              | c0.03                                                                             | 0.00                                                                              | 0.01                                                                                | c0.21                                                                               |                                                                                     | 0.01                                                                                | c0.19                                                                               |                                                                                     |
| v/s Ratio Perm                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 0.00                                                                              |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| v/c Ratio                         | 0.58                                                                              | 0.14                                                                              |                                                                                   | 0.56                                                                              | 0.34                                                                              | 0.03                                                                              | 0.33                                                                                | 0.39                                                                                |                                                                                     | 0.32                                                                                | 0.35                                                                                |                                                                                     |
| Uniform Delay, d1                 | 41.1                                                                              | 33.5                                                                              |                                                                                   | 48.2                                                                              | 42.8                                                                              | 37.6                                                                              | 46.8                                                                                | 13.5                                                                                |                                                                                     | 46.2                                                                                | 12.8                                                                                |                                                                                     |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 0.84                                                                                | 0.84                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Incremental Delay, d2             | 2.3                                                                               | 0.1                                                                               |                                                                                   | 8.2                                                                               | 0.5                                                                               | 0.0                                                                               | 0.9                                                                                 | 0.6                                                                                 |                                                                                     | 0.8                                                                                 | 0.0                                                                                 |                                                                                     |
| Delay (s)                         | 43.3                                                                              | 33.6                                                                              |                                                                                   | 56.4                                                                              | 43.2                                                                              | 37.6                                                                              | 40.4                                                                                | 11.9                                                                                |                                                                                     | 47.0                                                                                | 12.9                                                                                |                                                                                     |
| Level of Service                  | D                                                                                 | C                                                                                 |                                                                                   | E                                                                                 | D                                                                                 | D                                                                                 | D                                                                                   | B                                                                                   |                                                                                     | D                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay (s)                |                                                                                   | 39.7                                                                              |                                                                                   |                                                                                   | 43.6                                                                              |                                                                                   |                                                                                     | 12.8                                                                                |                                                                                     |                                                                                     | 14.2                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                   |                                                                                   | 18.8                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                   |                                                                                   | 0.42                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 100.0                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 42.3%                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

Queues  
4: SE 192nd Ave & Mill Plain Blvd

Existing Traffic Conditions  
AM Peak Hour Conditions

|                         |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | NBL                                                                               | NBT                                                                                | SBL                                                                                 | SBT                                                                                 |
| Lane Group Flow (vph)   | 128                                                                               | 111                                                                               | 149                                                                               | 147                                                                               | 221                                                                               | 404                                                                               | 689                                                                                | 95                                                                                  | 606                                                                                 |
| v/c Ratio               | 0.69                                                                              | 0.41                                                                              | 0.26                                                                              | 0.75                                                                              | 0.73                                                                              | 0.77                                                                              | 0.46                                                                               | 0.70                                                                                | 0.50                                                                                |
| Control Delay           | 61.7                                                                              | 40.2                                                                              | 3.0                                                                               | 66.0                                                                              | 45.1                                                                              | 52.1                                                                              | 20.4                                                                               | 70.3                                                                                | 25.0                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 61.7                                                                              | 40.2                                                                              | 3.0                                                                               | 66.0                                                                              | 45.1                                                                              | 52.1                                                                              | 20.4                                                                               | 70.3                                                                                | 25.0                                                                                |
| Queue Length 50th (ft)  | 79                                                                                | 66                                                                                | 0                                                                                 | 90                                                                                | 111                                                                               | 126                                                                               | 139                                                                                | 60                                                                                  | 138                                                                                 |
| Queue Length 95th (ft)  | 110                                                                               | 80                                                                                | 11                                                                                | 127                                                                               | 127                                                                               | #157                                                                              | 187                                                                                | 90                                                                                  | 170                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 628                                                                               |                                                                                   |                                                                                   | 391                                                                               |                                                                                   | 457                                                                                |                                                                                     | 709                                                                                 |
| Turn Bay Length (ft)    | 240                                                                               |                                                                                   | 130                                                                               |                                                                                   |                                                                                   | 205                                                                               |                                                                                    | 150                                                                                 |                                                                                     |
| Base Capacity (vph)     | 226                                                                               | 488                                                                               | 567                                                                               | 218                                                                               | 482                                                                               | 524                                                                               | 1502                                                                               | 167                                                                                 | 1225                                                                                |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.57                                                                              | 0.23                                                                              | 0.26                                                                              | 0.67                                                                              | 0.46                                                                              | 0.77                                                                              | 0.46                                                                               | 0.57                                                                                | 0.49                                                                                |

Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.

# HCM Signalized Intersection Capacity Analysis

## 4: SE 192nd Ave & Mill Plain Blvd

Existing Traffic Conditions  
AM Peak Hour Conditions

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |  |  |  |                                                                                   |  |  |                                                                                     |  |  |                                                                                     |
| Traffic Volume (vph)              | 95                                                                                | 82                                                                                | 110                                                                               | 109                                                                               | 90                                                                                | 73                                                                                | 299                                                                                 | 344                                                                                 | 166                                                                                 | 70                                                                                  | 311                                                                                 | 138                                                                                 |
| Future Volume (vph)               | 95                                                                                | 82                                                                                | 110                                                                               | 109                                                                               | 90                                                                                | 73                                                                                | 299                                                                                 | 344                                                                                 | 166                                                                                 | 70                                                                                  | 311                                                                                 | 138                                                                                 |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                                 | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Lane Util. Factor                 | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              |                                                                                   | 0.97                                                                                | 0.95                                                                                |                                                                                     | 1.00                                                                                | 0.95                                                                                |                                                                                     |
| Frpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              | 0.99                                                                              | 1.00                                                                              | 0.99                                                                              |                                                                                   | 1.00                                                                                | 0.99                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Flpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Frt                               | 1.00                                                                              | 1.00                                                                              | 0.85                                                                              | 1.00                                                                              | 0.93                                                                              |                                                                                   | 1.00                                                                                | 0.95                                                                                |                                                                                     | 1.00                                                                                | 0.95                                                                                |                                                                                     |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                                | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (prot)                 | 1703                                                                              | 1743                                                                              | 1508                                                                              | 1641                                                                              | 1617                                                                              |                                                                                   | 3433                                                                                | 3152                                                                                |                                                                                     | 1656                                                                                | 3168                                                                                |                                                                                     |
| Flt Permitted                     | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                                | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (perm)                 | 1703                                                                              | 1743                                                                              | 1508                                                                              | 1641                                                                              | 1617                                                                              |                                                                                   | 3433                                                                                | 3152                                                                                |                                                                                     | 1656                                                                                | 3168                                                                                |                                                                                     |
| Peak-hour factor, PHF             | 0.74                                                                              | 0.74                                                                              | 0.74                                                                              | 0.74                                                                              | 0.74                                                                              | 0.74                                                                              | 0.74                                                                                | 0.74                                                                                | 0.74                                                                                | 0.74                                                                                | 0.74                                                                                | 0.74                                                                                |
| Adj. Flow (vph)                   | 128                                                                               | 111                                                                               | 149                                                                               | 147                                                                               | 122                                                                               | 99                                                                                | 404                                                                                 | 465                                                                                 | 224                                                                                 | 95                                                                                  | 420                                                                                 | 186                                                                                 |
| RTOR Reduction (vph)              | 0                                                                                 | 0                                                                                 | 101                                                                               | 0                                                                                 | 34                                                                                | 0                                                                                 | 0                                                                                   | 45                                                                                  | 0                                                                                   | 0                                                                                   | 44                                                                                  | 0                                                                                   |
| Lane Group Flow (vph)             | 128                                                                               | 111                                                                               | 48                                                                                | 147                                                                               | 187                                                                               | 0                                                                                 | 404                                                                                 | 644                                                                                 | 0                                                                                   | 95                                                                                  | 562                                                                                 | 0                                                                                   |
| Confl. Peds. (#/hr)               | 1                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                 | 3                                                                                   |                                                                                     | 3                                                                                   | 3                                                                                   |                                                                                     | 3                                                                                   |
| Confl. Bikes (#/hr)               |                                                                                   |                                                                                   | 1                                                                                 |                                                                                   |                                                                                   | 1                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     | 1                                                                                   |
| Heavy Vehicles (%)                | 6%                                                                                | 9%                                                                                | 6%                                                                                | 10%                                                                               | 4%                                                                                | 15%                                                                               | 2%                                                                                  | 7%                                                                                  | 10%                                                                                 | 9%                                                                                  | 10%                                                                                 | 4%                                                                                  |
| Turn Type                         | Prot                                                                              | NA                                                                                | pm+ov                                                                             | Prot                                                                              | NA                                                                                |                                                                                   | Prot                                                                                | NA                                                                                  |                                                                                     | Prot                                                                                | NA                                                                                  |                                                                                     |
| Protected Phases                  | 5                                                                                 | 2                                                                                 | 7                                                                                 | 1                                                                                 | 6                                                                                 |                                                                                   | 7                                                                                   | 4                                                                                   |                                                                                     | 3                                                                                   | 8                                                                                   |                                                                                     |
| Permitted Phases                  |                                                                                   |                                                                                   | 2                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Green, G (s)             | 10.9                                                                              | 15.6                                                                              | 31.9                                                                              | 11.9                                                                              | 16.6                                                                              |                                                                                   | 16.3                                                                                | 45.3                                                                                |                                                                                     | 7.2                                                                                 | 36.2                                                                                |                                                                                     |
| Effective Green, g (s)            | 10.9                                                                              | 15.6                                                                              | 31.9                                                                              | 11.9                                                                              | 16.6                                                                              |                                                                                   | 16.3                                                                                | 45.3                                                                                |                                                                                     | 7.2                                                                                 | 36.2                                                                                |                                                                                     |
| Actuated g/C Ratio                | 0.11                                                                              | 0.16                                                                              | 0.32                                                                              | 0.12                                                                              | 0.17                                                                              |                                                                                   | 0.16                                                                                | 0.45                                                                                |                                                                                     | 0.07                                                                                | 0.36                                                                                |                                                                                     |
| Clearance Time (s)                | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                                 | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Vehicle Extension (s)             | 1.5                                                                               | 1.5                                                                               | 0.5                                                                               | 2.0                                                                               | 2.0                                                                               |                                                                                   | 0.5                                                                                 | 0.5                                                                                 |                                                                                     | 0.5                                                                                 | 0.5                                                                                 |                                                                                     |
| Lane Grp Cap (vph)                | 185                                                                               | 271                                                                               | 481                                                                               | 195                                                                               | 268                                                                               |                                                                                   | 559                                                                                 | 1427                                                                                |                                                                                     | 119                                                                                 | 1146                                                                                |                                                                                     |
| v/s Ratio Prot                    | c0.08                                                                             | c0.06                                                                             | 0.02                                                                              | 0.09                                                                              | c0.12                                                                             |                                                                                   | c0.12                                                                               | 0.20                                                                                |                                                                                     | c0.06                                                                               | c0.18                                                                               |                                                                                     |
| v/s Ratio Perm                    |                                                                                   |                                                                                   | 0.02                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| v/c Ratio                         | 0.69                                                                              | 0.41                                                                              | 0.10                                                                              | 0.75                                                                              | 0.70                                                                              |                                                                                   | 0.72                                                                                | 0.45                                                                                |                                                                                     | 0.80                                                                                | 0.49                                                                                |                                                                                     |
| Uniform Delay, d1                 | 42.9                                                                              | 38.0                                                                              | 23.9                                                                              | 42.6                                                                              | 39.3                                                                              |                                                                                   | 39.7                                                                                | 18.8                                                                                |                                                                                     | 45.7                                                                                | 24.7                                                                                |                                                                                     |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Incremental Delay, d2             | 8.7                                                                               | 0.4                                                                               | 0.0                                                                               | 13.6                                                                              | 6.2                                                                               |                                                                                   | 3.9                                                                                 | 1.0                                                                                 |                                                                                     | 28.3                                                                                | 0.1                                                                                 |                                                                                     |
| Delay (s)                         | 51.6                                                                              | 38.4                                                                              | 24.0                                                                              | 56.2                                                                              | 45.6                                                                              |                                                                                   | 43.6                                                                                | 19.8                                                                                |                                                                                     | 74.0                                                                                | 24.9                                                                                |                                                                                     |
| Level of Service                  | D                                                                                 | D                                                                                 | C                                                                                 | E                                                                                 | D                                                                                 |                                                                                   | D                                                                                   | B                                                                                   |                                                                                     | E                                                                                   | C                                                                                   |                                                                                     |
| Approach Delay (s)                |                                                                                   | 37.2                                                                              |                                                                                   |                                                                                   | 49.8                                                                              |                                                                                   |                                                                                     | 28.6                                                                                |                                                                                     |                                                                                     | 31.5                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                     | C                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                   |                                                                                   | 33.8                                                                              |                                                                                   |                                                                                   | HCM 2000 Level of Service                                                         |                                                                                     |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                   |                                                                                   | 0.61                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 100.0                                                                             |                                                                                   |                                                                                   | Sum of lost time (s)                                                              |                                                                                     |                                                                                     | 20.0                                                                                |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 53.9%                                                                             |                                                                                   |                                                                                   | ICU Level of Service                                                              |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |



Queues  
5: SE 192nd Ave & SE 20th St

Existing Traffic Conditions  
AM Peak Hour Conditions

|                         |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | WBL                                                                               | WBT                                                                               | NBL                                                                               | NBT                                                                               | SBL                                                                                | SBT                                                                                 |
| Lane Group Flow (vph)   | 133                                                                               | 186                                                                               | 49                                                                                | 203                                                                               | 39                                                                                | 779                                                                               | 80                                                                                 | 690                                                                                 |
| v/c Ratio               | 0.48                                                                              | 0.54                                                                              | 0.25                                                                              | 0.72                                                                              | 0.33                                                                              | 0.47                                                                              | 0.52                                                                               | 0.40                                                                                |
| Control Delay           | 49.2                                                                              | 37.5                                                                              | 47.5                                                                              | 45.5                                                                              | 51.1                                                                              | 19.9                                                                              | 65.0                                                                               | 11.5                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 |
| Total Delay             | 49.2                                                                              | 37.5                                                                              | 47.5                                                                              | 45.5                                                                              | 51.1                                                                              | 19.9                                                                              | 65.0                                                                               | 11.5                                                                                |
| Queue Length 50th (ft)  | 42                                                                                | 96                                                                                | 15                                                                                | 97                                                                                | 24                                                                                | 166                                                                               | 54                                                                                 | 86                                                                                  |
| Queue Length 95th (ft)  | 61                                                                                | 127                                                                               | 29                                                                                | 132                                                                               | 49                                                                                | 241                                                                               | 90                                                                                 | 110                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 1997                                                                              |                                                                                   | 3145                                                                              |                                                                                   | 1320                                                                              |                                                                                    | 1126                                                                                |
| Turn Bay Length (ft)    | 100                                                                               |                                                                                   | 150                                                                               |                                                                                   | 335                                                                               |                                                                                   | 410                                                                                |                                                                                     |
| Base Capacity (vph)     | 396                                                                               | 456                                                                               | 356                                                                               | 445                                                                               | 175                                                                               | 1667                                                                              | 183                                                                                | 1742                                                                                |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |
| Reduced v/c Ratio       | 0.34                                                                              | 0.41                                                                              | 0.14                                                                              | 0.46                                                                              | 0.22                                                                              | 0.47                                                                              | 0.44                                                                               | 0.40                                                                                |
| Intersection Summary    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |

# HCM Signalized Intersection Capacity Analysis

## 5: SE 192nd Ave & SE 20th St

Existing Traffic Conditions  
AM Peak Hour Conditions

|                                   |                                                                                    |  |  |                                                                                    |  |  |   |                                                                                      |  |  |                                                                                      |  |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                                                                                                                 | EBT                                                                               | EBR                                                                               | WBL                                                                                                                                                                 | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                                                                                                     | NBR                                                                                 | SBL                                                                                 | SBT                                                                                                                                                                     | SBR                                                                                 |
| Lane Configurations               |   |  |                                                                                   |   |  |                                                                                   |  |   |                                                                                     |  |   |  |
| Traffic Volume (vph)              | 105                                                                                                                                                                 | 97                                                                                | 50                                                                                | 39                                                                                                                                                                  | 81                                                                                | 79                                                                                | 31                                                                                  | 564                                                                                                                                                                     | 51                                                                                  | 63                                                                                  | 471                                                                                                                                                                     | 74                                                                                  |
| Future Volume (vph)               | 105                                                                                                                                                                 | 97                                                                                | 50                                                                                | 39                                                                                                                                                                  | 81                                                                                | 79                                                                                | 31                                                                                  | 564                                                                                                                                                                     | 51                                                                                  | 63                                                                                  | 471                                                                                                                                                                     | 74                                                                                  |
| Ideal Flow (vphpl)                | 1900                                                                                                                                                                | 1900                                                                              | 1900                                                                              | 1900                                                                                                                                                                | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                                                                                                    | 1900                                                                                | 1900                                                                                | 1900                                                                                                                                                                    | 1900                                                                                |
| Total Lost time (s)               | 5.0                                                                                                                                                                 | 5.0                                                                               |                                                                                   | 5.0                                                                                                                                                                 | 5.0                                                                               |                                                                                   | 5.0                                                                                 | 5.0                                                                                                                                                                     |                                                                                     | 5.0                                                                                 | 5.0                                                                                                                                                                     |                                                                                     |
| Lane Util. Factor                 | 0.97                                                                                                                                                                | 1.00                                                                              |                                                                                   | 0.97                                                                                                                                                                | 1.00                                                                              |                                                                                   | 1.00                                                                                | 0.95                                                                                                                                                                    |                                                                                     | 1.00                                                                                | 0.95                                                                                                                                                                    |                                                                                     |
| Frpb, ped/bikes                   | 1.00                                                                                                                                                                | 1.00                                                                              |                                                                                   | 1.00                                                                                                                                                                | 0.99                                                                              |                                                                                   | 1.00                                                                                | 1.00                                                                                                                                                                    |                                                                                     | 1.00                                                                                | 1.00                                                                                                                                                                    |                                                                                     |
| Flpb, ped/bikes                   | 1.00                                                                                                                                                                | 1.00                                                                              |                                                                                   | 1.00                                                                                                                                                                | 1.00                                                                              |                                                                                   | 1.00                                                                                | 1.00                                                                                                                                                                    |                                                                                     | 1.00                                                                                | 1.00                                                                                                                                                                    |                                                                                     |
| Frt                               | 1.00                                                                                                                                                                | 0.95                                                                              |                                                                                   | 1.00                                                                                                                                                                | 0.93                                                                              |                                                                                   | 1.00                                                                                | 0.99                                                                                                                                                                    |                                                                                     | 1.00                                                                                | 0.98                                                                                                                                                                    |                                                                                     |
| Flt Protected                     | 0.95                                                                                                                                                                | 1.00                                                                              |                                                                                   | 0.95                                                                                                                                                                | 1.00                                                                              |                                                                                   | 0.95                                                                                | 1.00                                                                                                                                                                    |                                                                                     | 0.95                                                                                | 1.00                                                                                                                                                                    |                                                                                     |
| Satd. Flow (prot)                 | 3303                                                                                                                                                                | 1748                                                                              |                                                                                   | 3242                                                                                                                                                                | 1710                                                                              |                                                                                   | 1752                                                                                | 3294                                                                                                                                                                    |                                                                                     | 1719                                                                                | 3166                                                                                                                                                                    |                                                                                     |
| Flt Permitted                     | 0.95                                                                                                                                                                | 1.00                                                                              |                                                                                   | 0.95                                                                                                                                                                | 1.00                                                                              |                                                                                   | 0.95                                                                                | 1.00                                                                                                                                                                    |                                                                                     | 0.95                                                                                | 1.00                                                                                                                                                                    |                                                                                     |
| Satd. Flow (perm)                 | 3303                                                                                                                                                                | 1748                                                                              |                                                                                   | 3242                                                                                                                                                                | 1710                                                                              |                                                                                   | 1752                                                                                | 3294                                                                                                                                                                    |                                                                                     | 1719                                                                                | 3166                                                                                                                                                                    |                                                                                     |
| Peak-hour factor, PHF             | 0.79                                                                                                                                                                | 0.79                                                                              | 0.79                                                                              | 0.79                                                                                                                                                                | 0.79                                                                              | 0.79                                                                              | 0.79                                                                                | 0.79                                                                                                                                                                    | 0.79                                                                                | 0.79                                                                                | 0.79                                                                                                                                                                    | 0.79                                                                                |
| Adj. Flow (vph)                   | 133                                                                                                                                                                 | 123                                                                               | 63                                                                                | 49                                                                                                                                                                  | 103                                                                               | 100                                                                               | 39                                                                                  | 714                                                                                                                                                                     | 65                                                                                  | 80                                                                                  | 596                                                                                                                                                                     | 94                                                                                  |
| RTOR Reduction (vph)              | 0                                                                                                                                                                   | 20                                                                                | 0                                                                                 | 0                                                                                                                                                                   | 39                                                                                | 0                                                                                 | 0                                                                                   | 5                                                                                                                                                                       | 0                                                                                   | 0                                                                                   | 9                                                                                                                                                                       | 0                                                                                   |
| Lane Group Flow (vph)             | 133                                                                                                                                                                 | 166                                                                               | 0                                                                                 | 49                                                                                                                                                                  | 164                                                                               | 0                                                                                 | 39                                                                                  | 774                                                                                                                                                                     | 0                                                                                   | 80                                                                                  | 681                                                                                                                                                                     | 0                                                                                   |
| Confl. Peds. (#/hr)               | 2                                                                                                                                                                   |                                                                                   |                                                                                   |                                                                                                                                                                     |                                                                                   |                                                                                   | 2                                                                                   | 2                                                                                                                                                                       |                                                                                     | 2                                                                                   | 2                                                                                                                                                                       |                                                                                     |
| Confl. Bikes (#/hr)               |                                                                                                                                                                     |                                                                                   | 2                                                                                 |                                                                                                                                                                     |                                                                                   |                                                                                   | 2                                                                                   |                                                                                                                                                                         |                                                                                     | 2                                                                                   |                                                                                                                                                                         | 1                                                                                   |
| Heavy Vehicles (%)                | 6%                                                                                                                                                                  | 3%                                                                                | 2%                                                                                | 8%                                                                                                                                                                  | 1%                                                                                | 3%                                                                                | 3%                                                                                  | 8%                                                                                                                                                                      | 8%                                                                                  | 5%                                                                                  | 12%                                                                                                                                                                     | 7%                                                                                  |
| Turn Type                         | Prot                                                                                                                                                                | NA                                                                                |                                                                                   | Prot                                                                                                                                                                | NA                                                                                |                                                                                   | Prot                                                                                | NA                                                                                                                                                                      |                                                                                     | Prot                                                                                | NA                                                                                                                                                                      |                                                                                     |
| Protected Phases                  | 5                                                                                                                                                                   | 2                                                                                 |                                                                                   | 1                                                                                                                                                                   | 6                                                                                 |                                                                                   | 7                                                                                   | 4                                                                                                                                                                       |                                                                                     | 3                                                                                   | 8                                                                                                                                                                       |                                                                                     |
| Permitted Phases                  |                                                                                                                                                                     |                                                                                   |                                                                                   |                                                                                                                                                                     |                                                                                   |                                                                                   |                                                                                     |                                                                                                                                                                         |                                                                                     |                                                                                     |                                                                                                                                                                         |                                                                                     |
| Actuated Green, G (s)             | 8.4                                                                                                                                                                 | 18.4                                                                              |                                                                                   | 5.1                                                                                                                                                                 | 15.1                                                                              |                                                                                   | 4.7                                                                                 | 48.5                                                                                                                                                                    |                                                                                     | 8.0                                                                                 | 51.8                                                                                                                                                                    |                                                                                     |
| Effective Green, g (s)            | 8.4                                                                                                                                                                 | 18.4                                                                              |                                                                                   | 5.1                                                                                                                                                                 | 15.1                                                                              |                                                                                   | 4.7                                                                                 | 48.5                                                                                                                                                                    |                                                                                     | 8.0                                                                                 | 51.8                                                                                                                                                                    |                                                                                     |
| Actuated g/C Ratio                | 0.08                                                                                                                                                                | 0.18                                                                              |                                                                                   | 0.05                                                                                                                                                                | 0.15                                                                              |                                                                                   | 0.05                                                                                | 0.48                                                                                                                                                                    |                                                                                     | 0.08                                                                                | 0.52                                                                                                                                                                    |                                                                                     |
| Clearance Time (s)                | 5.0                                                                                                                                                                 | 5.0                                                                               |                                                                                   | 5.0                                                                                                                                                                 | 5.0                                                                               |                                                                                   | 5.0                                                                                 | 5.0                                                                                                                                                                     |                                                                                     | 5.0                                                                                 | 5.0                                                                                                                                                                     |                                                                                     |
| Vehicle Extension (s)             | 2.0                                                                                                                                                                 | 2.0                                                                               |                                                                                   | 2.0                                                                                                                                                                 | 2.0                                                                               |                                                                                   | 2.0                                                                                 | 2.0                                                                                                                                                                     |                                                                                     | 2.0                                                                                 | 2.0                                                                                                                                                                     |                                                                                     |
| Lane Grp Cap (vph)                | 277                                                                                                                                                                 | 321                                                                               |                                                                                   | 165                                                                                                                                                                 | 258                                                                               |                                                                                   | 82                                                                                  | 1597                                                                                                                                                                    |                                                                                     | 137                                                                                 | 1639                                                                                                                                                                    |                                                                                     |
| v/s Ratio Prot                    | c0.04                                                                                                                                                               | c0.09                                                                             |                                                                                   | 0.02                                                                                                                                                                | c0.10                                                                             |                                                                                   | 0.02                                                                                | c0.23                                                                                                                                                                   |                                                                                     | c0.05                                                                               | c0.22                                                                                                                                                                   |                                                                                     |
| v/s Ratio Perm                    |                                                                                                                                                                     |                                                                                   |                                                                                   |                                                                                                                                                                     |                                                                                   |                                                                                   |                                                                                     |                                                                                                                                                                         |                                                                                     |                                                                                     |                                                                                                                                                                         |                                                                                     |
| v/c Ratio                         | 0.48                                                                                                                                                                | 0.52                                                                              |                                                                                   | 0.30                                                                                                                                                                | 0.64                                                                              |                                                                                   | 0.48                                                                                | 0.48                                                                                                                                                                    |                                                                                     | 0.58                                                                                | 0.42                                                                                                                                                                    |                                                                                     |
| Uniform Delay, d1                 | 43.7                                                                                                                                                                | 36.8                                                                              |                                                                                   | 45.7                                                                                                                                                                | 39.9                                                                              |                                                                                   | 46.4                                                                                | 17.3                                                                                                                                                                    |                                                                                     | 44.4                                                                                | 14.8                                                                                                                                                                    |                                                                                     |
| Progression Factor                | 1.00                                                                                                                                                                | 1.00                                                                              |                                                                                   | 1.00                                                                                                                                                                | 1.00                                                                              |                                                                                   | 1.00                                                                                | 1.00                                                                                                                                                                    |                                                                                     | 1.25                                                                                | 0.69                                                                                                                                                                    |                                                                                     |
| Incremental Delay, d2             | 0.5                                                                                                                                                                 | 0.6                                                                               |                                                                                   | 0.4                                                                                                                                                                 | 3.7                                                                               |                                                                                   | 1.6                                                                                 | 1.1                                                                                                                                                                     |                                                                                     | 4.0                                                                                 | 0.1                                                                                                                                                                     |                                                                                     |
| Delay (s)                         | 44.2                                                                                                                                                                | 37.4                                                                              |                                                                                   | 46.1                                                                                                                                                                | 43.6                                                                              |                                                                                   | 48.0                                                                                | 18.4                                                                                                                                                                    |                                                                                     | 59.5                                                                                | 10.3                                                                                                                                                                    |                                                                                     |
| Level of Service                  | D                                                                                                                                                                   | D                                                                                 |                                                                                   | D                                                                                                                                                                   | D                                                                                 |                                                                                   | D                                                                                   | B                                                                                                                                                                       |                                                                                     | E                                                                                   | B                                                                                                                                                                       |                                                                                     |
| Approach Delay (s)                |                                                                                                                                                                     | 40.2                                                                              |                                                                                   |                                                                                                                                                                     | 44.1                                                                              |                                                                                   |                                                                                     | 19.8                                                                                                                                                                    |                                                                                     |                                                                                     | 15.4                                                                                                                                                                    |                                                                                     |
| Approach LOS                      |                                                                                                                                                                     | D                                                                                 |                                                                                   |                                                                                                                                                                     | D                                                                                 |                                                                                   |                                                                                     | B                                                                                                                                                                       |                                                                                     |                                                                                     | B                                                                                                                                                                       |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                                                                                                     |                                                                                   |                                                                                   |                                                                                                                                                                     |                                                                                   |                                                                                   |                                                                                     |                                                                                                                                                                         |                                                                                     |                                                                                     |                                                                                                                                                                         |                                                                                     |
| HCM 2000 Control Delay            |                                                                                                                                                                     |                                                                                   | 24.1                                                                              |                                                                                                                                                                     |                                                                                   | HCM 2000 Level of Service                                                         |                                                                                     |                                                                                                                                                                         | C                                                                                   |                                                                                     |                                                                                                                                                                         |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                                                                                                     |                                                                                   | 0.52                                                                              |                                                                                                                                                                     |                                                                                   |                                                                                   |                                                                                     |                                                                                                                                                                         |                                                                                     |                                                                                     |                                                                                                                                                                         |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                                                                                                     |                                                                                   | 100.0                                                                             |                                                                                                                                                                     |                                                                                   | Sum of lost time (s)                                                              |                                                                                     |                                                                                                                                                                         | 20.0                                                                                |                                                                                     |                                                                                                                                                                         |                                                                                     |
| Intersection Capacity Utilization |                                                                                                                                                                     |                                                                                   | 53.1%                                                                             |                                                                                                                                                                     |                                                                                   | ICU Level of Service                                                              |                                                                                     |                                                                                                                                                                         | A                                                                                   |                                                                                     |                                                                                                                                                                         |                                                                                     |
| Analysis Period (min)             |                                                                                                                                                                     |                                                                                   | 15                                                                                |                                                                                                                                                                     |                                                                                   |                                                                                   |                                                                                     |                                                                                                                                                                         |                                                                                     |                                                                                     |                                                                                                                                                                         |                                                                                     |
| c Critical Lane Group             |                                                                                                                                                                     |                                                                                   |                                                                                   |                                                                                                                                                                     |                                                                                   |                                                                                   |                                                                                     |                                                                                                                                                                         |                                                                                     |                                                                                     |                                                                                                                                                                         |                                                                                     |

Queues  
1: SE 164th Ave & SE 15th St

Existing Traffic Conditions  
PM Peak Hour Conditions

|                         |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                               | NBT                                                                                | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Group Flow (vph)   | 42                                                                                | 121                                                                               | 115                                                                               | 116                                                                               | 95                                                                                | 125                                                                               | 1436                                                                               | 47                                                                                  | 153                                                                                 | 1361                                                                                | 38                                                                                  |
| v/c Ratio               | 0.09                                                                              | 0.26                                                                              | 0.24                                                                              | 0.21                                                                              | 0.18                                                                              | 0.61                                                                              | 0.79                                                                               | 0.08                                                                                | 0.63                                                                                | 0.69                                                                                | 0.06                                                                                |
| Control Delay           | 28.3                                                                              | 36.7                                                                              | 28.8                                                                              | 37.9                                                                              | 8.4                                                                               | 62.4                                                                              | 37.4                                                                               | 0.2                                                                                 | 60.1                                                                                | 32.7                                                                                | 0.2                                                                                 |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 28.3                                                                              | 36.7                                                                              | 28.8                                                                              | 37.9                                                                              | 8.4                                                                               | 62.4                                                                              | 37.4                                                                               | 0.2                                                                                 | 60.1                                                                                | 32.7                                                                                | 0.2                                                                                 |
| Queue Length 50th (ft)  | 20                                                                                | 66                                                                                | 58                                                                                | 69                                                                                | 0                                                                                 | 94                                                                                | 360                                                                                | 0                                                                                   | 113                                                                                 | 317                                                                                 | 0                                                                                   |
| Queue Length 95th (ft)  | 51                                                                                | 135                                                                               | 116                                                                               | 137                                                                               | 42                                                                                | 148                                                                               | 364                                                                                | 0                                                                                   | 172                                                                                 | 324                                                                                 | 0                                                                                   |
| Internal Link Dist (ft) |                                                                                   | 642                                                                               |                                                                                   | 766                                                                               |                                                                                   |                                                                                   | 1016                                                                               |                                                                                     |                                                                                     | 601                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 100                                                                               |                                                                                   | 250                                                                               |                                                                                   | 325                                                                               | 150                                                                               |                                                                                    | 150                                                                                 | 230                                                                                 |                                                                                     | 230                                                                                 |
| Base Capacity (vph)     | 499                                                                               | 548                                                                               | 480                                                                               | 614                                                                               | 567                                                                               | 220                                                                               | 1973                                                                               | 667                                                                                 | 247                                                                                 | 2060                                                                                | 693                                                                                 |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.08                                                                              | 0.22                                                                              | 0.24                                                                              | 0.19                                                                              | 0.17                                                                              | 0.57                                                                              | 0.73                                                                               | 0.07                                                                                | 0.62                                                                                | 0.66                                                                                | 0.05                                                                                |
| Intersection Summary    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM Signalized Intersection Capacity Analysis

1: SE 164th Ave & SE 15th St

## Existing Traffic Conditions

PM Peak Hour Conditions

|                                   |  |                                                                                   |       |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|-----------------------------------|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                                | EBT                                                                               | EBR   | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |   |  |       |  |  |  |  |  |  |  |  |  |
| Traffic Volume (vph)              | 37                                                                                 | 77                                                                                | 29    | 101                                                                               | 102                                                                               | 84                                                                                | 110                                                                                | 1264                                                                                | 41                                                                                  | 135                                                                                 | 1198                                                                                | 33                                                                                  |
| Future Volume (vph)               | 37                                                                                 | 77                                                                                | 29    | 101                                                                               | 102                                                                               | 84                                                                                | 110                                                                                | 1264                                                                                | 41                                                                                  | 135                                                                                 | 1198                                                                                | 33                                                                                  |
| Ideal Flow (vphpl)                | 1900                                                                               | 1900                                                                              | 1900  | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 4.5                                                                                | 5.0                                                                               |       | 4.5                                                                               | 5.0                                                                               | 5.0                                                                               | 4.5                                                                                | 5.0                                                                                 | 5.0                                                                                 | 4.5                                                                                 | 5.0                                                                                 | 5.0                                                                                 |
| Lane Util. Factor                 | 1.00                                                                               | 1.00                                                                              |       | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                               | 0.91                                                                                | 1.00                                                                                | 1.00                                                                                | 0.91                                                                                | 1.00                                                                                |
| Frpb, ped/bikes                   | 1.00                                                                               | 1.00                                                                              |       | 1.00                                                                              | 1.00                                                                              | 0.98                                                                              | 1.00                                                                               | 1.00                                                                                | 0.98                                                                                | 1.00                                                                                | 1.00                                                                                | 0.98                                                                                |
| Flpb, ped/bikes                   | 1.00                                                                               | 1.00                                                                              |       | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                               | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Frt                               | 1.00                                                                               | 0.96                                                                              |       | 1.00                                                                              | 1.00                                                                              | 0.85                                                                              | 1.00                                                                               | 1.00                                                                                | 0.85                                                                                | 1.00                                                                                | 1.00                                                                                | 0.85                                                                                |
| Flt Protected                     | 0.95                                                                               | 1.00                                                                              |       | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                               | 1.00                                                                                | 1.00                                                                                | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                |
| Satd. Flow (prot)                 | 1805                                                                               | 1787                                                                              |       | 1803                                                                              | 1881                                                                              | 1530                                                                              | 1805                                                                               | 5036                                                                                | 1549                                                                                | 1787                                                                                | 5136                                                                                | 1580                                                                                |
| Flt Permitted                     | 0.68                                                                               | 1.00                                                                              |       | 0.58                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                               | 1.00                                                                                | 1.00                                                                                | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                |
| Satd. Flow (perm)                 | 1296                                                                               | 1787                                                                              |       | 1093                                                                              | 1881                                                                              | 1530                                                                              | 1805                                                                               | 5036                                                                                | 1549                                                                                | 1787                                                                                | 5136                                                                                | 1580                                                                                |
| Peak-hour factor, PHF             | 0.88                                                                               | 0.88                                                                              | 0.88  | 0.88                                                                              | 0.88                                                                              | 0.88                                                                              | 0.88                                                                               | 0.88                                                                                | 0.88                                                                                | 0.88                                                                                | 0.88                                                                                | 0.88                                                                                |
| Adj. Flow (vph)                   | 42                                                                                 | 88                                                                                | 33    | 115                                                                               | 116                                                                               | 95                                                                                | 125                                                                                | 1436                                                                                | 47                                                                                  | 153                                                                                 | 1361                                                                                | 38                                                                                  |
| RTOR Reduction (vph)              | 0                                                                                  | 11                                                                                | 0     | 0                                                                                 | 0                                                                                 | 67                                                                                | 0                                                                                  | 0                                                                                   | 30                                                                                  | 0                                                                                   | 0                                                                                   | 23                                                                                  |
| Lane Group Flow (vph)             | 42                                                                                 | 110                                                                               | 0     | 115                                                                               | 116                                                                               | 28                                                                                | 125                                                                                | 1436                                                                                | 17                                                                                  | 153                                                                                 | 1361                                                                                | 15                                                                                  |
| Confl. Peds. (#/hr)               |                                                                                    |                                                                                   | 2     | 2                                                                                 |                                                                                   |                                                                                   | 1                                                                                  |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 1                                                                                   |
| Confl. Bikes (#/hr)               |                                                                                    |                                                                                   |       |                                                                                   |                                                                                   | 4                                                                                 |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Heavy Vehicles (%)                | 0%                                                                                 | 1%                                                                                | 3%    | 0%                                                                                | 1%                                                                                | 4%                                                                                | 0%                                                                                 | 3%                                                                                  | 2%                                                                                  | 1%                                                                                  | 1%                                                                                  | 0%                                                                                  |
| Turn Type                         | pm+pt                                                                              | NA                                                                                |       | pm+pt                                                                             | NA                                                                                | Perm                                                                              | Prot                                                                               | NA                                                                                  | Perm                                                                                | Prot                                                                                | NA                                                                                  | Perm                                                                                |
| Protected Phases                  | 5                                                                                  | 2                                                                                 |       | 1                                                                                 | 6                                                                                 |                                                                                   | 7                                                                                  | 4                                                                                   |                                                                                     | 3                                                                                   | 8                                                                                   |                                                                                     |
| Permitted Phases                  | 2                                                                                  |                                                                                   |       | 6                                                                                 |                                                                                   | 6                                                                                 |                                                                                    |                                                                                     | 4                                                                                   |                                                                                     |                                                                                     | 8                                                                                   |
| Actuated Green, G (s)             | 37.3                                                                               | 31.0                                                                              |       | 45.1                                                                              | 34.9                                                                              | 34.9                                                                              | 13.7                                                                               | 43.4                                                                                | 43.4                                                                                | 16.4                                                                                | 46.1                                                                                | 46.1                                                                                |
| Effective Green, g (s)            | 37.3                                                                               | 31.0                                                                              |       | 45.1                                                                              | 34.9                                                                              | 34.9                                                                              | 13.7                                                                               | 43.4                                                                                | 43.4                                                                                | 16.4                                                                                | 46.1                                                                                | 46.1                                                                                |
| Actuated g/C Ratio                | 0.31                                                                               | 0.26                                                                              |       | 0.38                                                                              | 0.29                                                                              | 0.29                                                                              | 0.11                                                                               | 0.36                                                                                | 0.36                                                                                | 0.14                                                                                | 0.38                                                                                | 0.38                                                                                |
| Clearance Time (s)                | 4.5                                                                                | 5.0                                                                               |       | 4.5                                                                               | 5.0                                                                               | 5.0                                                                               | 4.5                                                                                | 5.0                                                                                 | 5.0                                                                                 | 4.5                                                                                 | 5.0                                                                                 | 5.0                                                                                 |
| Vehicle Extension (s)             | 3.0                                                                                | 2.0                                                                               |       | 3.0                                                                               | 2.0                                                                               | 2.0                                                                               | 3.0                                                                                | 2.0                                                                                 | 2.0                                                                                 | 3.0                                                                                 | 2.0                                                                                 | 2.0                                                                                 |
| Lane Grp Cap (vph)                | 429                                                                                | 461                                                                               |       | 471                                                                               | 547                                                                               | 444                                                                               | 206                                                                                | 1821                                                                                | 560                                                                                 | 244                                                                                 | 1973                                                                                | 606                                                                                 |
| v/s Ratio Prot                    | 0.01                                                                               | 0.06                                                                              |       | c0.02                                                                             | 0.06                                                                              |                                                                                   | 0.07                                                                               | c0.29                                                                               |                                                                                     | c0.09                                                                               | c0.27                                                                               |                                                                                     |
| v/s Ratio Perm                    | 0.03                                                                               |                                                                                   |       | c0.07                                                                             |                                                                                   | 0.02                                                                              |                                                                                    |                                                                                     | 0.01                                                                                |                                                                                     |                                                                                     | 0.01                                                                                |
| v/c Ratio                         | 0.10                                                                               | 0.24                                                                              |       | 0.24                                                                              | 0.21                                                                              | 0.06                                                                              | 0.61                                                                               | 0.79                                                                                | 0.03                                                                                | 0.63                                                                                | 0.69                                                                                | 0.02                                                                                |
| Uniform Delay, d1                 | 29.2                                                                               | 35.2                                                                              |       | 25.1                                                                              | 32.2                                                                              | 30.7                                                                              | 50.6                                                                               | 34.2                                                                                | 24.7                                                                                | 48.9                                                                                | 31.0                                                                                | 23.0                                                                                |
| Progression Factor                | 1.00                                                                               | 1.00                                                                              |       | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                               | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Incremental Delay, d2             | 0.1                                                                                | 1.2                                                                               |       | 0.3                                                                               | 0.9                                                                               | 0.3                                                                               | 5.0                                                                                | 2.2                                                                                 | 0.0                                                                                 | 5.0                                                                                 | 0.8                                                                                 | 0.0                                                                                 |
| Delay (s)                         | 29.3                                                                               | 36.4                                                                              |       | 25.4                                                                              | 33.0                                                                              | 31.0                                                                              | 55.6                                                                               | 36.4                                                                                | 24.7                                                                                | 53.9                                                                                | 31.8                                                                                | 23.0                                                                                |
| Level of Service                  | C                                                                                  | D                                                                                 |       | C                                                                                 | C                                                                                 | C                                                                                 | E                                                                                  | D                                                                                   | C                                                                                   | D                                                                                   | C                                                                                   | C                                                                                   |
| Approach Delay (s)                |                                                                                    | 34.6                                                                              |       |                                                                                   | 29.7                                                                              |                                                                                   |                                                                                    | 37.5                                                                                |                                                                                     |                                                                                     | 33.7                                                                                |                                                                                     |
| Approach LOS                      |                                                                                    | C                                                                                 |       |                                                                                   | C                                                                                 |                                                                                   |                                                                                    | D                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                    |                                                                                   |       |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                    |                                                                                   | 35.1  |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                    |                                                                                   | 0.55  |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                    |                                                                                   | 120.0 |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                    |                                                                                   | 62.4% |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                    |                                                                                   | 15    |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                    |                                                                                   |       |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |



HCM 6th TWSC  
2: SE 189th Ave & SE 15th St

Existing Traffic Conditions  
PM Peak Hour Conditions

| Intersection             |                                                                                   |      |        |                                                                                   |        |                                                                                   |
|--------------------------|-----------------------------------------------------------------------------------|------|--------|-----------------------------------------------------------------------------------|--------|-----------------------------------------------------------------------------------|
| Int Delay, s/veh         | 0.9                                                                               |      |        |                                                                                   |        |                                                                                   |
| Movement                 | EBT                                                                               | EBR  | WBL    | WBT                                                                               | NBL    | NBR                                                                               |
| Lane Configurations      |  |      |        |  |        |  |
| Traffic Vol, veh/h       | 230                                                                               | 13   | 21     | 211                                                                               | 11     | 12                                                                                |
| Future Vol, veh/h        | 230                                                                               | 13   | 21     | 211                                                                               | 11     | 12                                                                                |
| Conflicting Peds, #/hr   | 0                                                                                 | 4    | 4      | 0                                                                                 | 6      | 0                                                                                 |
| Sign Control             | Free                                                                              | Free | Free   | Free                                                                              | Stop   | Stop                                                                              |
| RT Channelized           | -                                                                                 | None | -      | None                                                                              | -      | None                                                                              |
| Storage Length           | -                                                                                 | -    | -      | -                                                                                 | 0      | -                                                                                 |
| Veh in Median Storage, # | 0                                                                                 | -    | -      | 0                                                                                 | 0      | -                                                                                 |
| Grade, %                 | 0                                                                                 | -    | -      | 0                                                                                 | 0      | -                                                                                 |
| Peak Hour Factor         | 86                                                                                | 86   | 86     | 86                                                                                | 86     | 86                                                                                |
| Heavy Vehicles, %        | 1                                                                                 | 8    | 5      | 1                                                                                 | 0      | 8                                                                                 |
| Mvmt Flow                | 267                                                                               | 15   | 24     | 245                                                                               | 13     | 14                                                                                |
|                          |                                                                                   |      |        |                                                                                   |        |                                                                                   |
| Major/Minor              | Major1                                                                            |      | Major2 |                                                                                   | Minor1 |                                                                                   |
| Conflicting Flow All     | 0                                                                                 | 0    | 286    | 0                                                                                 | 578    | 279                                                                               |
| Stage 1                  | -                                                                                 | -    | -      | -                                                                                 | 279    | -                                                                                 |
| Stage 2                  | -                                                                                 | -    | -      | -                                                                                 | 299    | -                                                                                 |
| Critical Hdwy            | -                                                                                 | -    | 4.15   | -                                                                                 | 6.4    | 6.28                                                                              |
| Critical Hdwy Stg 1      | -                                                                                 | -    | -      | -                                                                                 | 5.4    | -                                                                                 |
| Critical Hdwy Stg 2      | -                                                                                 | -    | -      | -                                                                                 | 5.4    | -                                                                                 |
| Follow-up Hdwy           | -                                                                                 | -    | 2.245  | -                                                                                 | 3.5    | 3.372                                                                             |
| Pot Cap-1 Maneuver       | -                                                                                 | -    | 1259   | -                                                                                 | 481    | 746                                                                               |
| Stage 1                  | -                                                                                 | -    | -      | -                                                                                 | 773    | -                                                                                 |
| Stage 2                  | -                                                                                 | -    | -      | -                                                                                 | 757    | -                                                                                 |
| Platoon blocked, %       | -                                                                                 | -    |        | -                                                                                 |        |                                                                                   |
| Mov Cap-1 Maneuver       | -                                                                                 | -    | 1254   | -                                                                                 | 466    | 743                                                                               |
| Mov Cap-2 Maneuver       | -                                                                                 | -    | -      | -                                                                                 | 466    | -                                                                                 |
| Stage 1                  | -                                                                                 | -    | -      | -                                                                                 | 770    | -                                                                                 |
| Stage 2                  | -                                                                                 | -    | -      | -                                                                                 | 736    | -                                                                                 |
|                          |                                                                                   |      |        |                                                                                   |        |                                                                                   |
| Approach                 | EB                                                                                |      | WB     |                                                                                   | NB     |                                                                                   |
| HCM Control Delay, s     | 0                                                                                 |      | 0.7    |                                                                                   | 11.5   |                                                                                   |
| HCM LOS                  |                                                                                   |      |        |                                                                                   | B      |                                                                                   |
|                          |                                                                                   |      |        |                                                                                   |        |                                                                                   |
| Minor Lane/Major Mvmt    | NBLn1                                                                             | EBT  | EBR    | WBL                                                                               | WBT    |                                                                                   |
| Capacity (veh/h)         | 579                                                                               | -    | -      | 1254                                                                              | -      |                                                                                   |
| HCM Lane V/C Ratio       | 0.046                                                                             | -    | -      | 0.019                                                                             | -      |                                                                                   |
| HCM Control Delay (s)    | 11.5                                                                              | -    | -      | 7.9                                                                               | 0      |                                                                                   |
| HCM Lane LOS             | B                                                                                 | -    | -      | A                                                                                 | A      |                                                                                   |
| HCM 95th %tile Q(veh)    | 0.1                                                                               | -    | -      | 0.1                                                                               | -      |                                                                                   |

Queues  
3: SE 192nd Ave & SE 15th St

Existing Traffic Conditions  
PM Peak Hour Conditions

|                         |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                               | NBT                                                                                 | SBL                                                                                 | SBT                                                                                 |
| Lane Group Flow (vph)   | 102                                                                               | 156                                                                               | 45                                                                                | 81                                                                                | 136                                                                               | 54                                                                                | 1071                                                                                | 57                                                                                  | 1094                                                                                |
| v/c Ratio               | 0.65                                                                              | 0.51                                                                              | 0.39                                                                              | 0.40                                                                              | 0.36                                                                              | 0.38                                                                              | 0.55                                                                                | 0.46                                                                                | 0.55                                                                                |
| Control Delay           | 64.5                                                                              | 32.7                                                                              | 54.5                                                                              | 44.8                                                                              | 7.5                                                                               | 55.5                                                                              | 24.5                                                                                | 56.4                                                                                | 18.7                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 64.5                                                                              | 32.7                                                                              | 54.5                                                                              | 44.8                                                                              | 7.5                                                                               | 55.5                                                                              | 24.5                                                                                | 56.4                                                                                | 18.7                                                                                |
| Queue Length 50th (ft)  | 63                                                                                | 68                                                                                | 28                                                                                | 51                                                                                | 3                                                                                 | 27                                                                                | 277                                                                                 | 36                                                                                  | 233                                                                                 |
| Queue Length 95th (ft)  | #159                                                                              | 115                                                                               | 63                                                                                | 79                                                                                | 37                                                                                | m38                                                                               | 293                                                                                 | 75                                                                                  | 405                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 206                                                                               |                                                                                   | 1016                                                                              |                                                                                   |                                                                                   | 1126                                                                                |                                                                                     | 238                                                                                 |
| Turn Bay Length (ft)    | 115                                                                               |                                                                                   | 110                                                                               |                                                                                   | 110                                                                               | 150                                                                               |                                                                                     | 475                                                                                 |                                                                                     |
| Base Capacity (vph)     | 160                                                                               | 471                                                                               | 162                                                                               | 507                                                                               | 437                                                                               | 160                                                                               | 1953                                                                                | 194                                                                                 | 1973                                                                                |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.64                                                                              | 0.33                                                                              | 0.28                                                                              | 0.16                                                                              | 0.31                                                                              | 0.34                                                                              | 0.55                                                                                | 0.29                                                                                | 0.55                                                                                |

Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

# HCM Signalized Intersection Capacity Analysis

## 3: SE 192nd Ave & SE 15th St

Existing Traffic Conditions  
PM Peak Hour Conditions

|                                   |  |  |  |  |  |  |   |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Traffic Volume (vph)              | 93                                                                                | 74                                                                                | 68                                                                                | 41                                                                                | 74                                                                                | 124                                                                               | 49                                                                                  | 948                                                                                 | 26                                                                                  | 52                                                                                  | 885                                                                                 | 110                                                                                 |
| Future Volume (vph)               | 93                                                                                | 74                                                                                | 68                                                                                | 41                                                                                | 74                                                                                | 124                                                                               | 49                                                                                  | 948                                                                                 | 26                                                                                  | 52                                                                                  | 885                                                                                 | 110                                                                                 |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                                 | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Lane Util. Factor                 | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 0.95                                                                                |                                                                                     | 1.00                                                                                | 0.95                                                                                |                                                                                     |
| Frpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 0.99                                                                              | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Flpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Frt                               | 1.00                                                                              | 0.93                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 0.85                                                                              | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 0.98                                                                                |                                                                                     |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                                | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (prot)                 | 1787                                                                              | 1754                                                                              |                                                                                   | 1805                                                                              | 1881                                                                              | 1602                                                                              | 1736                                                                                | 3520                                                                                |                                                                                     | 1770                                                                                | 3505                                                                                |                                                                                     |
| Flt Permitted                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                                | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (perm)                 | 1787                                                                              | 1754                                                                              |                                                                                   | 1805                                                                              | 1881                                                                              | 1602                                                                              | 1736                                                                                | 3520                                                                                |                                                                                     | 1770                                                                                | 3505                                                                                |                                                                                     |
| Peak-hour factor, PHF             | 0.91                                                                              | 0.91                                                                              | 0.91                                                                              | 0.91                                                                              | 0.91                                                                              | 0.91                                                                              | 0.91                                                                                | 0.91                                                                                | 0.91                                                                                | 0.91                                                                                | 0.91                                                                                | 0.91                                                                                |
| Adj. Flow (vph)                   | 102                                                                               | 81                                                                                | 75                                                                                | 45                                                                                | 81                                                                                | 136                                                                               | 54                                                                                  | 1042                                                                                | 29                                                                                  | 57                                                                                  | 973                                                                                 | 121                                                                                 |
| RTOR Reduction (vph)              | 0                                                                                 | 37                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 108                                                                               | 0                                                                                   | 1                                                                                   | 0                                                                                   | 0                                                                                   | 7                                                                                   | 0                                                                                   |
| Lane Group Flow (vph)             | 102                                                                               | 119                                                                               | 0                                                                                 | 45                                                                                | 81                                                                                | 28                                                                                | 54                                                                                  | 1070                                                                                | 0                                                                                   | 57                                                                                  | 1087                                                                                | 0                                                                                   |
| Confl. Peds. (#/hr)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 3                                                                                   |                                                                                     | 4                                                                                   | 4                                                                                   |                                                                                     | 3                                                                                   |
| Confl. Bikes (#/hr)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 1                                                                                 |                                                                                     |                                                                                     | 1                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Heavy Vehicles (%)                | 1%                                                                                | 1%                                                                                | 0%                                                                                | 0%                                                                                | 1%                                                                                | 0%                                                                                | 4%                                                                                  | 2%                                                                                  | 4%                                                                                  | 2%                                                                                  | 1%                                                                                  | 1%                                                                                  |
| Turn Type                         | Prot                                                                              | NA                                                                                |                                                                                   | Prot                                                                              | NA                                                                                | pm+ov                                                                             | Prot                                                                                | NA                                                                                  |                                                                                     | Prot                                                                                | NA                                                                                  |                                                                                     |
| Protected Phases                  | 5                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 6                                                                                 | 3                                                                                 | 7                                                                                   | 4                                                                                   |                                                                                     | 3                                                                                   | 8                                                                                   |                                                                                     |
| Permitted Phases                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 6                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Green, G (s)             | 8.8                                                                               | 15.2                                                                              |                                                                                   | 4.4                                                                               | 10.8                                                                              | 17.8                                                                              | 7.3                                                                                 | 53.4                                                                                |                                                                                     | 7.0                                                                                 | 53.1                                                                                |                                                                                     |
| Effective Green, g (s)            | 8.8                                                                               | 15.2                                                                              |                                                                                   | 4.4                                                                               | 10.8                                                                              | 17.8                                                                              | 7.3                                                                                 | 53.4                                                                                |                                                                                     | 7.0                                                                                 | 53.1                                                                                |                                                                                     |
| Actuated g/C Ratio                | 0.09                                                                              | 0.15                                                                              |                                                                                   | 0.04                                                                              | 0.11                                                                              | 0.18                                                                              | 0.07                                                                                | 0.53                                                                                |                                                                                     | 0.07                                                                                | 0.53                                                                                |                                                                                     |
| Clearance Time (s)                | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                                 | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Vehicle Extension (s)             | 1.0                                                                               | 1.0                                                                               |                                                                                   | 1.0                                                                               | 1.0                                                                               | 1.0                                                                               | 1.0                                                                                 | 1.0                                                                                 |                                                                                     | 1.0                                                                                 | 1.0                                                                                 |                                                                                     |
| Lane Grp Cap (vph)                | 157                                                                               | 266                                                                               |                                                                                   | 79                                                                                | 203                                                                               | 365                                                                               | 126                                                                                 | 1879                                                                                |                                                                                     | 123                                                                                 | 1861                                                                                |                                                                                     |
| v/s Ratio Prot                    | c0.06                                                                             | c0.07                                                                             |                                                                                   | 0.02                                                                              | 0.04                                                                              | 0.01                                                                              | 0.03                                                                                | c0.30                                                                               |                                                                                     | 0.03                                                                                | c0.31                                                                               |                                                                                     |
| v/s Ratio Perm                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 0.01                                                                              |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| v/c Ratio                         | 0.65                                                                              | 0.45                                                                              |                                                                                   | 0.57                                                                              | 0.40                                                                              | 0.08                                                                              | 0.43                                                                                | 0.57                                                                                |                                                                                     | 0.46                                                                                | 0.58                                                                                |                                                                                     |
| Uniform Delay, d1                 | 44.1                                                                              | 38.6                                                                              |                                                                                   | 46.9                                                                              | 41.6                                                                              | 34.3                                                                              | 44.4                                                                                | 15.6                                                                                |                                                                                     | 44.7                                                                                | 15.9                                                                                |                                                                                     |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.16                                                                                | 1.38                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Incremental Delay, d2             | 6.8                                                                               | 0.4                                                                               |                                                                                   | 5.5                                                                               | 0.5                                                                               | 0.0                                                                               | 0.6                                                                                 | 0.9                                                                                 |                                                                                     | 1.0                                                                                 | 0.3                                                                                 |                                                                                     |
| Delay (s)                         | 50.9                                                                              | 39.0                                                                              |                                                                                   | 52.4                                                                              | 42.0                                                                              | 34.3                                                                              | 52.2                                                                                | 22.4                                                                                |                                                                                     | 45.7                                                                                | 16.2                                                                                |                                                                                     |
| Level of Service                  | D                                                                                 | D                                                                                 |                                                                                   | D                                                                                 | D                                                                                 | C                                                                                 | D                                                                                   | C                                                                                   |                                                                                     | D                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay (s)                |                                                                                   | 43.7                                                                              |                                                                                   |                                                                                   | 39.8                                                                              |                                                                                   |                                                                                     | 23.8                                                                                |                                                                                     |                                                                                     | 17.7                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                     | C                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                   |                                                                                   | 24.6                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                   |                                                                                   | 0.60                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 100.0                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 61.1%                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

Queues  
4: SE 192nd Ave & Mill Plain Blvd

Existing Traffic Conditions  
PM Peak Hour Conditions

|                         |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | NBL                                                                               | NBT                                                                                | SBL                                                                                 | SBT                                                                                 |
| Lane Group Flow (vph)   | 300                                                                               | 13                                                                                | 478                                                                               | 49                                                                                | 59                                                                                | 384                                                                               | 848                                                                                | 18                                                                                  | 942                                                                                 |
| v/c Ratio               | 0.58                                                                              | 0.05                                                                              | 0.94                                                                              | 0.13                                                                              | 0.29                                                                              | 0.88                                                                              | 0.54                                                                               | 0.19                                                                                | 0.88                                                                                |
| Control Delay           | 40.7                                                                              | 31.3                                                                              | 45.1                                                                              | 36.4                                                                              | 21.7                                                                              | 65.4                                                                              | 22.8                                                                               | 50.3                                                                                | 42.3                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 40.7                                                                              | 31.3                                                                              | 45.1                                                                              | 36.4                                                                              | 21.7                                                                              | 65.4                                                                              | 22.8                                                                               | 50.3                                                                                | 42.3                                                                                |
| Queue Length 50th (ft)  | 165                                                                               | 8                                                                                 | ~281                                                                              | 19                                                                                | 14                                                                                | 125                                                                               | 174                                                                                | 11                                                                                  | 275                                                                                 |
| Queue Length 95th (ft)  | #440                                                                              | 21                                                                                | 157                                                                               | 65                                                                                | 41                                                                                | #210                                                                              | 293                                                                                | 33                                                                                  | #389                                                                                |
| Internal Link Dist (ft) |                                                                                   | 628                                                                               |                                                                                   |                                                                                   | 391                                                                               |                                                                                   | 457                                                                                |                                                                                     | 709                                                                                 |
| Turn Bay Length (ft)    | 240                                                                               |                                                                                   | 130                                                                               |                                                                                   |                                                                                   | 205                                                                               |                                                                                    | 150                                                                                 |                                                                                     |
| Base Capacity (vph)     | 513                                                                               | 513                                                                               | 513                                                                               | 400                                                                               | 477                                                                               | 441                                                                               | 1557                                                                               | 180                                                                                 | 1125                                                                                |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.58                                                                              | 0.03                                                                              | 0.93                                                                              | 0.12                                                                              | 0.12                                                                              | 0.87                                                                              | 0.54                                                                               | 0.10                                                                                | 0.84                                                                                |

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.  
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.



# HCM Signalized Intersection Capacity Analysis

## 4: SE 192nd Ave & Mill Plain Blvd

Existing Traffic Conditions  
PM Peak Hour Conditions

|                                   |  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                           |                                                                                   |                                                                                   |      |                                                                                     |                                                                                     |      |
|-----------------------------------|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|---------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------|
| Movement                          | EBL                                                                                | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                       | NBL                                                                               | NBT                                                                               | NBR  | SBL                                                                                 | SBT                                                                                 | SBR  |
| Lane Configurations               |   |  |  |  |  |                           |  |  |      |  |  |      |
| Traffic Volume (vph)              | 267                                                                                | 12                                                                                | 425                                                                               | 44                                                                                | 20                                                                                | 33                        | 342                                                                               | 744                                                                               | 11   | 16                                                                                  | 661                                                                                 | 177  |
| Future Volume (vph)               | 267                                                                                | 12                                                                                | 425                                                                               | 44                                                                                | 20                                                                                | 33                        | 342                                                                               | 744                                                                               | 11   | 16                                                                                  | 661                                                                                 | 177  |
| Ideal Flow (vphpl)                | 1900                                                                               | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                      | 1900                                                                              | 1900                                                                              | 1900 | 1900                                                                                | 1900                                                                                | 1900 |
| Total Lost time (s)               | 5.0                                                                                | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               |                           | 5.0                                                                               | 5.0                                                                               |      | 5.0                                                                                 | 5.0                                                                                 |      |
| Lane Util. Factor                 | 1.00                                                                               | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              |                           | 0.97                                                                              | 0.95                                                                              |      | 1.00                                                                                | 0.95                                                                                |      |
| Frpb, ped/bikes                   | 1.00                                                                               | 1.00                                                                              | 0.99                                                                              | 1.00                                                                              | 0.99                                                                              |                           | 1.00                                                                              | 1.00                                                                              |      | 1.00                                                                                | 0.99                                                                                |      |
| Flpb, ped/bikes                   | 1.00                                                                               | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              |                           | 1.00                                                                              | 1.00                                                                              |      | 1.00                                                                                | 1.00                                                                                |      |
| Frt                               | 1.00                                                                               | 1.00                                                                              | 0.85                                                                              | 1.00                                                                              | 0.91                                                                              |                           | 1.00                                                                              | 1.00                                                                              |      | 1.00                                                                                | 0.97                                                                                |      |
| Flt Protected                     | 0.95                                                                               | 1.00                                                                              | 1.00                                                                              | 0.95                                                                              | 1.00                                                                              |                           | 0.95                                                                              | 1.00                                                                              |      | 0.95                                                                                | 1.00                                                                                |      |
| Satd. Flow (prot)                 | 1787                                                                               | 1900                                                                              | 1583                                                                              | 1805                                                                              | 1665                                                                              |                           | 3467                                                                              | 3530                                                                              |      | 1805                                                                                | 3417                                                                                |      |
| Flt Permitted                     | 0.95                                                                               | 1.00                                                                              | 1.00                                                                              | 0.95                                                                              | 1.00                                                                              |                           | 0.95                                                                              | 1.00                                                                              |      | 0.95                                                                                | 1.00                                                                                |      |
| Satd. Flow (perm)                 | 1787                                                                               | 1900                                                                              | 1583                                                                              | 1805                                                                              | 1665                                                                              |                           | 3467                                                                              | 3530                                                                              |      | 1805                                                                                | 3417                                                                                |      |
| Peak-hour factor, PHF             | 0.89                                                                               | 0.89                                                                              | 0.89                                                                              | 0.89                                                                              | 0.89                                                                              | 0.89                      | 0.89                                                                              | 0.89                                                                              | 0.89 | 0.89                                                                                | 0.89                                                                                | 0.89 |
| Adj. Flow (vph)                   | 300                                                                                | 13                                                                                | 478                                                                               | 49                                                                                | 22                                                                                | 37                        | 384                                                                               | 836                                                                               | 12   | 18                                                                                  | 743                                                                                 | 199  |
| RTOR Reduction (vph)              | 0                                                                                  | 0                                                                                 | 126                                                                               | 0                                                                                 | 34                                                                                | 0                         | 0                                                                                 | 1                                                                                 | 0    | 0                                                                                   | 26                                                                                  | 0    |
| Lane Group Flow (vph)             | 300                                                                                | 13                                                                                | 352                                                                               | 49                                                                                | 25                                                                                | 0                         | 384                                                                               | 847                                                                               | 0    | 18                                                                                  | 916                                                                                 | 0    |
| Confl. Peds. (#/hr)               | 8                                                                                  |                                                                                   | 6                                                                                 | 6                                                                                 |                                                                                   | 8                         | 9                                                                                 |                                                                                   | 9    | 9                                                                                   |                                                                                     | 9    |
| Confl. Bikes (#/hr)               |                                                                                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 1                         |                                                                                   |                                                                                   | 3    |                                                                                     |                                                                                     | 1    |
| Heavy Vehicles (%)                | 1%                                                                                 | 0%                                                                                | 1%                                                                                | 0%                                                                                | 0%                                                                                | 3%                        | 1%                                                                                | 2%                                                                                | 0%   | 0%                                                                                  | 2%                                                                                  | 1%   |
| Turn Type                         | Prot                                                                               | NA                                                                                | pm+ov                                                                             | Prot                                                                              | NA                                                                                |                           | Prot                                                                              | NA                                                                                |      | Prot                                                                                | NA                                                                                  |      |
| Protected Phases                  | 5                                                                                  | 2                                                                                 | 7                                                                                 | 1                                                                                 | 6                                                                                 |                           | 7                                                                                 | 4                                                                                 |      | 3                                                                                   | 8                                                                                   |      |
| Permitted Phases                  |                                                                                    |                                                                                   | 2                                                                                 |                                                                                   |                                                                                   |                           |                                                                                   |                                                                                   |      |                                                                                     |                                                                                     |      |
| Actuated Green, G (s)             | 28.8                                                                               | 18.0                                                                              | 33.7                                                                              | 19.8                                                                              | 9.0                                                                               |                           | 15.7                                                                              | 40.0                                                                              |      | 2.2                                                                                 | 26.5                                                                                |      |
| Effective Green, g (s)            | 28.8                                                                               | 18.0                                                                              | 33.7                                                                              | 19.8                                                                              | 9.0                                                                               |                           | 15.7                                                                              | 40.0                                                                              |      | 2.2                                                                                 | 26.5                                                                                |      |
| Actuated g/C Ratio                | 0.29                                                                               | 0.18                                                                              | 0.34                                                                              | 0.20                                                                              | 0.09                                                                              |                           | 0.16                                                                              | 0.40                                                                              |      | 0.02                                                                                | 0.26                                                                                |      |
| Clearance Time (s)                | 5.0                                                                                | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               |                           | 5.0                                                                               | 5.0                                                                               |      | 5.0                                                                                 | 5.0                                                                                 |      |
| Vehicle Extension (s)             | 1.5                                                                                | 1.5                                                                               | 0.5                                                                               | 2.0                                                                               | 2.0                                                                               |                           | 0.5                                                                               | 0.5                                                                               |      | 0.5                                                                                 | 0.5                                                                                 |      |
| Lane Grp Cap (vph)                | 514                                                                                | 342                                                                               | 533                                                                               | 357                                                                               | 149                                                                               |                           | 544                                                                               | 1412                                                                              |      | 39                                                                                  | 905                                                                                 |      |
| v/s Ratio Prot                    | c0.17                                                                              | 0.01                                                                              | 0.10                                                                              | c0.03                                                                             | 0.02                                                                              |                           | c0.11                                                                             | 0.24                                                                              |      | 0.01                                                                                | c0.27                                                                               |      |
| v/s Ratio Perm                    |                                                                                    |                                                                                   | 0.12                                                                              |                                                                                   |                                                                                   |                           |                                                                                   |                                                                                   |      |                                                                                     |                                                                                     |      |
| v/c Ratio                         | 0.58                                                                               | 0.04                                                                              | 0.66                                                                              | 0.14                                                                              | 0.17                                                                              |                           | 0.71                                                                              | 0.60                                                                              |      | 0.46                                                                                | 1.01                                                                                |      |
| Uniform Delay, d1                 | 30.5                                                                               | 33.9                                                                              | 28.3                                                                              | 33.1                                                                              | 42.0                                                                              |                           | 40.0                                                                              | 23.7                                                                              |      | 48.3                                                                                | 36.8                                                                                |      |
| Progression Factor                | 1.00                                                                               | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              |                           | 1.00                                                                              | 1.00                                                                              |      | 1.00                                                                                | 1.00                                                                                |      |
| Incremental Delay, d2             | 1.1                                                                                | 0.0                                                                               | 2.4                                                                               | 0.1                                                                               | 0.2                                                                               |                           | 3.4                                                                               | 1.9                                                                               |      | 3.1                                                                                 | 33.0                                                                                |      |
| Delay (s)                         | 31.6                                                                               | 33.9                                                                              | 30.7                                                                              | 33.1                                                                              | 42.2                                                                              |                           | 43.4                                                                              | 25.6                                                                              |      | 51.4                                                                                | 69.8                                                                                |      |
| Level of Service                  | C                                                                                  | C                                                                                 | C                                                                                 | C                                                                                 | D                                                                                 |                           | D                                                                                 | C                                                                                 |      | D                                                                                   | E                                                                                   |      |
| Approach Delay (s)                |                                                                                    | 31.0                                                                              |                                                                                   |                                                                                   | 38.1                                                                              |                           |                                                                                   | 31.1                                                                              |      |                                                                                     | 69.4                                                                                |      |
| Approach LOS                      |                                                                                    | C                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                           |                                                                                   | C                                                                                 |      |                                                                                     | E                                                                                   |      |
| <b>Intersection Summary</b>       |                                                                                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                           |                                                                                   |                                                                                   |      |                                                                                     |                                                                                     |      |
| HCM 2000 Control Delay            |                                                                                    |                                                                                   | 43.2                                                                              |                                                                                   |                                                                                   | HCM 2000 Level of Service |                                                                                   |                                                                                   |      | D                                                                                   |                                                                                     |      |
| HCM 2000 Volume to Capacity ratio |                                                                                    |                                                                                   | 0.70                                                                              |                                                                                   |                                                                                   |                           |                                                                                   |                                                                                   |      |                                                                                     |                                                                                     |      |
| Actuated Cycle Length (s)         |                                                                                    |                                                                                   | 100.0                                                                             |                                                                                   |                                                                                   | Sum of lost time (s)      |                                                                                   |                                                                                   |      | 20.0                                                                                |                                                                                     |      |
| Intersection Capacity Utilization |                                                                                    |                                                                                   | 68.0%                                                                             |                                                                                   |                                                                                   | ICU Level of Service      |                                                                                   |                                                                                   |      | C                                                                                   |                                                                                     |      |
| Analysis Period (min)             |                                                                                    |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                           |                                                                                   |                                                                                   |      |                                                                                     |                                                                                     |      |
| c Critical Lane Group             |                                                                                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                           |                                                                                   |                                                                                   |      |                                                                                     |                                                                                     |      |

Queues  
5: SE 192nd Ave & SE 20th St

Existing Traffic Conditions  
PM Peak Hour Conditions

|                         |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | WBL                                                                               | WBT                                                                               | NBL                                                                               | NBT                                                                               | SBL                                                                                | SBT                                                                                 |
| Lane Group Flow (vph)   | 126                                                                               | 239                                                                               | 113                                                                               | 354                                                                               | 101                                                                               | 996                                                                               | 143                                                                                | 1006                                                                                |
| v/c Ratio               | 0.45                                                                              | 0.76                                                                              | 0.24                                                                              | 0.85                                                                              | 0.62                                                                              | 0.75                                                                              | 0.70                                                                               | 0.68                                                                                |
| Control Delay           | 48.8                                                                              | 50.6                                                                              | 39.5                                                                              | 50.6                                                                              | 59.8                                                                              | 33.0                                                                              | 64.7                                                                               | 19.8                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 |
| Total Delay             | 48.8                                                                              | 50.6                                                                              | 39.5                                                                              | 50.6                                                                              | 59.8                                                                              | 33.0                                                                              | 64.7                                                                               | 19.8                                                                                |
| Queue Length 50th (ft)  | 40                                                                                | 132                                                                               | 32                                                                                | 187                                                                               | 62                                                                                | 291                                                                               | 67                                                                                 | 290                                                                                 |
| Queue Length 95th (ft)  | 68                                                                                | 200                                                                               | 59                                                                                | 284                                                                               | 117                                                                               | #458                                                                              | #158                                                                               | #277                                                                                |
| Internal Link Dist (ft) |                                                                                   | 1997                                                                              |                                                                                   | 3145                                                                              |                                                                                   | 1320                                                                              |                                                                                    | 1126                                                                                |
| Turn Bay Length (ft)    | 100                                                                               |                                                                                   | 150                                                                               |                                                                                   | 335                                                                               |                                                                                   | 410                                                                                |                                                                                     |
| Base Capacity (vph)     | 450                                                                               | 462                                                                               | 486                                                                               | 465                                                                               | 186                                                                               | 1330                                                                              | 237                                                                                | 1489                                                                                |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |
| Reduced v/c Ratio       | 0.28                                                                              | 0.52                                                                              | 0.23                                                                              | 0.76                                                                              | 0.54                                                                              | 0.75                                                                              | 0.60                                                                               | 0.68                                                                                |

Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.

# HCM Signalized Intersection Capacity Analysis

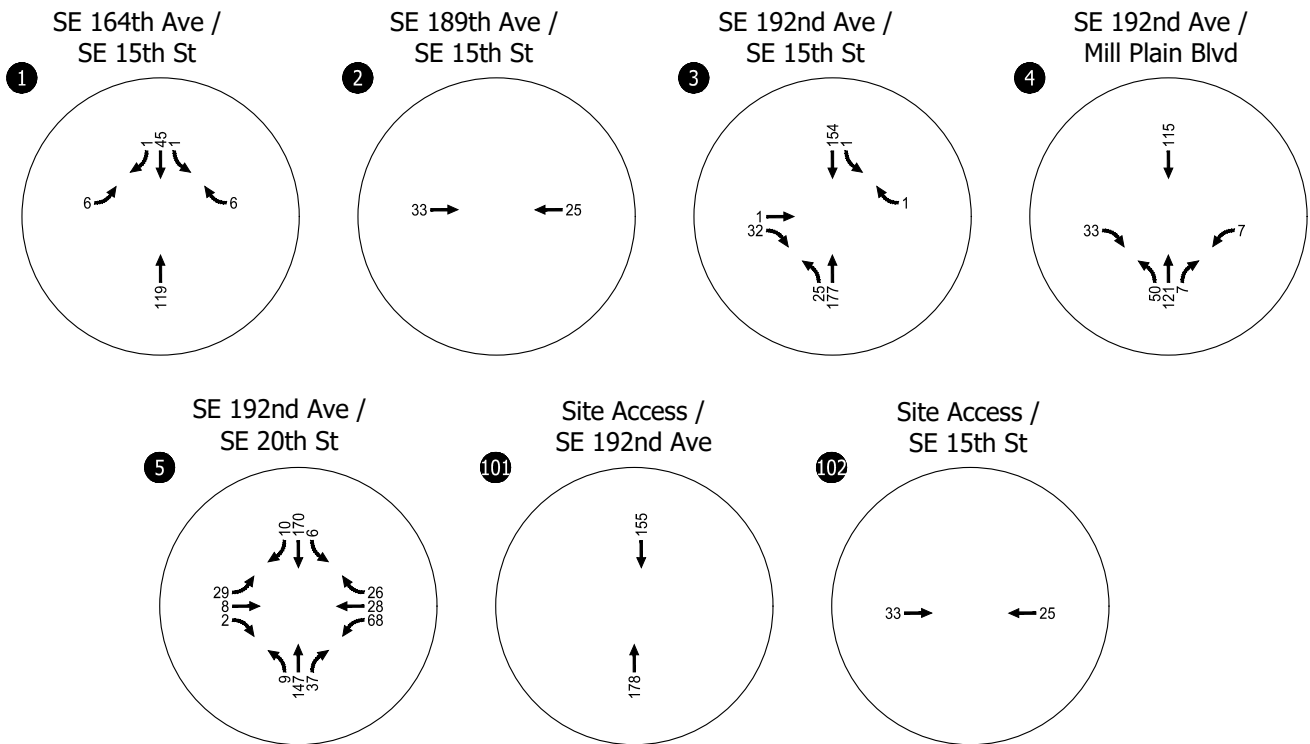
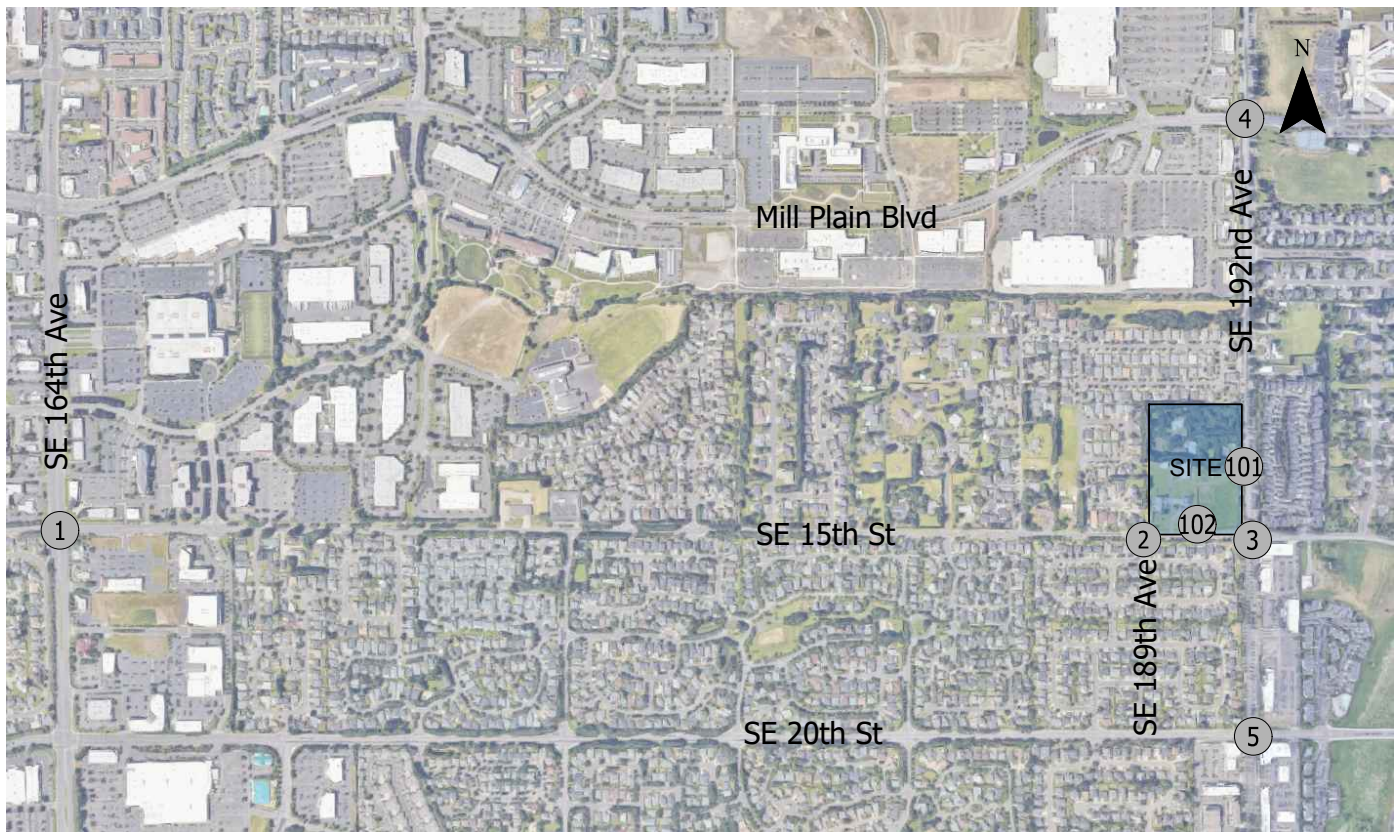
## 5: SE 192nd Ave & SE 20th St

Existing Traffic Conditions  
PM Peak Hour Conditions

|                                   |  |  |  |  |  |  |   |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |                                                                                   |  |  |                                                                                   |  |  |                                                                                     |  |  |  |
| Traffic Volume (vph)              | 121                                                                               | 152                                                                               | 78                                                                                | 108                                                                               | 168                                                                               | 172                                                                               | 97                                                                                  | 861                                                                                 | 95                                                                                  | 137                                                                                 | 828                                                                                 | 137                                                                                 |
| Future Volume (vph)               | 121                                                                               | 152                                                                               | 78                                                                                | 108                                                                               | 168                                                                               | 172                                                                               | 97                                                                                  | 861                                                                                 | 95                                                                                  | 137                                                                                 | 828                                                                                 | 137                                                                                 |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                                 | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Lane Util. Factor                 | 0.97                                                                              | 1.00                                                                              |                                                                                   | 0.97                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                                | 0.95                                                                                |                                                                                     | 1.00                                                                                | 0.95                                                                                |                                                                                     |
| Frpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 0.99                                                                              |                                                                                   | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Flpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Frt                               | 1.00                                                                              | 0.95                                                                              |                                                                                   | 1.00                                                                              | 0.92                                                                              |                                                                                   | 1.00                                                                                | 0.99                                                                                |                                                                                     | 1.00                                                                                | 0.98                                                                                |                                                                                     |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                                | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (prot)                 | 3467                                                                              | 1776                                                                              |                                                                                   | 3502                                                                              | 1721                                                                              |                                                                                   | 1805                                                                                | 3447                                                                                |                                                                                     | 1787                                                                                | 3442                                                                                |                                                                                     |
| Flt Permitted                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                                | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (perm)                 | 3467                                                                              | 1776                                                                              |                                                                                   | 3502                                                                              | 1721                                                                              |                                                                                   | 1805                                                                                | 3447                                                                                |                                                                                     | 1787                                                                                | 3442                                                                                |                                                                                     |
| Peak-hour factor, PHF             | 0.96                                                                              | 0.96                                                                              | 0.96                                                                              | 0.96                                                                              | 0.96                                                                              | 0.96                                                                              | 0.96                                                                                | 0.96                                                                                | 0.96                                                                                | 0.96                                                                                | 0.96                                                                                | 0.96                                                                                |
| Adj. Flow (vph)                   | 126                                                                               | 158                                                                               | 81                                                                                | 112                                                                               | 175                                                                               | 179                                                                               | 101                                                                                 | 897                                                                                 | 99                                                                                  | 143                                                                                 | 862                                                                                 | 143                                                                                 |
| RTOR Reduction (vph)              | 0                                                                                 | 21                                                                                | 0                                                                                 | 0                                                                                 | 37                                                                                | 0                                                                                 | 0                                                                                   | 7                                                                                   | 0                                                                                   | 0                                                                                   | 12                                                                                  | 0                                                                                   |
| Lane Group Flow (vph)             | 126                                                                               | 218                                                                               | 0                                                                                 | 113                                                                               | 317                                                                               | 0                                                                                 | 101                                                                                 | 989                                                                                 | 0                                                                                   | 143                                                                                 | 994                                                                                 | 0                                                                                   |
| Confl. Peds. (#/hr)               | 3                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                 |                                                                                   | 3                                                                                 | 1                                                                                   |                                                                                     | 5                                                                                   | 5                                                                                   |                                                                                     | 1                                                                                   |
| Confl. Bikes (#/hr)               |                                                                                   |                                                                                   | 1                                                                                 |                                                                                   |                                                                                   | 4                                                                                 |                                                                                     |                                                                                     | 5                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |
| Heavy Vehicles (%)                | 1%                                                                                | 0%                                                                                | 3%                                                                                | 0%                                                                                | 1%                                                                                | 1%                                                                                | 0%                                                                                  | 3%                                                                                  | 1%                                                                                  | 1%                                                                                  | 2%                                                                                  | 4%                                                                                  |
| Turn Type                         | Prot                                                                              | NA                                                                                |                                                                                   | Prot                                                                              | NA                                                                                |                                                                                   | Prot                                                                                | NA                                                                                  |                                                                                     | Prot                                                                                | NA                                                                                  |                                                                                     |
| Protected Phases                  | 5                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 6                                                                                 |                                                                                   | 7                                                                                   | 4                                                                                   |                                                                                     | 3                                                                                   | 8                                                                                   |                                                                                     |
| Permitted Phases                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Green, G (s)             | 8.0                                                                               | 16.6                                                                              |                                                                                   | 13.6                                                                              | 22.2                                                                              |                                                                                   | 7.9                                                                                 | 38.3                                                                                |                                                                                     | 11.5                                                                                | 41.9                                                                                |                                                                                     |
| Effective Green, g (s)            | 8.0                                                                               | 16.6                                                                              |                                                                                   | 13.6                                                                              | 22.2                                                                              |                                                                                   | 7.9                                                                                 | 38.3                                                                                |                                                                                     | 11.5                                                                                | 41.9                                                                                |                                                                                     |
| Actuated g/C Ratio                | 0.08                                                                              | 0.17                                                                              |                                                                                   | 0.14                                                                              | 0.22                                                                              |                                                                                   | 0.08                                                                                | 0.38                                                                                |                                                                                     | 0.12                                                                                | 0.42                                                                                |                                                                                     |
| Clearance Time (s)                | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                                 | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Vehicle Extension (s)             | 2.0                                                                               | 2.0                                                                               |                                                                                   | 2.0                                                                               | 2.0                                                                               |                                                                                   | 2.0                                                                                 | 2.0                                                                                 |                                                                                     | 2.0                                                                                 | 2.0                                                                                 |                                                                                     |
| Lane Grp Cap (vph)                | 277                                                                               | 294                                                                               |                                                                                   | 476                                                                               | 382                                                                               |                                                                                   | 142                                                                                 | 1320                                                                                |                                                                                     | 205                                                                                 | 1442                                                                                |                                                                                     |
| v/s Ratio Prot                    | 0.04                                                                              | c0.12                                                                             |                                                                                   | 0.03                                                                              | c0.18                                                                             |                                                                                   | 0.06                                                                                | c0.29                                                                               |                                                                                     | c0.08                                                                               | c0.29                                                                               |                                                                                     |
| v/s Ratio Perm                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| v/c Ratio                         | 0.45                                                                              | 0.74                                                                              |                                                                                   | 0.24                                                                              | 0.83                                                                              |                                                                                   | 0.71                                                                                | 0.75                                                                                |                                                                                     | 0.70                                                                                | 0.69                                                                                |                                                                                     |
| Uniform Delay, d1                 | 43.9                                                                              | 39.7                                                                              |                                                                                   | 38.6                                                                              | 37.1                                                                              |                                                                                   | 44.9                                                                                | 26.7                                                                                |                                                                                     | 42.6                                                                                | 23.7                                                                                |                                                                                     |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.15                                                                                | 0.67                                                                                |                                                                                     |
| Incremental Delay, d2             | 0.4                                                                               | 8.5                                                                               |                                                                                   | 0.1                                                                               | 13.2                                                                              |                                                                                   | 13.1                                                                                | 3.9                                                                                 |                                                                                     | 7.2                                                                                 | 1.0                                                                                 |                                                                                     |
| Delay (s)                         | 44.4                                                                              | 48.2                                                                              |                                                                                   | 38.7                                                                              | 50.3                                                                              |                                                                                   | 58.0                                                                                | 30.6                                                                                |                                                                                     | 56.0                                                                                | 16.9                                                                                |                                                                                     |
| Level of Service                  | D                                                                                 | D                                                                                 |                                                                                   | D                                                                                 | D                                                                                 |                                                                                   | E                                                                                   | C                                                                                   |                                                                                     | E                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay (s)                |                                                                                   | 46.9                                                                              |                                                                                   |                                                                                   | 47.5                                                                              |                                                                                   |                                                                                     | 33.1                                                                                |                                                                                     |                                                                                     | 21.8                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                     | C                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                   |                                                                                   | 32.7                                                                              |                                                                                   |                                                                                   | HCM 2000 Level of Service                                                         |                                                                                     |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                   |                                                                                   | 0.79                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 100.0                                                                             |                                                                                   |                                                                                   | Sum of lost time (s)                                                              |                                                                                     |                                                                                     |                                                                                     | 20.0                                                                                |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 74.8%                                                                             |                                                                                   |                                                                                   | ICU Level of Service                                                              |                                                                                     |                                                                                     |                                                                                     | D                                                                                   |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

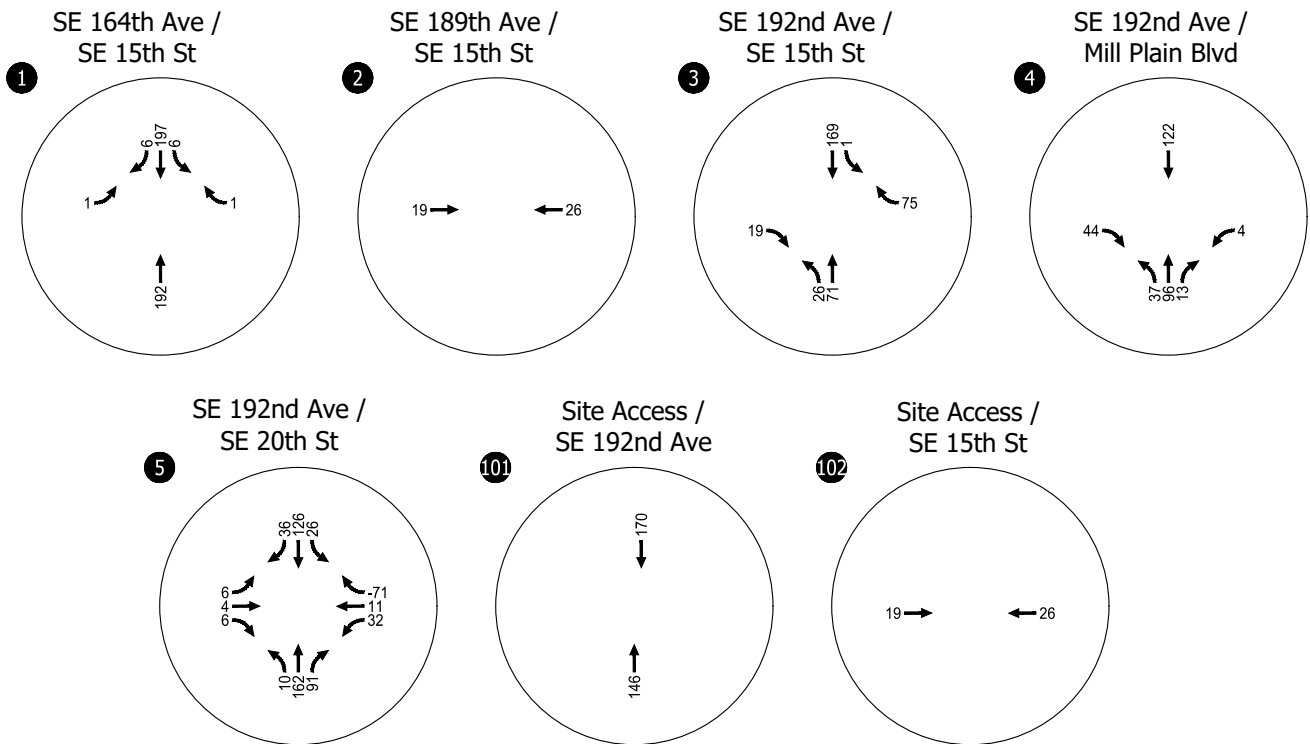
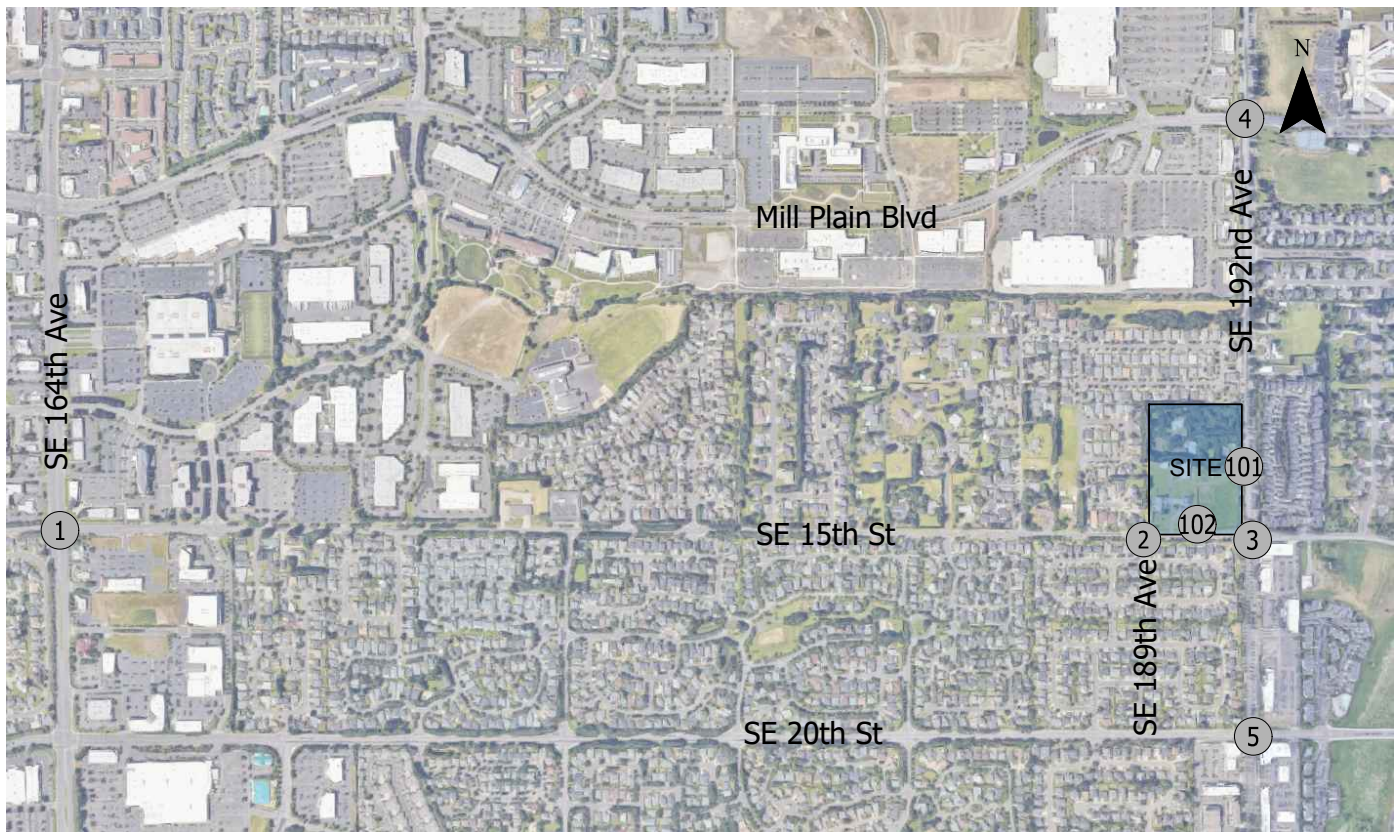
## Appendix D In Process Trips





In-Process Trips  
Weekday AM Peak Hour  
Vancouver, WA

Figure  
D-1



In-Process Trips  
Weekday PM Peak Hour  
Vancouver, WA

Figure  
D-2

Appendix E 2027 Background Operations  
(Existing Zoning) Worksheets



## Queues

1: SE 164th Ave &amp; SE 15th St

## Background 2027 Traffic Conditions

AM Peak Hour Conditions

|                         |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                               | NBT                                                                                | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Group Flow (vph)   | 17                                                                                | 77                                                                                | 50                                                                                | 54                                                                                | 80                                                                                | 64                                                                                | 1150                                                                               | 77                                                                                  | 74                                                                                  | 1063                                                                                | 19                                                                                  |
| v/c Ratio               | 0.03                                                                              | 0.10                                                                              | 0.08                                                                              | 0.06                                                                              | 0.10                                                                              | 0.44                                                                              | 0.77                                                                               | 0.14                                                                                | 0.49                                                                                | 0.70                                                                                | 0.03                                                                                |
| Control Delay           | 19.1                                                                              | 13.8                                                                              | 19.0                                                                              | 24.0                                                                              | 3.9                                                                               | 61.6                                                                              | 41.9                                                                               | 3.2                                                                                 | 62.3                                                                                | 39.1                                                                                | 0.1                                                                                 |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 19.1                                                                              | 13.8                                                                              | 19.0                                                                              | 24.0                                                                              | 3.9                                                                               | 61.6                                                                              | 41.9                                                                               | 3.2                                                                                 | 62.3                                                                                | 39.1                                                                                | 0.1                                                                                 |
| Queue Length 50th (ft)  | 6                                                                                 | 14                                                                                | 19                                                                                | 21                                                                                | 0                                                                                 | 48                                                                                | 297                                                                                | 0                                                                                   | 56                                                                                  | 265                                                                                 | 0                                                                                   |
| Queue Length 95th (ft)  | 23                                                                                | 55                                                                                | 50                                                                                | 62                                                                                | 25                                                                                | 92                                                                                | 320                                                                                | 20                                                                                  | 103                                                                                 | 286                                                                                 | 0                                                                                   |
| Internal Link Dist (ft) |                                                                                   | 600                                                                               |                                                                                   | 638                                                                               |                                                                                   |                                                                                   | 842                                                                                |                                                                                     |                                                                                     | 586                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 100                                                                               |                                                                                   | 250                                                                               |                                                                                   | 325                                                                               | 150                                                                               |                                                                                    | 150                                                                                 | 230                                                                                 |                                                                                     | 230                                                                                 |
| Base Capacity (vph)     | 729                                                                               | 756                                                                               | 674                                                                               | 903                                                                               | 787                                                                               | 167                                                                               | 2014                                                                               | 706                                                                                 | 169                                                                                 | 2014                                                                                | 687                                                                                 |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.02                                                                              | 0.10                                                                              | 0.07                                                                              | 0.06                                                                              | 0.10                                                                              | 0.38                                                                              | 0.57                                                                               | 0.11                                                                                | 0.44                                                                                | 0.53                                                                                | 0.03                                                                                |
| Intersection Summary    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |



# HCM Signalized Intersection Capacity Analysis

1: SE 164th Ave & SE 15th St

# Background 2027 Traffic Conditions

AM Peak Hour Conditions

|                                   |  |  |  |  |  |  |   |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Traffic Volume (vph)              | 16                                                                                | 28                                                                                | 44                                                                                | 47                                                                                | 51                                                                                | 75                                                                                | 60                                                                                  | 1081                                                                                | 72                                                                                  | 70                                                                                  | 999                                                                                 | 18                                                                                  |
| Future Volume (vph)               | 16                                                                                | 28                                                                                | 44                                                                                | 47                                                                                | 51                                                                                | 75                                                                                | 60                                                                                  | 1081                                                                                | 72                                                                                  | 70                                                                                  | 999                                                                                 | 18                                                                                  |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 4.5                                                                               | 5.0                                                                               |                                                                                   | 4.5                                                                               | 5.0                                                                               | 5.0                                                                               | 4.5                                                                                 | 5.0                                                                                 | 5.0                                                                                 | 4.5                                                                                 | 5.0                                                                                 | 5.0                                                                                 |
| Lane Util. Factor                 | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 0.91                                                                                | 1.00                                                                                | 1.00                                                                                | 0.91                                                                                | 1.00                                                                                |
| Frpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 0.99                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Flpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Frt                               | 1.00                                                                              | 0.91                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 0.85                                                                              | 1.00                                                                                | 1.00                                                                                | 0.85                                                                                | 1.00                                                                                | 1.00                                                                                | 0.85                                                                                |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                |
| Satd. Flow (prot)                 | 1802                                                                              | 1695                                                                              |                                                                                   | 1752                                                                              | 1900                                                                              | 1546                                                                              | 1805                                                                                | 5036                                                                                | 1615                                                                                | 1752                                                                                | 5036                                                                                | 1568                                                                                |
| Flt Permitted                     | 0.72                                                                              | 1.00                                                                              |                                                                                   | 0.66                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                |
| Satd. Flow (perm)                 | 1369                                                                              | 1695                                                                              |                                                                                   | 1219                                                                              | 1900                                                                              | 1546                                                                              | 1805                                                                                | 5036                                                                                | 1615                                                                                | 1752                                                                                | 5036                                                                                | 1568                                                                                |
| Peak-hour factor, PHF             | 0.94                                                                              | 0.94                                                                              | 0.94                                                                              | 0.94                                                                              | 0.94                                                                              | 0.94                                                                              | 0.94                                                                                | 0.94                                                                                | 0.94                                                                                | 0.94                                                                                | 0.94                                                                                | 0.94                                                                                |
| Adj. Flow (vph)                   | 17                                                                                | 30                                                                                | 47                                                                                | 50                                                                                | 54                                                                                | 80                                                                                | 64                                                                                  | 1150                                                                                | 77                                                                                  | 74                                                                                  | 1063                                                                                | 19                                                                                  |
| RTOR Reduction (vph)              | 0                                                                                 | 27                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 44                                                                                | 0                                                                                   | 0                                                                                   | 54                                                                                  | 0                                                                                   | 0                                                                                   | 13                                                                                  |
| Lane Group Flow (vph)             | 17                                                                                | 50                                                                                | 0                                                                                 | 50                                                                                | 54                                                                                | 36                                                                                | 64                                                                                  | 1150                                                                                | 23                                                                                  | 74                                                                                  | 1063                                                                                | 6                                                                                   |
| Confl. Peds. (#/hr)               | 1                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 1                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Heavy Vehicles (%)                | 0%                                                                                | 0%                                                                                | 3%                                                                                | 3%                                                                                | 0%                                                                                | 3%                                                                                | 0%                                                                                  | 3%                                                                                  | 0%                                                                                  | 3%                                                                                  | 3%                                                                                  | 3%                                                                                  |
| Turn Type                         | pm+pt                                                                             | NA                                                                                |                                                                                   | pm+pt                                                                             | NA                                                                                | Perm                                                                              | Prot                                                                                | NA                                                                                  | Perm                                                                                | Prot                                                                                | NA                                                                                  | Perm                                                                                |
| Protected Phases                  | 5                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 6                                                                                 |                                                                                   | 7                                                                                   | 4                                                                                   |                                                                                     | 3                                                                                   | 8                                                                                   |                                                                                     |
| Permitted Phases                  | 2                                                                                 |                                                                                   |                                                                                   | 6                                                                                 |                                                                                   | 6                                                                                 |                                                                                     |                                                                                     | 4                                                                                   |                                                                                     |                                                                                     | 8                                                                                   |
| Actuated Green, G (s)             | 52.7                                                                              | 49.9                                                                              |                                                                                   | 59.7                                                                              | 53.4                                                                              | 53.4                                                                              | 8.4                                                                                 | 35.7                                                                                | 35.7                                                                                | 9.1                                                                                 | 36.4                                                                                | 36.4                                                                                |
| Effective Green, g (s)            | 52.7                                                                              | 49.9                                                                              |                                                                                   | 59.7                                                                              | 53.4                                                                              | 53.4                                                                              | 8.4                                                                                 | 35.7                                                                                | 35.7                                                                                | 9.1                                                                                 | 36.4                                                                                | 36.4                                                                                |
| Actuated g/C Ratio                | 0.44                                                                              | 0.42                                                                              |                                                                                   | 0.50                                                                              | 0.44                                                                              | 0.44                                                                              | 0.07                                                                                | 0.30                                                                                | 0.30                                                                                | 0.08                                                                                | 0.30                                                                                | 0.30                                                                                |
| Clearance Time (s)                | 4.5                                                                               | 5.0                                                                               |                                                                                   | 4.5                                                                               | 5.0                                                                               | 5.0                                                                               | 4.5                                                                                 | 5.0                                                                                 | 5.0                                                                                 | 4.5                                                                                 | 5.0                                                                                 | 5.0                                                                                 |
| Vehicle Extension (s)             | 3.0                                                                               | 2.0                                                                               |                                                                                   | 3.0                                                                               | 2.0                                                                               | 2.0                                                                               | 3.0                                                                                 | 2.0                                                                                 | 2.0                                                                                 | 3.0                                                                                 | 2.0                                                                                 | 2.0                                                                                 |
| Lane Grp Cap (vph)                | 611                                                                               | 704                                                                               |                                                                                   | 634                                                                               | 845                                                                               | 687                                                                               | 126                                                                                 | 1498                                                                                | 480                                                                                 | 132                                                                                 | 1527                                                                                | 475                                                                                 |
| v/s Ratio Prot                    | 0.00                                                                              | 0.03                                                                              |                                                                                   | c0.00                                                                             | 0.03                                                                              |                                                                                   | 0.04                                                                                | c0.23                                                                               |                                                                                     | c0.04                                                                               | 0.21                                                                                |                                                                                     |
| v/s Ratio Perm                    | 0.01                                                                              |                                                                                   |                                                                                   | c0.04                                                                             |                                                                                   | 0.02                                                                              |                                                                                     |                                                                                     | 0.01                                                                                |                                                                                     |                                                                                     | 0.00                                                                                |
| v/c Ratio                         | 0.03                                                                              | 0.07                                                                              |                                                                                   | 0.08                                                                              | 0.06                                                                              | 0.05                                                                              | 0.51                                                                                | 0.77                                                                                | 0.05                                                                                | 0.56                                                                                | 0.70                                                                                | 0.01                                                                                |
| Uniform Delay, d1                 | 19.1                                                                              | 21.1                                                                              |                                                                                   | 15.6                                                                              | 19.0                                                                              | 18.9                                                                              | 53.8                                                                                | 38.4                                                                                | 30.0                                                                                | 53.5                                                                                | 36.9                                                                                | 29.2                                                                                |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Incremental Delay, d2             | 0.0                                                                               | 0.2                                                                               |                                                                                   | 0.1                                                                               | 0.0                                                                               | 0.0                                                                               | 3.2                                                                                 | 2.2                                                                                 | 0.0                                                                                 | 5.4                                                                                 | 1.1                                                                                 | 0.0                                                                                 |
| Delay (s)                         | 19.1                                                                              | 21.3                                                                              |                                                                                   | 15.7                                                                              | 19.0                                                                              | 18.9                                                                              | 57.0                                                                                | 40.6                                                                                | 30.1                                                                                | 58.9                                                                                | 38.0                                                                                | 29.2                                                                                |
| Level of Service                  | B                                                                                 | C                                                                                 |                                                                                   | B                                                                                 | B                                                                                 | B                                                                                 | E                                                                                   | D                                                                                   | C                                                                                   | E                                                                                   | D                                                                                   | C                                                                                   |
| Approach Delay (s)                |                                                                                   | 20.9                                                                              |                                                                                   |                                                                                   | 18.1                                                                              |                                                                                   |                                                                                     | 40.7                                                                                |                                                                                     |                                                                                     | 39.2                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | C                                                                                 |                                                                                   |                                                                                   | B                                                                                 |                                                                                   |                                                                                     | D                                                                                   |                                                                                     |                                                                                     | D                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                   |                                                                                   | 37.9                                                                              |                                                                                   |                                                                                   |                                                                                   | HCM 2000 Level of Service                                                           |                                                                                     |                                                                                     | D                                                                                   |                                                                                     |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                   |                                                                                   | 0.37                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 120.0                                                                             |                                                                                   |                                                                                   |                                                                                   | Sum of lost time (s)                                                                |                                                                                     |                                                                                     | 19.0                                                                                |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 49.7%                                                                             |                                                                                   |                                                                                   |                                                                                   | ICU Level of Service                                                                |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

| Intersection             |                                                                                   |      |        |                                                                                   |                                                                                   |      |
|--------------------------|-----------------------------------------------------------------------------------|------|--------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|
| Int Delay, s/veh         | 1                                                                                 |      |        |                                                                                   |                                                                                   |      |
| Movement                 | EBT                                                                               | EBR  | WBL    | WBT                                                                               | NBL                                                                               | NBR  |
| Lane Configurations      |  |      |        |  |  |      |
| Traffic Vol, veh/h       | 203                                                                               | 10   | 8      | 186                                                                               | 16                                                                                | 20   |
| Future Vol, veh/h        | 203                                                                               | 10   | 8      | 186                                                                               | 16                                                                                | 20   |
| Conflicting Peds, #/hr   | 0                                                                                 | 3    | 3      | 0                                                                                 | 3                                                                                 | 0    |
| Sign Control             | Free                                                                              | Free | Free   | Free                                                                              | Stop                                                                              | Stop |
| RT Channelized           | -                                                                                 | None | -      | None                                                                              | -                                                                                 | None |
| Storage Length           | -                                                                                 | -    | -      | -                                                                                 | 0                                                                                 | -    |
| Veh in Median Storage, # | 0                                                                                 | -    | -      | 0                                                                                 | 0                                                                                 | -    |
| Grade, %                 | 0                                                                                 | -    | -      | 0                                                                                 | 0                                                                                 | -    |
| Peak Hour Factor         | 77                                                                                | 77   | 77     | 77                                                                                | 77                                                                                | 77   |
| Heavy Vehicles, %        | 3                                                                                 | 3    | 3      | 3                                                                                 | 0                                                                                 | 0    |
| Mvmt Flow                | 264                                                                               | 13   | 10     | 242                                                                               | 21                                                                                | 26   |
|                          |                                                                                   |      |        |                                                                                   |                                                                                   |      |
| Major/Minor              | Major1                                                                            |      | Major2 |                                                                                   | Minor1                                                                            |      |
| Conflicting Flow All     | 0                                                                                 | 0    | 280    | 0                                                                                 | 539                                                                               | 274  |
| Stage 1                  | -                                                                                 | -    | -      | -                                                                                 | 274                                                                               | -    |
| Stage 2                  | -                                                                                 | -    | -      | -                                                                                 | 265                                                                               | -    |
| Critical Hdwy            | -                                                                                 | -    | 4.13   | -                                                                                 | 6.4                                                                               | 6.2  |
| Critical Hdwy Stg 1      | -                                                                                 | -    | -      | -                                                                                 | 5.4                                                                               | -    |
| Critical Hdwy Stg 2      | -                                                                                 | -    | -      | -                                                                                 | 5.4                                                                               | -    |
| Follow-up Hdwy           | -                                                                                 | -    | 2.227  | -                                                                                 | 3.5                                                                               | 3.3  |
| Pot Cap-1 Maneuver       | -                                                                                 | -    | 1277   | -                                                                                 | 507                                                                               | 770  |
| Stage 1                  | -                                                                                 | -    | -      | -                                                                                 | 777                                                                               | -    |
| Stage 2                  | -                                                                                 | -    | -      | -                                                                                 | 784                                                                               | -    |
| Platoon blocked, %       | -                                                                                 | -    |        | -                                                                                 |                                                                                   |      |
| Mov Cap-1 Maneuver       | -                                                                                 | -    | 1273   | -                                                                                 | 499                                                                               | 768  |
| Mov Cap-2 Maneuver       | -                                                                                 | -    | -      | -                                                                                 | 499                                                                               | -    |
| Stage 1                  | -                                                                                 | -    | -      | -                                                                                 | 775                                                                               | -    |
| Stage 2                  | -                                                                                 | -    | -      | -                                                                                 | 775                                                                               | -    |
|                          |                                                                                   |      |        |                                                                                   |                                                                                   |      |
| Approach                 | EB                                                                                |      | WB     |                                                                                   | NB                                                                                |      |
| HCM Control Delay, s     | 0                                                                                 |      | 0.3    |                                                                                   | 11.3                                                                              |      |
| HCM LOS                  | B                                                                                 |      |        |                                                                                   |                                                                                   |      |
|                          |                                                                                   |      |        |                                                                                   |                                                                                   |      |
| Minor Lane/Major Mvmt    | NBLn1                                                                             | EBT  | EBR    | WBL                                                                               | WBT                                                                               |      |
| Capacity (veh/h)         | 620                                                                               | -    | -      | 1273                                                                              | -                                                                                 |      |
| HCM Lane V/C Ratio       | 0.075                                                                             | -    | -      | 0.008                                                                             | -                                                                                 |      |
| HCM Control Delay (s)    | 11.3                                                                              | -    | -      | 7.9                                                                               | 0                                                                                 |      |
| HCM Lane LOS             | B                                                                                 | -    | -      | A                                                                                 | A                                                                                 |      |
| HCM 95th %tile Q(veh)    | 0.2                                                                               | -    | -      | 0                                                                                 | -                                                                                 |      |

Queues  
3: SE 192nd Ave & SE 15th St

Background 2027 Traffic Conditions  
AM Peak Hour Conditions

|                         |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                               | NBT                                                                                | SBL                                                                                 | SBT                                                                                 |
| Lane Group Flow (vph)   | 150                                                                               | 118                                                                               | 26                                                                                | 59                                                                                | 54                                                                                | 53                                                                                | 939                                                                                | 27                                                                                  | 830                                                                                 |
| v/c Ratio               | 0.72                                                                              | 0.31                                                                              | 0.26                                                                              | 0.40                                                                              | 0.17                                                                              | 0.39                                                                              | 0.46                                                                               | 0.28                                                                                | 0.43                                                                                |
| Control Delay           | 60.5                                                                              | 16.0                                                                              | 51.4                                                                              | 50.0                                                                              | 1.2                                                                               | 44.1                                                                              | 14.5                                                                               | 52.0                                                                                | 16.5                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 60.5                                                                              | 16.0                                                                              | 51.4                                                                              | 50.0                                                                              | 1.2                                                                               | 44.1                                                                              | 14.5                                                                               | 52.0                                                                                | 16.5                                                                                |
| Queue Length 50th (ft)  | 93                                                                                | 22                                                                                | 16                                                                                | 37                                                                                | 0                                                                                 | 27                                                                                | 163                                                                                | 17                                                                                  | 158                                                                                 |
| Queue Length 95th (ft)  | 151                                                                               | 66                                                                                | 43                                                                                | 71                                                                                | 0                                                                                 | m42                                                                               | 147                                                                                | 44                                                                                  | 288                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 318                                                                               |                                                                                   | 1016                                                                              |                                                                                   |                                                                                   | 1126                                                                               |                                                                                     | 227                                                                                 |
| Turn Bay Length (ft)    | 115                                                                               |                                                                                   | 110                                                                               |                                                                                   | 110                                                                               | 150                                                                               |                                                                                    | 475                                                                                 |                                                                                     |
| Base Capacity (vph)     | 350                                                                               | 464                                                                               | 100                                                                               | 175                                                                               | 320                                                                               | 151                                                                               | 2080                                                                               | 109                                                                                 | 1995                                                                                |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.43                                                                              | 0.25                                                                              | 0.26                                                                              | 0.34                                                                              | 0.17                                                                              | 0.35                                                                              | 0.45                                                                               | 0.25                                                                                | 0.42                                                                                |

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

# HCM Signalized Intersection Capacity Analysis

## 3: SE 192nd Ave & SE 15th St

Background 2027 Traffic Conditions  
AM Peak Hour Conditions

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Traffic Volume (vph)              | 138                                                                               | 40                                                                                | 69                                                                                | 24                                                                                | 54                                                                                | 50                                                                                | 49                                                                                  | 839                                                                                 | 25                                                                                  | 25                                                                                  | 693                                                                                 | 71                                                                                  |
| Future Volume (vph)               | 138                                                                               | 40                                                                                | 69                                                                                | 24                                                                                | 54                                                                                | 50                                                                                | 49                                                                                  | 839                                                                                 | 25                                                                                  | 25                                                                                  | 693                                                                                 | 71                                                                                  |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                                 | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Lane Util. Factor                 | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 0.95                                                                                |                                                                                     | 1.00                                                                                | 0.95                                                                                |                                                                                     |
| Frpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 0.99                                                                              | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Flpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Frt                               | 1.00                                                                              | 0.90                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 0.85                                                                              | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 0.99                                                                                |                                                                                     |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                                | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (prot)                 | 1752                                                                              | 1719                                                                              |                                                                                   | 1805                                                                              | 1845                                                                              | 1555                                                                              | 1805                                                                                | 3490                                                                                |                                                                                     | 1752                                                                                | 3449                                                                                |                                                                                     |
| Flt Permitted                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                                | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (perm)                 | 1752                                                                              | 1719                                                                              |                                                                                   | 1805                                                                              | 1845                                                                              | 1555                                                                              | 1805                                                                                | 3490                                                                                |                                                                                     | 1752                                                                                | 3449                                                                                |                                                                                     |
| Peak-hour factor, PHF             | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Adj. Flow (vph)                   | 150                                                                               | 43                                                                                | 75                                                                                | 26                                                                                | 59                                                                                | 54                                                                                | 53                                                                                  | 912                                                                                 | 27                                                                                  | 27                                                                                  | 753                                                                                 | 77                                                                                  |
| RTOR Reduction (vph)              | 0                                                                                 | 61                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 48                                                                                | 0                                                                                   | 2                                                                                   | 0                                                                                   | 0                                                                                   | 7                                                                                   | 0                                                                                   |
| Lane Group Flow (vph)             | 150                                                                               | 57                                                                                | 0                                                                                 | 26                                                                                | 59                                                                                | 6                                                                                 | 53                                                                                  | 937                                                                                 | 0                                                                                   | 27                                                                                  | 823                                                                                 | 0                                                                                   |
| Confl. Peds. (#/hr)               | 1                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 1                                                                                 |                                                                                     |                                                                                     | 3                                                                                   | 3                                                                                   |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     | 1                                                                                   |                                                                                     |                                                                                     | 1                                                                                   |
| Heavy Vehicles (%)                | 3%                                                                                | 0%                                                                                | 0%                                                                                | 0%                                                                                | 3%                                                                                | 3%                                                                                | 0%                                                                                  | 3%                                                                                  | 0%                                                                                  | 3%                                                                                  | 3%                                                                                  | 3%                                                                                  |
| Turn Type                         | Prot                                                                              | NA                                                                                |                                                                                   | Prot                                                                              | NA                                                                                | pm+ov                                                                             | Prot                                                                                | NA                                                                                  |                                                                                     | Prot                                                                                | NA                                                                                  |                                                                                     |
| Protected Phases                  | 5                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 6                                                                                 | 3                                                                                 | 7                                                                                   | 4                                                                                   |                                                                                     | 3                                                                                   | 8                                                                                   |                                                                                     |
| Permitted Phases                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 6                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Green, G (s)             | 14.0                                                                              | 18.5                                                                              |                                                                                   | 2.6                                                                               | 7.1                                                                               | 11.7                                                                              | 6.6                                                                                 | 54.3                                                                                |                                                                                     | 4.6                                                                                 | 52.3                                                                                |                                                                                     |
| Effective Green, g (s)            | 14.0                                                                              | 18.5                                                                              |                                                                                   | 2.6                                                                               | 7.1                                                                               | 11.7                                                                              | 6.6                                                                                 | 54.3                                                                                |                                                                                     | 4.6                                                                                 | 52.3                                                                                |                                                                                     |
| Actuated g/C Ratio                | 0.14                                                                              | 0.18                                                                              |                                                                                   | 0.03                                                                              | 0.07                                                                              | 0.12                                                                              | 0.07                                                                                | 0.54                                                                                |                                                                                     | 0.05                                                                                | 0.52                                                                                |                                                                                     |
| Clearance Time (s)                | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                                 | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Vehicle Extension (s)             | 1.0                                                                               | 1.0                                                                               |                                                                                   | 1.0                                                                               | 1.0                                                                               | 1.0                                                                               | 1.0                                                                                 | 1.0                                                                                 |                                                                                     | 1.0                                                                                 | 1.0                                                                                 |                                                                                     |
| Lane Grp Cap (vph)                | 245                                                                               | 318                                                                               |                                                                                   | 46                                                                                | 130                                                                               | 181                                                                               | 119                                                                                 | 1895                                                                                |                                                                                     | 80                                                                                  | 1803                                                                                |                                                                                     |
| v/s Ratio Prot                    | c0.09                                                                             | c0.03                                                                             |                                                                                   | 0.01                                                                              | c0.03                                                                             | 0.00                                                                              | 0.03                                                                                | c0.27                                                                               |                                                                                     | 0.02                                                                                | c0.24                                                                               |                                                                                     |
| v/s Ratio Perm                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 0.00                                                                              |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| v/c Ratio                         | 0.61                                                                              | 0.18                                                                              |                                                                                   | 0.57                                                                              | 0.45                                                                              | 0.03                                                                              | 0.45                                                                                | 0.49                                                                                |                                                                                     | 0.34                                                                                | 0.46                                                                                |                                                                                     |
| Uniform Delay, d1                 | 40.4                                                                              | 34.3                                                                              |                                                                                   | 48.1                                                                              | 44.6                                                                              | 39.1                                                                              | 44.9                                                                                | 14.3                                                                                |                                                                                     | 46.2                                                                                | 14.9                                                                                |                                                                                     |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 0.87                                                                                | 0.92                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Incremental Delay, d2             | 3.2                                                                               | 0.1                                                                               |                                                                                   | 9.1                                                                               | 0.9                                                                               | 0.0                                                                               | 0.7                                                                                 | 0.7                                                                                 |                                                                                     | 0.9                                                                                 | 0.1                                                                                 |                                                                                     |
| Delay (s)                         | 43.6                                                                              | 34.4                                                                              |                                                                                   | 57.3                                                                              | 45.5                                                                              | 39.2                                                                              | 39.9                                                                                | 13.9                                                                                |                                                                                     | 47.1                                                                                | 15.0                                                                                |                                                                                     |
| Level of Service                  | D                                                                                 | C                                                                                 |                                                                                   | E                                                                                 | D                                                                                 | D                                                                                 | D                                                                                   | B                                                                                   |                                                                                     | D                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay (s)                |                                                                                   | 39.6                                                                              |                                                                                   |                                                                                   | 45.2                                                                              |                                                                                   |                                                                                     | 15.3                                                                                |                                                                                     |                                                                                     | 16.0                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                   |                                                                                   | 20.3                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                   |                                                                                   | 0.52                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 100.0                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 55.0%                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |



Queues  
4: SE 192nd Ave & Mill Plain Blvd

Background 2027 Traffic Conditions  
AM Peak Hour Conditions

|                         |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | NBL                                                                               | NBT                                                                                | SBL                                                                                 | SBT                                                                                 |
| Lane Group Flow (vph)   | 136                                                                               | 118                                                                               | 205                                                                               | 166                                                                               | 234                                                                               | 504                                                                               | 915                                                                                | 100                                                                                 | 802                                                                                 |
| v/c Ratio               | 0.70                                                                              | 0.40                                                                              | 0.34                                                                              | 0.79                                                                              | 0.73                                                                              | 0.85                                                                              | 0.59                                                                               | 0.70                                                                                | 0.67                                                                                |
| Control Delay           | 61.7                                                                              | 39.3                                                                              | 6.4                                                                               | 69.6                                                                              | 44.9                                                                              | 57.4                                                                              | 24.3                                                                               | 69.1                                                                                | 30.5                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 61.7                                                                              | 39.3                                                                              | 6.4                                                                               | 69.6                                                                              | 44.9                                                                              | 57.4                                                                              | 24.3                                                                               | 69.1                                                                                | 30.5                                                                                |
| Queue Length 50th (ft)  | 84                                                                                | 70                                                                                | 21                                                                                | 103                                                                               | 120                                                                               | 162                                                                               | 217                                                                                | 63                                                                                  | 213                                                                                 |
| Queue Length 95th (ft)  | 116                                                                               | 84                                                                                | 29                                                                                | 139                                                                               | 135                                                                               | #227                                                                              | 273                                                                                | 94                                                                                  | 242                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 628                                                                               |                                                                                   |                                                                                   | 391                                                                               |                                                                                   | 457                                                                                |                                                                                     | 709                                                                                 |
| Turn Bay Length (ft)    | 240                                                                               |                                                                                   | 130                                                                               |                                                                                   |                                                                                   | 205                                                                               |                                                                                    | 150                                                                                 |                                                                                     |
| Base Capacity (vph)     | 233                                                                               | 516                                                                               | 602                                                                               | 227                                                                               | 507                                                                               | 591                                                                               | 1561                                                                               | 176                                                                                 | 1200                                                                                |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.58                                                                              | 0.23                                                                              | 0.34                                                                              | 0.73                                                                              | 0.46                                                                              | 0.85                                                                              | 0.59                                                                               | 0.57                                                                                | 0.67                                                                                |

Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.

# HCM Signalized Intersection Capacity Analysis

## 4: SE 192nd Ave & Mill Plain Blvd

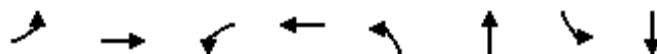
# Background 2027 Traffic Conditions

AM Peak Hour Conditions

|                                   |  |  |  |  |  |  |   |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |  |  |  |                                                                                   |  |  |                                                                                     |  |  |  |
| Traffic Volume (vph)              | 101                                                                               | 87                                                                                | 152                                                                               | 123                                                                               | 96                                                                                | 77                                                                                | 373                                                                                 | 494                                                                                 | 183                                                                                 | 74                                                                                  | 448                                                                                 | 146                                                                                 |
| Future Volume (vph)               | 101                                                                               | 87                                                                                | 152                                                                               | 123                                                                               | 96                                                                                | 77                                                                                | 373                                                                                 | 494                                                                                 | 183                                                                                 | 74                                                                                  | 448                                                                                 | 146                                                                                 |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                                 | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Lane Util. Factor                 | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              |                                                                                   | 0.97                                                                                | 0.95                                                                                |                                                                                     | 1.00                                                                                | 0.95                                                                                |                                                                                     |
| Frpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              | 0.99                                                                              | 1.00                                                                              | 0.99                                                                              |                                                                                   | 1.00                                                                                | 0.99                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Flpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Frt                               | 1.00                                                                              | 1.00                                                                              | 0.85                                                                              | 1.00                                                                              | 0.93                                                                              |                                                                                   | 1.00                                                                                | 0.96                                                                                |                                                                                     | 1.00                                                                                | 0.96                                                                                |                                                                                     |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                                | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (prot)                 | 1752                                                                              | 1845                                                                              | 1552                                                                              | 1752                                                                              | 1711                                                                              |                                                                                   | 3433                                                                                | 3338                                                                                |                                                                                     | 1752                                                                                | 3362                                                                                |                                                                                     |
| Flt Permitted                     | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                                | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (perm)                 | 1752                                                                              | 1845                                                                              | 1552                                                                              | 1752                                                                              | 1711                                                                              |                                                                                   | 3433                                                                                | 3338                                                                                |                                                                                     | 1752                                                                                | 3362                                                                                |                                                                                     |
| Peak-hour factor, PHF             | 0.74                                                                              | 0.74                                                                              | 0.74                                                                              | 0.74                                                                              | 0.74                                                                              | 0.74                                                                              | 0.74                                                                                | 0.74                                                                                | 0.74                                                                                | 0.74                                                                                | 0.74                                                                                | 0.74                                                                                |
| Adj. Flow (vph)                   | 136                                                                               | 118                                                                               | 205                                                                               | 166                                                                               | 130                                                                               | 104                                                                               | 504                                                                                 | 668                                                                                 | 247                                                                                 | 100                                                                                 | 605                                                                                 | 197                                                                                 |
| RTOR Reduction (vph)              | 0                                                                                 | 0                                                                                 | 86                                                                                | 0                                                                                 | 33                                                                                | 0                                                                                 | 0                                                                                   | 29                                                                                  | 0                                                                                   | 0                                                                                   | 28                                                                                  | 0                                                                                   |
| Lane Group Flow (vph)             | 136                                                                               | 118                                                                               | 119                                                                               | 166                                                                               | 201                                                                               | 0                                                                                 | 504                                                                                 | 886                                                                                 | 0                                                                                   | 100                                                                                 | 774                                                                                 | 0                                                                                   |
| Confl. Peds. (#/hr)               | 1                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                 | 3                                                                                   |                                                                                     | 3                                                                                   | 3                                                                                   |                                                                                     | 3                                                                                   |
| Confl. Bikes (#/hr)               |                                                                                   |                                                                                   | 1                                                                                 |                                                                                   |                                                                                   | 1                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     | 1                                                                                   |
| Heavy Vehicles (%)                | 3%                                                                                | 3%                                                                                | 3%                                                                                | 3%                                                                                | 3%                                                                                | 3%                                                                                | 2%                                                                                  | 3%                                                                                  | 3%                                                                                  | 3%                                                                                  | 3%                                                                                  | 3%                                                                                  |
| Turn Type                         | Prot                                                                              | NA                                                                                | pm+ov                                                                             | Prot                                                                              | NA                                                                                |                                                                                   | Prot                                                                                | NA                                                                                  |                                                                                     | Prot                                                                                | NA                                                                                  |                                                                                     |
| Protected Phases                  | 5                                                                                 | 2                                                                                 | 7                                                                                 | 1                                                                                 | 6                                                                                 |                                                                                   | 7                                                                                   | 4                                                                                   |                                                                                     | 3                                                                                   | 8                                                                                   |                                                                                     |
| Permitted Phases                  |                                                                                   |                                                                                   | 2                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Green, G (s)             | 11.1                                                                              | 16.0                                                                              | 34.2                                                                              | 11.9                                                                              | 16.8                                                                              |                                                                                   | 18.2                                                                                | 44.9                                                                                |                                                                                     | 7.2                                                                                 | 33.9                                                                                |                                                                                     |
| Effective Green, g (s)            | 11.1                                                                              | 16.0                                                                              | 34.2                                                                              | 11.9                                                                              | 16.8                                                                              |                                                                                   | 18.2                                                                                | 44.9                                                                                |                                                                                     | 7.2                                                                                 | 33.9                                                                                |                                                                                     |
| Actuated g/C Ratio                | 0.11                                                                              | 0.16                                                                              | 0.34                                                                              | 0.12                                                                              | 0.17                                                                              |                                                                                   | 0.18                                                                                | 0.45                                                                                |                                                                                     | 0.07                                                                                | 0.34                                                                                |                                                                                     |
| Clearance Time (s)                | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                                 | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Vehicle Extension (s)             | 1.5                                                                               | 1.5                                                                               | 0.5                                                                               | 2.0                                                                               | 2.0                                                                               |                                                                                   | 0.5                                                                                 | 0.5                                                                                 |                                                                                     | 0.5                                                                                 | 0.5                                                                                 |                                                                                     |
| Lane Grp Cap (vph)                | 194                                                                               | 295                                                                               | 530                                                                               | 208                                                                               | 287                                                                               |                                                                                   | 624                                                                                 | 1498                                                                                |                                                                                     | 126                                                                                 | 1139                                                                                |                                                                                     |
| v/s Ratio Prot                    | c0.08                                                                             | c0.06                                                                             | 0.04                                                                              | 0.09                                                                              | c0.12                                                                             |                                                                                   | c0.15                                                                               | 0.27                                                                                |                                                                                     | 0.06                                                                                | c0.23                                                                               |                                                                                     |
| v/s Ratio Perm                    |                                                                                   |                                                                                   | 0.04                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| v/c Ratio                         | 0.70                                                                              | 0.40                                                                              | 0.22                                                                              | 0.80                                                                              | 0.70                                                                              |                                                                                   | 0.81                                                                                | 0.59                                                                                |                                                                                     | 0.79                                                                                | 0.68                                                                                |                                                                                     |
| Uniform Delay, d1                 | 42.9                                                                              | 37.7                                                                              | 23.4                                                                              | 42.9                                                                              | 39.2                                                                              |                                                                                   | 39.2                                                                                | 20.7                                                                                |                                                                                     | 45.7                                                                                | 28.4                                                                                |                                                                                     |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Incremental Delay, d2             | 9.0                                                                               | 0.3                                                                               | 0.1                                                                               | 17.7                                                                              | 5.9                                                                               |                                                                                   | 7.2                                                                                 | 1.7                                                                                 |                                                                                     | 26.5                                                                                | 1.3                                                                                 |                                                                                     |
| Delay (s)                         | 51.8                                                                              | 38.0                                                                              | 23.5                                                                              | 60.6                                                                              | 45.1                                                                              |                                                                                   | 46.4                                                                                | 22.4                                                                                |                                                                                     | 72.2                                                                                | 29.7                                                                                |                                                                                     |
| Level of Service                  | D                                                                                 | D                                                                                 | C                                                                                 | E                                                                                 | D                                                                                 |                                                                                   | D                                                                                   | C                                                                                   |                                                                                     | E                                                                                   | C                                                                                   |                                                                                     |
| Approach Delay (s)                |                                                                                   | 35.6                                                                              |                                                                                   |                                                                                   | 51.6                                                                              |                                                                                   |                                                                                     | 30.9                                                                                |                                                                                     |                                                                                     | 34.4                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                     | C                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                   |                                                                                   | 35.2                                                                              |                                                                                   |                                                                                   | HCM 2000 Level of Service                                                         |                                                                                     |                                                                                     |                                                                                     | D                                                                                   |                                                                                     |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                   |                                                                                   | 0.71                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 100.0                                                                             |                                                                                   |                                                                                   | Sum of lost time (s)                                                              |                                                                                     |                                                                                     | 20.0                                                                                |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 60.5%                                                                             |                                                                                   |                                                                                   | ICU Level of Service                                                              |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

Queues  
5: SE 192nd Ave & SE 20th St

Background 2027 Traffic Conditions  
AM Peak Hour Conditions



| Lane Group              | EBL  | EBT  | WBL  | WBT  | NBL  | NBT  | SBL  | SBT  |
|-------------------------|------|------|------|------|------|------|------|------|
| Lane Group Flow (vph)   | 177  | 211  | 138  | 285  | 53   | 1061 | 94   | 967  |
| v/c Ratio               | 0.55 | 0.59 | 0.48 | 0.82 | 0.41 | 0.67 | 0.60 | 0.60 |
| Control Delay           | 49.5 | 38.7 | 49.0 | 51.1 | 52.9 | 26.9 | 73.9 | 17.8 |
| Queue Delay             | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  |
| Total Delay             | 49.5 | 38.7 | 49.0 | 51.1 | 52.9 | 26.9 | 73.9 | 17.8 |
| Queue Length 50th (ft)  | 56   | 108  | 44   | 148  | 33   | 287  | 62   | 247  |
| Queue Length 95th (ft)  | 76   | 145  | 63   | 189  | 61   | 346  | 98   | 206  |
| Internal Link Dist (ft) |      | 1997 |      | 3145 |      | 1320 |      | 1126 |
| Turn Bay Length (ft)    | 100  |      | 150  |      | 335  |      | 410  |      |
| Base Capacity (vph)     | 408  | 455  | 374  | 445  | 175  | 1573 | 180  | 1618 |
| Starvation Cap Reductn  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Spillback Cap Reductn   | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Storage Cap Reductn     | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Reduced v/c Ratio       | 0.43 | 0.46 | 0.37 | 0.64 | 0.30 | 0.67 | 0.52 | 0.60 |
| Intersection Summary    |      |      |      |      |      |      |      |      |

# HCM Signalized Intersection Capacity Analysis

## 5: SE 192nd Ave & SE 20th St

Background 2027 Traffic Conditions  
AM Peak Hour Conditions

|                                   |  |      |       |      |       |                           |      |       |      |       |      |      |
|-----------------------------------|------------------------------------------------------------------------------------|------|-------|------|-------|---------------------------|------|-------|------|-------|------|------|
| Movement                          | EBL                                                                                | EBT  | EBR   | WBL  | WBT   | WBR                       | NBL  | NBT   | NBR  | SBL   | SBT  | SBR  |
| Lane Configurations               | ↔↔                                                                                 | ↗    |       | ↔↔   | ↗     |                           | ↗    | ↕↕    |      | ↗     | ↕↕   |      |
| Traffic Volume (vph)              | 140                                                                                | 111  | 55    | 109  | 114   | 111                       | 42   | 747   | 91   | 74    | 675  | 89   |
| Future Volume (vph)               | 140                                                                                | 111  | 55    | 109  | 114   | 111                       | 42   | 747   | 91   | 74    | 675  | 89   |
| Ideal Flow (vphpl)                | 1900                                                                               | 1900 | 1900  | 1900 | 1900  | 1900                      | 1900 | 1900  | 1900 | 1900  | 1900 | 1900 |
| Total Lost time (s)               | 5.0                                                                                | 5.0  |       | 5.0  | 5.0   |                           | 5.0  | 5.0   |      | 5.0   | 5.0  |      |
| Lane Util. Factor                 | 0.97                                                                               | 1.00 |       | 0.97 | 1.00  |                           | 1.00 | 0.95  |      | 1.00  | 0.95 |      |
| Frpb, ped/bikes                   | 1.00                                                                               | 1.00 |       | 1.00 | 0.99  |                           | 1.00 | 1.00  |      | 1.00  | 1.00 |      |
| Flpb, ped/bikes                   | 1.00                                                                               | 1.00 |       | 1.00 | 1.00  |                           | 1.00 | 1.00  |      | 1.00  | 1.00 |      |
| Frt                               | 1.00                                                                               | 0.95 |       | 1.00 | 0.93  |                           | 1.00 | 0.98  |      | 1.00  | 0.98 |      |
| Flt Protected                     | 0.95                                                                               | 1.00 |       | 0.95 | 1.00  |                           | 0.95 | 1.00  |      | 0.95  | 1.00 |      |
| Satd. Flow (prot)                 | 3400                                                                               | 1750 |       | 3400 | 1710  |                           | 1752 | 3438  |      | 1752  | 3433 |      |
| Flt Permitted                     | 0.95                                                                               | 1.00 |       | 0.95 | 1.00  |                           | 0.95 | 1.00  |      | 0.95  | 1.00 |      |
| Satd. Flow (perm)                 | 3400                                                                               | 1750 |       | 3400 | 1710  |                           | 1752 | 3438  |      | 1752  | 3433 |      |
| Peak-hour factor, PHF             | 0.79                                                                               | 0.79 | 0.79  | 0.79 | 0.79  | 0.79                      | 0.79 | 0.79  | 0.79 | 0.79  | 0.79 | 0.79 |
| Adj. Flow (vph)                   | 177                                                                                | 141  | 70    | 138  | 144   | 141                       | 53   | 946   | 115  | 94    | 854  | 113  |
| RTOR Reduction (vph)              | 0                                                                                  | 19   | 0     | 0    | 38    | 0                         | 0    | 8     | 0    | 0     | 9    | 0    |
| Lane Group Flow (vph)             | 177                                                                                | 192  | 0     | 138  | 247   | 0                         | 53   | 1053  | 0    | 94    | 958  | 0    |
| Confl. Peds. (#/hr)               | 2                                                                                  |      |       |      |       |                           | 2    | 2     |      | 2     | 2    |      |
| Confl. Bikes (#/hr)               |                                                                                    |      | 2     |      |       | 2                         |      |       | 2    |       |      | 1    |
| Heavy Vehicles (%)                | 3%                                                                                 | 3%   | 2%    | 3%   | 1%    | 3%                        | 3%   | 3%    | 3%   | 3%    | 3%   | 3%   |
| Turn Type                         | Prot                                                                               | NA   |       | Prot | NA    |                           | Prot | NA    |      | Prot  | NA   |      |
| Protected Phases                  | 5                                                                                  | 2    |       | 1    | 6     |                           | 7    | 4     |      | 3     | 8    |      |
| Permitted Phases                  |                                                                                    |      |       |      |       |                           |      |       |      |       |      |      |
| Actuated Green, G (s)             | 9.5                                                                                | 19.3 |       | 8.4  | 18.2  |                           | 6.4  | 44.5  |      | 7.8   | 45.9 |      |
| Effective Green, g (s)            | 9.5                                                                                | 19.3 |       | 8.4  | 18.2  |                           | 6.4  | 44.5  |      | 7.8   | 45.9 |      |
| Actuated g/C Ratio                | 0.10                                                                               | 0.19 |       | 0.08 | 0.18  |                           | 0.06 | 0.44  |      | 0.08  | 0.46 |      |
| Clearance Time (s)                | 5.0                                                                                | 5.0  |       | 5.0  | 5.0   |                           | 5.0  | 5.0   |      | 5.0   | 5.0  |      |
| Vehicle Extension (s)             | 2.0                                                                                | 2.0  |       | 2.0  | 2.0   |                           | 2.0  | 2.0   |      | 2.0   | 2.0  |      |
| Lane Grp Cap (vph)                | 323                                                                                | 337  |       | 285  | 311   |                           | 112  | 1529  |      | 136   | 1575 |      |
| v/s Ratio Prot                    | c0.05                                                                              | 0.11 |       | 0.04 | c0.14 |                           | 0.03 | c0.31 |      | c0.05 | 0.28 |      |
| v/s Ratio Perm                    |                                                                                    |      |       |      |       |                           |      |       |      |       |      |      |
| v/c Ratio                         | 0.55                                                                               | 0.57 |       | 0.48 | 0.80  |                           | 0.47 | 0.69  |      | 0.69  | 0.61 |      |
| Uniform Delay, d1                 | 43.2                                                                               | 36.6 |       | 43.7 | 39.1  |                           | 45.2 | 22.2  |      | 44.9  | 20.3 |      |
| Progression Factor                | 1.00                                                                               | 1.00 |       | 1.00 | 1.00  |                           | 1.00 | 1.00  |      | 1.34  | 0.72 |      |
| Incremental Delay, d2             | 1.0                                                                                | 1.3  |       | 0.5  | 12.3  |                           | 1.1  | 2.6   |      | 11.1  | 0.4  |      |
| Delay (s)                         | 44.2                                                                               | 37.9 |       | 44.2 | 51.4  |                           | 46.3 | 24.8  |      | 71.2  | 15.1 |      |
| Level of Service                  | D                                                                                  | D    |       | D    | D     |                           | D    | C     |      | E     | B    |      |
| Approach Delay (s)                |                                                                                    | 40.8 |       |      | 49.1  |                           |      | 25.8  |      |       | 20.1 |      |
| Approach LOS                      |                                                                                    | D    |       |      | D     |                           |      | C     |      |       | C    |      |
| <b>Intersection Summary</b>       |                                                                                    |      |       |      |       |                           |      |       |      |       |      |      |
| HCM 2000 Control Delay            |                                                                                    |      | 29.0  |      |       | HCM 2000 Level of Service |      |       | C    |       |      |      |
| HCM 2000 Volume to Capacity ratio |                                                                                    |      | 0.70  |      |       |                           |      |       |      |       |      |      |
| Actuated Cycle Length (s)         |                                                                                    |      | 100.0 |      |       | Sum of lost time (s)      |      |       | 20.0 |       |      |      |
| Intersection Capacity Utilization |                                                                                    |      | 61.8% |      |       | ICU Level of Service      |      |       | B    |       |      |      |
| Analysis Period (min)             |                                                                                    |      | 15    |      |       |                           |      |       |      |       |      |      |
| c Critical Lane Group             |                                                                                    |      |       |      |       |                           |      |       |      |       |      |      |



| Intersection             |           |        |      |        |      |      |
|--------------------------|-----------|--------|------|--------|------|------|
| Int Delay, s/veh         | 0         |        |      |        |      |      |
| Movement                 | EBL       | EBR    | NBL  | NBT    | SBT  | SBR  |
| Lane Configurations      |           | ↗      |      | ↗↗     | ↗↗   |      |
| Traffic Vol, veh/h       | 0         | 3      | 0    | 1027   | 786  | 4    |
| Future Vol, veh/h        | 0         | 3      | 0    | 1027   | 786  | 4    |
| Conflicting Peds, #/hr   | 0         | 0      | 0    | 0      | 0    | 0    |
| Sign Control             | Stop      | Stop   | Free | Free   | Free | Free |
| RT Channelized           | -         | None   | -    | None   | -    | None |
| Storage Length           | -         | 0      | -    | -      | -    | -    |
| Veh in Median Storage, # | 0         | -      | -    | 0      | 0    | -    |
| Grade, %                 | 0         | -      | -    | 0      | 0    | -    |
| Peak Hour Factor         | 92        | 92     | 92   | 92     | 92   | 92   |
| Heavy Vehicles, %        | 0         | 0      | 0    | 3      | 3    | 0    |
| Mvmt Flow                | 0         | 3      | 0    | 1116   | 854  | 4    |
| Major/Minor              | Minor2    | Major1 |      | Major2 |      |      |
| Conflicting Flow All     | -         | 429    | -    | 0      | -    | 0    |
| Stage 1                  | -         | -      | -    | -      | -    | -    |
| Stage 2                  | -         | -      | -    | -      | -    | -    |
| Critical Hdwy            | -         | 6.9    | -    | -      | -    | -    |
| Critical Hdwy Stg 1      | -         | -      | -    | -      | -    | -    |
| Critical Hdwy Stg 2      | -         | -      | -    | -      | -    | -    |
| Follow-up Hdwy           | -         | 3.3    | -    | -      | -    | -    |
| Pot Cap-1 Maneuver       | 0         | 580    | 0    | -      | -    | -    |
| Stage 1                  | 0         | -      | 0    | -      | -    | -    |
| Stage 2                  | 0         | -      | 0    | -      | -    | -    |
| Platoon blocked, %       |           |        |      | -      | -    | -    |
| Mov Cap-1 Maneuver       | -         | 580    | -    | -      | -    | -    |
| Mov Cap-2 Maneuver       | -         | -      | -    | -      | -    | -    |
| Stage 1                  | -         | -      | -    | -      | -    | -    |
| Stage 2                  | -         | -      | -    | -      | -    | -    |
| Approach                 | EB        | NB     |      | SB     |      |      |
| HCM Control Delay, s     | 11.2      | 0      |      | 0      |      |      |
| HCM LOS                  | B         |        |      |        |      |      |
| Minor Lane/Major Mvmt    | NBT EBLn1 |        | SBT  | SBR    |      |      |
| Capacity (veh/h)         | - 580     |        | -    | -      |      |      |
| HCM Lane V/C Ratio       | - 0.006   |        | -    | -      |      |      |
| HCM Control Delay (s)    | - 11.2    |        | -    | -      |      |      |
| HCM Lane LOS             | - B       |        | -    | -      |      |      |
| HCM 95th %tile Q(veh)    | - 0       |        | -    | -      |      |      |

| Intersection             |        |                                                                                   |                                                                                   |        |                                                                                   |      |
|--------------------------|--------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|--------|-----------------------------------------------------------------------------------|------|
| Int Delay, s/veh         | 0.9    |                                                                                   |                                                                                   |        |                                                                                   |      |
| Movement                 | EBL    | EBT                                                                               | WBT                                                                               | WBR    | SBL                                                                               | SBR  |
| Lane Configurations      |        |  |  |        |  |      |
| Traffic Vol, veh/h       | 5      | 229                                                                               | 171                                                                               | 3      | 18                                                                                | 13   |
| Future Vol, veh/h        | 5      | 229                                                                               | 171                                                                               | 3      | 18                                                                                | 13   |
| Conflicting Peds, #/hr   | 0      | 0                                                                                 | 0                                                                                 | 0      | 0                                                                                 | 0    |
| Sign Control             | Free   | Free                                                                              | Free                                                                              | Free   | Stop                                                                              | Stop |
| RT Channelized           | -      | None                                                                              | -                                                                                 | None   | -                                                                                 | None |
| Storage Length           | -      | -                                                                                 | -                                                                                 | -      | 0                                                                                 | -    |
| Veh in Median Storage, # | -      | 0                                                                                 | 0                                                                                 | -      | 0                                                                                 | -    |
| Grade, %                 | -      | 0                                                                                 | 0                                                                                 | -      | 0                                                                                 | -    |
| Peak Hour Factor         | 92     | 92                                                                                | 92                                                                                | 92     | 92                                                                                | 92   |
| Heavy Vehicles, %        | 0      | 0                                                                                 | 3                                                                                 | 0      | 0                                                                                 | 0    |
| Mvmt Flow                | 5      | 249                                                                               | 186                                                                               | 3      | 20                                                                                | 14   |
| Major/Minor              | Major1 | Major2                                                                            |                                                                                   | Minor2 |                                                                                   |      |
| Conflicting Flow All     | 189    | 0                                                                                 | -                                                                                 | 0      | 447                                                                               | 188  |
| Stage 1                  | -      | -                                                                                 | -                                                                                 | -      | 188                                                                               | -    |
| Stage 2                  | -      | -                                                                                 | -                                                                                 | -      | 259                                                                               | -    |
| Critical Hdwy            | 4.1    | -                                                                                 | -                                                                                 | -      | 6.4                                                                               | 6.2  |
| Critical Hdwy Stg 1      | -      | -                                                                                 | -                                                                                 | -      | 5.4                                                                               | -    |
| Critical Hdwy Stg 2      | -      | -                                                                                 | -                                                                                 | -      | 5.4                                                                               | -    |
| Follow-up Hdwy           | 2.2    | -                                                                                 | -                                                                                 | -      | 3.5                                                                               | 3.3  |
| Pot Cap-1 Maneuver       | 1397   | -                                                                                 | -                                                                                 | -      | 573                                                                               | 859  |
| Stage 1                  | -      | -                                                                                 | -                                                                                 | -      | 849                                                                               | -    |
| Stage 2                  | -      | -                                                                                 | -                                                                                 | -      | 789                                                                               | -    |
| Platoon blocked, %       |        | -                                                                                 | -                                                                                 | -      |                                                                                   |      |
| Mov Cap-1 Maneuver       | 1397   | -                                                                                 | -                                                                                 | -      | 571                                                                               | 859  |
| Mov Cap-2 Maneuver       | -      | -                                                                                 | -                                                                                 | -      | 571                                                                               | -    |
| Stage 1                  | -      | -                                                                                 | -                                                                                 | -      | 846                                                                               | -    |
| Stage 2                  | -      | -                                                                                 | -                                                                                 | -      | 789                                                                               | -    |
| Approach                 | EB     | WB                                                                                |                                                                                   | SB     |                                                                                   |      |
| HCM Control Delay, s     | 0.2    | 0                                                                                 |                                                                                   | 10.7   |                                                                                   |      |
| HCM LOS                  |        |                                                                                   |                                                                                   | B      |                                                                                   |      |
| Minor Lane/Major Mvmt    | EBL    | EBT                                                                               | WBT                                                                               | WBR    | SBLn1                                                                             |      |
| Capacity (veh/h)         | 1397   | -                                                                                 | -                                                                                 | -      | 664                                                                               |      |
| HCM Lane V/C Ratio       | 0.004  | -                                                                                 | -                                                                                 | -      | 0.051                                                                             |      |
| HCM Control Delay (s)    | 7.6    | 0                                                                                 | -                                                                                 | -      | 10.7                                                                              |      |
| HCM Lane LOS             | A      | A                                                                                 | -                                                                                 | -      | B                                                                                 |      |
| HCM 95th %tile Q(veh)    | 0      | -                                                                                 | -                                                                                 | -      | 0.2                                                                               |      |

## Queues

1: SE 164th Ave &amp; SE 15th St

## Background 2027 Traffic Conditions

PM Peak Hour Conditions

|                         |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                               | NBT                                                                                | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Group Flow (vph)   | 45                                                                                | 128                                                                               | 127                                                                               | 123                                                                               | 107                                                                               | 133                                                                               | 1743                                                                               | 59                                                                                  | 176                                                                                 | 1669                                                                                | 47                                                                                  |
| v/c Ratio               | 0.13                                                                              | 0.38                                                                              | 0.35                                                                              | 0.30                                                                              | 0.25                                                                              | 0.62                                                                              | 0.83                                                                               | 0.08                                                                                | 0.62                                                                                | 0.72                                                                                | 0.06                                                                                |
| Control Delay           | 33.4                                                                              | 44.1                                                                              | 36.0                                                                              | 45.6                                                                              | 10.2                                                                              | 61.9                                                                              | 35.4                                                                               | 1.1                                                                                 | 56.8                                                                                | 28.5                                                                                | 0.1                                                                                 |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 33.4                                                                              | 44.1                                                                              | 36.0                                                                              | 45.6                                                                              | 10.2                                                                              | 61.9                                                                              | 35.4                                                                               | 1.1                                                                                 | 56.8                                                                                | 28.5                                                                                | 0.1                                                                                 |
| Queue Length 50th (ft)  | 25                                                                                | 81                                                                                | 75                                                                                | 84                                                                                | 0                                                                                 | 99                                                                                | 420                                                                                | 0                                                                                   | 128                                                                                 | 359                                                                                 | 0                                                                                   |
| Queue Length 95th (ft)  | 55                                                                                | 140                                                                               | 128                                                                               | 146                                                                               | 48                                                                                | 156                                                                               | 479                                                                                | 6                                                                                   | 193                                                                                 | 421                                                                                 | 0                                                                                   |
| Internal Link Dist (ft) |                                                                                   | 642                                                                               |                                                                                   | 766                                                                               |                                                                                   |                                                                                   | 1016                                                                               |                                                                                     |                                                                                     | 601                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 100                                                                               |                                                                                   | 250                                                                               |                                                                                   | 325                                                                               | 150                                                                               |                                                                                    | 150                                                                                 | 230                                                                                 |                                                                                     | 230                                                                                 |
| Base Capacity (vph)     | 400                                                                               | 497                                                                               | 365                                                                               | 549                                                                               | 527                                                                               | 226                                                                               | 2111                                                                               | 707                                                                                 | 283                                                                                 | 2331                                                                                | 771                                                                                 |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.11                                                                              | 0.26                                                                              | 0.35                                                                              | 0.22                                                                              | 0.20                                                                              | 0.59                                                                              | 0.83                                                                               | 0.08                                                                                | 0.62                                                                                | 0.72                                                                                | 0.06                                                                                |
| Intersection Summary    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM Signalized Intersection Capacity Analysis

1: SE 164th Ave & SE 15th St

# Background 2027 Traffic Conditions

PM Peak Hour Conditions

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Traffic Volume (vph)              | 40                                                                                | 82                                                                                | 31                                                                                | 112                                                                               | 108                                                                               | 94                                                                                | 117                                                                                 | 1534                                                                                | 52                                                                                  | 155                                                                                 | 1469                                                                                | 41                                                                                  |
| Future Volume (vph)               | 40                                                                                | 82                                                                                | 31                                                                                | 112                                                                               | 108                                                                               | 94                                                                                | 117                                                                                 | 1534                                                                                | 52                                                                                  | 155                                                                                 | 1469                                                                                | 41                                                                                  |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 4.5                                                                               | 5.0                                                                               |                                                                                   | 4.5                                                                               | 5.0                                                                               | 5.0                                                                               | 4.5                                                                                 | 5.0                                                                                 | 5.0                                                                                 | 4.5                                                                                 | 5.0                                                                                 | 5.0                                                                                 |
| Lane Util. Factor                 | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 0.91                                                                                | 1.00                                                                                | 1.00                                                                                | 0.91                                                                                | 1.00                                                                                |
| Frpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 0.98                                                                              | 1.00                                                                                | 1.00                                                                                | 0.98                                                                                | 1.00                                                                                | 1.00                                                                                | 0.98                                                                                |
| Flpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Frt                               | 1.00                                                                              | 0.96                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 0.85                                                                              | 1.00                                                                                | 1.00                                                                                | 0.85                                                                                | 1.00                                                                                | 1.00                                                                                | 0.85                                                                                |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                |
| Satd. Flow (prot)                 | 1805                                                                              | 1787                                                                              |                                                                                   | 1803                                                                              | 1881                                                                              | 1543                                                                              | 1805                                                                                | 5036                                                                                | 1549                                                                                | 1787                                                                                | 5136                                                                                | 1580                                                                                |
| Flt Permitted                     | 0.68                                                                              | 1.00                                                                              |                                                                                   | 0.52                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                |
| Satd. Flow (perm)                 | 1288                                                                              | 1787                                                                              |                                                                                   | 985                                                                               | 1881                                                                              | 1543                                                                              | 1805                                                                                | 5036                                                                                | 1549                                                                                | 1787                                                                                | 5136                                                                                | 1580                                                                                |
| Peak-hour factor, PHF             | 0.88                                                                              | 0.88                                                                              | 0.88                                                                              | 0.88                                                                              | 0.88                                                                              | 0.88                                                                              | 0.88                                                                                | 0.88                                                                                | 0.88                                                                                | 0.88                                                                                | 0.88                                                                                | 0.88                                                                                |
| Adj. Flow (vph)                   | 45                                                                                | 93                                                                                | 35                                                                                | 127                                                                               | 123                                                                               | 107                                                                               | 133                                                                                 | 1743                                                                                | 59                                                                                  | 176                                                                                 | 1669                                                                                | 47                                                                                  |
| RTOR Reduction (vph)              | 0                                                                                 | 12                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 84                                                                                | 0                                                                                   | 0                                                                                   | 34                                                                                  | 0                                                                                   | 0                                                                                   | 26                                                                                  |
| Lane Group Flow (vph)             | 45                                                                                | 116                                                                               | 0                                                                                 | 127                                                                               | 123                                                                               | 23                                                                                | 133                                                                                 | 1743                                                                                | 25                                                                                  | 176                                                                                 | 1669                                                                                | 21                                                                                  |
| Confl. Peds. (#/hr)               |                                                                                   |                                                                                   | 2                                                                                 | 2                                                                                 |                                                                                   |                                                                                   | 1                                                                                   |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 1                                                                                   |
| Confl. Bikes (#/hr)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 4                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Heavy Vehicles (%)                | 0%                                                                                | 1%                                                                                | 3%                                                                                | 0%                                                                                | 1%                                                                                | 3%                                                                                | 0%                                                                                  | 3%                                                                                  | 2%                                                                                  | 1%                                                                                  | 1%                                                                                  | 0%                                                                                  |
| Turn Type                         | pm+pt                                                                             | NA                                                                                |                                                                                   | pm+pt                                                                             | NA                                                                                | Perm                                                                              | Prot                                                                                | NA                                                                                  | Perm                                                                                | Prot                                                                                | NA                                                                                  | Perm                                                                                |
| Protected Phases                  | 5                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 6                                                                                 |                                                                                   | 7                                                                                   | 4                                                                                   |                                                                                     | 3                                                                                   | 8                                                                                   |                                                                                     |
| Permitted Phases                  | 2                                                                                 |                                                                                   |                                                                                   | 6                                                                                 |                                                                                   | 6                                                                                 |                                                                                     |                                                                                     | 4                                                                                   |                                                                                     |                                                                                     | 8                                                                                   |
| Actuated Green, G (s)             | 28.7                                                                              | 22.1                                                                              |                                                                                   | 35.5                                                                              | 25.5                                                                              | 25.5                                                                              | 14.4                                                                                | 49.9                                                                                | 49.9                                                                                | 19.0                                                                                | 54.5                                                                                | 54.5                                                                                |
| Effective Green, g (s)            | 28.7                                                                              | 22.1                                                                              |                                                                                   | 35.5                                                                              | 25.5                                                                              | 25.5                                                                              | 14.4                                                                                | 49.9                                                                                | 49.9                                                                                | 19.0                                                                                | 54.5                                                                                | 54.5                                                                                |
| Actuated g/C Ratio                | 0.24                                                                              | 0.18                                                                              |                                                                                   | 0.30                                                                              | 0.21                                                                              | 0.21                                                                              | 0.12                                                                                | 0.42                                                                                | 0.42                                                                                | 0.16                                                                                | 0.45                                                                                | 0.45                                                                                |
| Clearance Time (s)                | 4.5                                                                               | 5.0                                                                               |                                                                                   | 4.5                                                                               | 5.0                                                                               | 5.0                                                                               | 4.5                                                                                 | 5.0                                                                                 | 5.0                                                                                 | 4.5                                                                                 | 5.0                                                                                 | 5.0                                                                                 |
| Vehicle Extension (s)             | 3.0                                                                               | 2.0                                                                               |                                                                                   | 3.0                                                                               | 2.0                                                                               | 2.0                                                                               | 3.0                                                                                 | 2.0                                                                                 | 2.0                                                                                 | 3.0                                                                                 | 2.0                                                                                 | 2.0                                                                                 |
| Lane Grp Cap (vph)                | 336                                                                               | 329                                                                               |                                                                                   | 359                                                                               | 399                                                                               | 327                                                                               | 216                                                                                 | 2094                                                                                | 644                                                                                 | 282                                                                                 | 2332                                                                                | 717                                                                                 |
| v/s Ratio Prot                    | 0.01                                                                              | 0.06                                                                              |                                                                                   | c0.03                                                                             | 0.07                                                                              |                                                                                   | 0.07                                                                                | c0.35                                                                               |                                                                                     | c0.10                                                                               | 0.32                                                                                |                                                                                     |
| v/s Ratio Perm                    | 0.02                                                                              |                                                                                   |                                                                                   | c0.08                                                                             |                                                                                   | 0.01                                                                              |                                                                                     |                                                                                     | 0.02                                                                                |                                                                                     |                                                                                     | 0.01                                                                                |
| v/c Ratio                         | 0.13                                                                              | 0.35                                                                              |                                                                                   | 0.35                                                                              | 0.31                                                                              | 0.07                                                                              | 0.62                                                                                | 0.83                                                                                | 0.04                                                                                | 0.62                                                                                | 0.72                                                                                | 0.03                                                                                |
| Uniform Delay, d1                 | 35.6                                                                              | 42.7                                                                              |                                                                                   | 32.2                                                                              | 39.8                                                                              | 37.8                                                                              | 50.2                                                                                | 31.3                                                                                | 20.8                                                                                | 47.2                                                                                | 26.5                                                                                | 18.1                                                                                |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Incremental Delay, d2             | 0.2                                                                               | 2.9                                                                               |                                                                                   | 0.6                                                                               | 2.0                                                                               | 0.4                                                                               | 5.1                                                                                 | 2.9                                                                                 | 0.0                                                                                 | 4.3                                                                                 | 0.9                                                                                 | 0.0                                                                                 |
| Delay (s)                         | 35.8                                                                              | 45.6                                                                              |                                                                                   | 32.8                                                                              | 41.8                                                                              | 38.2                                                                              | 55.3                                                                                | 34.2                                                                                | 20.8                                                                                | 51.4                                                                                | 27.4                                                                                | 18.1                                                                                |
| Level of Service                  | D                                                                                 | D                                                                                 |                                                                                   | C                                                                                 | D                                                                                 | D                                                                                 | E                                                                                   | C                                                                                   | C                                                                                   | D                                                                                   | C                                                                                   | B                                                                                   |
| Approach Delay (s)                |                                                                                   | 43.1                                                                              |                                                                                   |                                                                                   | 37.5                                                                              |                                                                                   |                                                                                     | 35.2                                                                                |                                                                                     |                                                                                     | 29.4                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                     | D                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                   |                                                                                   | 33.2                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                   |                                                                                   | 0.65                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 120.0                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 68.6%                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |



| Intersection             |                                                                                   |      |        |                                                                                   |        |                                                                                   |
|--------------------------|-----------------------------------------------------------------------------------|------|--------|-----------------------------------------------------------------------------------|--------|-----------------------------------------------------------------------------------|
| Int Delay, s/veh         | 0.8                                                                               |      |        |                                                                                   |        |                                                                                   |
| Movement                 | EBT                                                                               | EBR  | WBL    | WBT                                                                               | NBL    | NBR                                                                               |
| Lane Configurations      |  |      |        |  |        |  |
| Traffic Vol, veh/h       | 277                                                                               | 14   | 22     | 259                                                                               | 12     | 13                                                                                |
| Future Vol, veh/h        | 277                                                                               | 14   | 22     | 259                                                                               | 12     | 13                                                                                |
| Conflicting Peds, #/hr   | 0                                                                                 | 4    | 4      | 0                                                                                 | 6      | 0                                                                                 |
| Sign Control             | Free                                                                              | Free | Free   | Free                                                                              | Stop   | Stop                                                                              |
| RT Channelized           | -                                                                                 | None | -      | None                                                                              | -      | None                                                                              |
| Storage Length           | -                                                                                 | -    | -      | -                                                                                 | 0      | -                                                                                 |
| Veh in Median Storage, # | 0                                                                                 | -    | -      | 0                                                                                 | 0      | -                                                                                 |
| Grade, %                 | 0                                                                                 | -    | -      | 0                                                                                 | 0      | -                                                                                 |
| Peak Hour Factor         | 86                                                                                | 86   | 86     | 86                                                                                | 86     | 86                                                                                |
| Heavy Vehicles, %        | 1                                                                                 | 3    | 3      | 1                                                                                 | 0      | 3                                                                                 |
| Mvmt Flow                | 322                                                                               | 16   | 26     | 301                                                                               | 14     | 15                                                                                |
|                          |                                                                                   |      |        |                                                                                   |        |                                                                                   |
| Major/Minor              | Major1                                                                            |      | Major2 |                                                                                   | Minor1 |                                                                                   |
| Conflicting Flow All     | 0                                                                                 | 0    | 342    | 0                                                                                 | 693    | 334                                                                               |
| Stage 1                  | -                                                                                 | -    | -      | -                                                                                 | 334    | -                                                                                 |
| Stage 2                  | -                                                                                 | -    | -      | -                                                                                 | 359    | -                                                                                 |
| Critical Hdwy            | -                                                                                 | -    | 4.13   | -                                                                                 | 6.4    | 6.23                                                                              |
| Critical Hdwy Stg 1      | -                                                                                 | -    | -      | -                                                                                 | 5.4    | -                                                                                 |
| Critical Hdwy Stg 2      | -                                                                                 | -    | -      | -                                                                                 | 5.4    | -                                                                                 |
| Follow-up Hdwy           | -                                                                                 | -    | 2.227  | -                                                                                 | 3.5    | 3.327                                                                             |
| Pot Cap-1 Maneuver       | -                                                                                 | -    | 1211   | -                                                                                 | 412    | 706                                                                               |
| Stage 1                  | -                                                                                 | -    | -      | -                                                                                 | 730    | -                                                                                 |
| Stage 2                  | -                                                                                 | -    | -      | -                                                                                 | 711    | -                                                                                 |
| Platoon blocked, %       | -                                                                                 | -    |        | -                                                                                 |        |                                                                                   |
| Mov Cap-1 Maneuver       | -                                                                                 | -    | 1206   | -                                                                                 | 397    | 703                                                                               |
| Mov Cap-2 Maneuver       | -                                                                                 | -    | -      | -                                                                                 | 397    | -                                                                                 |
| Stage 1                  | -                                                                                 | -    | -      | -                                                                                 | 727    | -                                                                                 |
| Stage 2                  | -                                                                                 | -    | -      | -                                                                                 | 688    | -                                                                                 |
|                          |                                                                                   |      |        |                                                                                   |        |                                                                                   |
| Approach                 | EB                                                                                |      | WB     |                                                                                   | NB     |                                                                                   |
| HCM Control Delay, s     | 0                                                                                 |      | 0.6    |                                                                                   | 12.4   |                                                                                   |
| HCM LOS                  | B                                                                                 |      |        |                                                                                   |        |                                                                                   |
|                          |                                                                                   |      |        |                                                                                   |        |                                                                                   |
| Minor Lane/Major Mvmt    | NBLn1                                                                             | EBT  | EBR    | WBL                                                                               | WBT    |                                                                                   |
| Capacity (veh/h)         | 513                                                                               | -    | -      | 1206                                                                              | -      |                                                                                   |
| HCM Lane V/C Ratio       | 0.057                                                                             | -    | -      | 0.021                                                                             | -      |                                                                                   |
| HCM Control Delay (s)    | 12.4                                                                              | -    | -      | 8.1                                                                               | 0      |                                                                                   |
| HCM Lane LOS             | B                                                                                 | -    | -      | A                                                                                 | A      |                                                                                   |
| HCM 95th %tile Q(veh)    | 0.2                                                                               | -    | -      | 0.1                                                                               | -      |                                                                                   |

Queues  
3: SE 192nd Ave & SE 15th St

Background 2027 Traffic Conditions  
PM Peak Hour Conditions



| Lane Group              | EBL  | EBT  | WBL  | WBT  | WBR  | NBL  | NBT  | SBL  | SBT  |
|-------------------------|------|------|------|------|------|------|------|------|------|
| Lane Group Flow (vph)   | 120  | 189  | 48   | 88   | 227  | 93   | 1215 | 62   | 1352 |
| v/c Ratio               | 0.69 | 0.77 | 0.47 | 0.61 | 0.60 | 0.65 | 0.60 | 0.49 | 0.66 |
| Control Delay           | 63.4 | 50.6 | 61.0 | 62.5 | 15.0 | 44.0 | 16.7 | 57.3 | 18.9 |
| Queue Delay             | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  |
| Total Delay             | 63.4 | 50.6 | 61.0 | 62.5 | 15.0 | 44.0 | 16.7 | 57.3 | 18.9 |
| Queue Length 50th (ft)  | 75   | 86   | 30   | 55   | 22   | 49   | 243  | 39   | 324  |
| Queue Length 95th (ft)  | 130  | 154  | #79  | 105  | 84   | m49  | m116 | 79   | 457  |
| Internal Link Dist (ft) |      | 206  |      | 1016 |      |      | 1126 |      | 238  |
| Turn Bay Length (ft)    | 115  |      | 110  |      | 110  | 150  |      | 475  |      |
| Base Capacity (vph)     | 232  | 337  | 103  | 172  | 421  | 176  | 2025 | 177  | 2057 |
| Starvation Cap Reductn  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Spillback Cap Reductn   | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Storage Cap Reductn     | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Reduced v/c Ratio       | 0.52 | 0.56 | 0.47 | 0.51 | 0.54 | 0.53 | 0.60 | 0.35 | 0.66 |

Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

# HCM Signalized Intersection Capacity Analysis

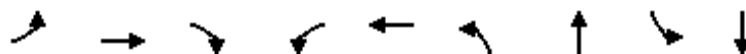
## 3: SE 192nd Ave & SE 15th St

Background 2027 Traffic Conditions  
PM Peak Hour Conditions

|                                   |  |  |  |  |  |  |   |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Traffic Volume (vph)              | 109                                                                               | 80                                                                                | 92                                                                                | 44                                                                                | 80                                                                                | 207                                                                               | 85                                                                                  | 1077                                                                                | 28                                                                                  | 56                                                                                  | 1110                                                                                | 120                                                                                 |
| Future Volume (vph)               | 109                                                                               | 80                                                                                | 92                                                                                | 44                                                                                | 80                                                                                | 207                                                                               | 85                                                                                  | 1077                                                                                | 28                                                                                  | 56                                                                                  | 1110                                                                                | 120                                                                                 |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                                 | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Lane Util. Factor                 | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 0.95                                                                                |                                                                                     | 1.00                                                                                | 0.95                                                                                |                                                                                     |
| Frpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 0.99                                                                              | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Flpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Frt                               | 1.00                                                                              | 0.92                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 0.85                                                                              | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 0.99                                                                                |                                                                                     |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                                | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (prot)                 | 1787                                                                              | 1740                                                                              |                                                                                   | 1805                                                                              | 1881                                                                              | 1604                                                                              | 1752                                                                                | 3522                                                                                |                                                                                     | 1770                                                                                | 3513                                                                                |                                                                                     |
| Flt Permitted                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                                | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (perm)                 | 1787                                                                              | 1740                                                                              |                                                                                   | 1805                                                                              | 1881                                                                              | 1604                                                                              | 1752                                                                                | 3522                                                                                |                                                                                     | 1770                                                                                | 3513                                                                                |                                                                                     |
| Peak-hour factor, PHF             | 0.91                                                                              | 0.91                                                                              | 0.91                                                                              | 0.91                                                                              | 0.91                                                                              | 0.91                                                                              | 0.91                                                                                | 0.91                                                                                | 0.91                                                                                | 0.91                                                                                | 0.91                                                                                | 0.91                                                                                |
| Adj. Flow (vph)                   | 120                                                                               | 88                                                                                | 101                                                                               | 48                                                                                | 88                                                                                | 227                                                                               | 93                                                                                  | 1184                                                                                | 31                                                                                  | 62                                                                                  | 1220                                                                                | 132                                                                                 |
| RTOR Reduction (vph)              | 0                                                                                 | 44                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 159                                                                               | 0                                                                                   | 2                                                                                   | 0                                                                                   | 0                                                                                   | 7                                                                                   | 0                                                                                   |
| Lane Group Flow (vph)             | 120                                                                               | 145                                                                               | 0                                                                                 | 48                                                                                | 88                                                                                | 68                                                                                | 93                                                                                  | 1213                                                                                | 0                                                                                   | 62                                                                                  | 1345                                                                                | 0                                                                                   |
| Confl. Peds. (#/hr)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 3                                                                                   |                                                                                     | 4                                                                                   | 4                                                                                   |                                                                                     | 3                                                                                   |
| Confl. Bikes (#/hr)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 1                                                                                 |                                                                                     |                                                                                     | 1                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Heavy Vehicles (%)                | 1%                                                                                | 1%                                                                                | 0%                                                                                | 0%                                                                                | 1%                                                                                | 0%                                                                                | 3%                                                                                  | 2%                                                                                  | 3%                                                                                  | 2%                                                                                  | 1%                                                                                  | 1%                                                                                  |
| Turn Type                         | Prot                                                                              | NA                                                                                |                                                                                   | Prot                                                                              | NA                                                                                | pm+ov                                                                             | Prot                                                                                | NA                                                                                  |                                                                                     | Prot                                                                                | NA                                                                                  |                                                                                     |
| Protected Phases                  | 5                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 6                                                                                 | 3                                                                                 | 7                                                                                   | 4                                                                                   |                                                                                     | 3                                                                                   | 8                                                                                   |                                                                                     |
| Permitted Phases                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 6                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Green, G (s)             | 9.7                                                                               | 11.7                                                                              |                                                                                   | 4.7                                                                               | 6.7                                                                               | 13.8                                                                              | 7.2                                                                                 | 56.5                                                                                |                                                                                     | 7.1                                                                                 | 56.4                                                                                |                                                                                     |
| Effective Green, g (s)            | 9.7                                                                               | 11.7                                                                              |                                                                                   | 4.7                                                                               | 6.7                                                                               | 13.8                                                                              | 7.2                                                                                 | 56.5                                                                                |                                                                                     | 7.1                                                                                 | 56.4                                                                                |                                                                                     |
| Actuated g/C Ratio                | 0.10                                                                              | 0.12                                                                              |                                                                                   | 0.05                                                                              | 0.07                                                                              | 0.14                                                                              | 0.07                                                                                | 0.56                                                                                |                                                                                     | 0.07                                                                                | 0.56                                                                                |                                                                                     |
| Clearance Time (s)                | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                                 | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Vehicle Extension (s)             | 1.0                                                                               | 1.0                                                                               |                                                                                   | 1.0                                                                               | 1.0                                                                               | 1.0                                                                               | 1.0                                                                                 | 1.0                                                                                 |                                                                                     | 1.0                                                                                 | 1.0                                                                                 |                                                                                     |
| Lane Grp Cap (vph)                | 173                                                                               | 203                                                                               |                                                                                   | 84                                                                                | 126                                                                               | 301                                                                               | 126                                                                                 | 1989                                                                                |                                                                                     | 125                                                                                 | 1981                                                                                |                                                                                     |
| v/s Ratio Prot                    | c0.07                                                                             | c0.08                                                                             |                                                                                   | 0.03                                                                              | 0.05                                                                              | 0.02                                                                              | 0.05                                                                                | c0.34                                                                               |                                                                                     | 0.04                                                                                | c0.38                                                                               |                                                                                     |
| v/s Ratio Perm                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 0.03                                                                              |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| v/c Ratio                         | 0.69                                                                              | 0.71                                                                              |                                                                                   | 0.57                                                                              | 0.70                                                                              | 0.22                                                                              | 0.74                                                                                | 0.61                                                                                |                                                                                     | 0.50                                                                                | 0.68                                                                                |                                                                                     |
| Uniform Delay, d1                 | 43.7                                                                              | 42.5                                                                              |                                                                                   | 46.7                                                                              | 45.7                                                                              | 38.3                                                                              | 45.5                                                                                | 14.4                                                                                |                                                                                     | 44.7                                                                                | 15.4                                                                                |                                                                                     |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 0.80                                                                                | 1.02                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Incremental Delay, d2             | 9.3                                                                               | 9.5                                                                               |                                                                                   | 5.7                                                                               | 12.8                                                                              | 0.1                                                                               | 7.3                                                                                 | 0.5                                                                                 |                                                                                     | 1.1                                                                                 | 0.7                                                                                 |                                                                                     |
| Delay (s)                         | 53.0                                                                              | 52.0                                                                              |                                                                                   | 52.4                                                                              | 58.4                                                                              | 38.5                                                                              | 43.9                                                                                | 15.2                                                                                |                                                                                     | 45.9                                                                                | 16.1                                                                                |                                                                                     |
| Level of Service                  | D                                                                                 | D                                                                                 |                                                                                   | D                                                                                 | E                                                                                 | D                                                                                 | D                                                                                   | B                                                                                   |                                                                                     | D                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay (s)                |                                                                                   | 52.4                                                                              |                                                                                   |                                                                                   | 45.2                                                                              |                                                                                   |                                                                                     | 17.2                                                                                |                                                                                     |                                                                                     | 17.4                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                   |                                                                                   | 23.5                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                   |                                                                                   | 0.72                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 100.0                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 69.9%                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

Queues  
4: SE 192nd Ave & Mill Plain Blvd

Background 2027 Traffic Conditions  
PM Peak Hour Conditions



| Lane Group              | EBL  | EBT  | EBR   | WBL  | WBT  | NBL   | NBT  | SBL  | SBT  |
|-------------------------|------|------|-------|------|------|-------|------|------|------|
| Lane Group Flow (vph)   | 318  | 15   | 564   | 57   | 63   | 454   | 1030 | 19   | 1147 |
| v/c Ratio               | 0.63 | 0.06 | 1.17  | 0.22 | 0.31 | 1.09  | 0.66 | 0.20 | 1.04 |
| Control Delay           | 41.5 | 31.4 | 120.7 | 40.5 | 21.8 | 113.3 | 25.3 | 50.5 | 72.5 |
| Queue Delay             | 0.0  | 0.0  | 0.0   | 0.0  | 0.0  | 0.0   | 0.0  | 0.0  | 0.0  |
| Total Delay             | 41.5 | 31.4 | 120.7 | 40.5 | 21.8 | 113.3 | 25.3 | 50.5 | 72.5 |
| Queue Length 50th (ft)  | 172  | 9    | ~443  | 22   | 15   | ~169  | 238  | 12   | ~406 |
| Queue Length 95th (ft)  | #468 | 22   | 235   | 73   | 42   | #263  | 376  | 35   | #541 |
| Internal Link Dist (ft) |      | 628  |       |      | 391  |       | 457  |      | 709  |
| Turn Bay Length (ft)    | 240  |      | 130   |      |      | 205   |      | 150  |      |
| Base Capacity (vph)     | 507  | 513  | 481   | 292  | 479  | 416   | 1563 | 180  | 1100 |
| Starvation Cap Reductn  | 0    | 0    | 0     | 0    | 0    | 0     | 0    | 0    | 0    |
| Spillback Cap Reductn   | 0    | 0    | 0     | 0    | 0    | 0     | 0    | 0    | 0    |
| Storage Cap Reductn     | 0    | 0    | 0     | 0    | 0    | 0     | 0    | 0    | 0    |
| Reduced v/c Ratio       | 0.63 | 0.03 | 1.17  | 0.20 | 0.13 | 1.09  | 0.66 | 0.11 | 1.04 |

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.  
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.



# HCM Signalized Intersection Capacity Analysis

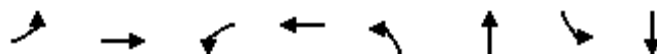
## 4: SE 192nd Ave & Mill Plain Blvd

Background 2027 Traffic Conditions  
PM Peak Hour Conditions

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |  |  |  |                                                                                   |   |  |                                                                                     |  |  |  |
| Traffic Volume (vph)              | 283                                                                               | 13                                                                                | 502                                                                               | 51                                                                                | 21                                                                                | 35                                                                                | 404                                                                                 | 892                                                                                 | 25                                                                                  | 17                                                                                  | 833                                                                                 | 188                                                                                 |
| Future Volume (vph)               | 283                                                                               | 13                                                                                | 502                                                                               | 51                                                                                | 21                                                                                | 35                                                                                | 404                                                                                 | 892                                                                                 | 25                                                                                  | 17                                                                                  | 833                                                                                 | 188                                                                                 |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                                 | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Lane Util. Factor                 | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              |                                                                                   | 0.97                                                                                | 0.95                                                                                |                                                                                     | 1.00                                                                                | 0.95                                                                                |                                                                                     |
| Frpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              | 0.99                                                                              | 1.00                                                                              | 0.99                                                                              |                                                                                   | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Flpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Frt                               | 1.00                                                                              | 1.00                                                                              | 0.85                                                                              | 1.00                                                                              | 0.91                                                                              |                                                                                   | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 0.97                                                                                |                                                                                     |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                                | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (prot)                 | 1787                                                                              | 1900                                                                              | 1580                                                                              | 1805                                                                              | 1668                                                                              |                                                                                   | 3467                                                                                | 3522                                                                                |                                                                                     | 1805                                                                                | 3433                                                                                |                                                                                     |
| Flt Permitted                     | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                                | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (perm)                 | 1787                                                                              | 1900                                                                              | 1580                                                                              | 1805                                                                              | 1668                                                                              |                                                                                   | 3467                                                                                | 3522                                                                                |                                                                                     | 1805                                                                                | 3433                                                                                |                                                                                     |
| Peak-hour factor, PHF             | 0.89                                                                              | 0.89                                                                              | 0.89                                                                              | 0.89                                                                              | 0.89                                                                              | 0.89                                                                              | 0.89                                                                                | 0.89                                                                                | 0.89                                                                                | 0.89                                                                                | 0.89                                                                                | 0.89                                                                                |
| Adj. Flow (vph)                   | 318                                                                               | 15                                                                                | 564                                                                               | 57                                                                                | 24                                                                                | 39                                                                                | 454                                                                                 | 1002                                                                                | 28                                                                                  | 19                                                                                  | 936                                                                                 | 211                                                                                 |
| RTOR Reduction (vph)              | 0                                                                                 | 0                                                                                 | 93                                                                                | 0                                                                                 | 35                                                                                | 0                                                                                 | 0                                                                                   | 2                                                                                   | 0                                                                                   | 0                                                                                   | 20                                                                                  | 0                                                                                   |
| Lane Group Flow (vph)             | 318                                                                               | 15                                                                                | 471                                                                               | 57                                                                                | 28                                                                                | 0                                                                                 | 454                                                                                 | 1028                                                                                | 0                                                                                   | 19                                                                                  | 1127                                                                                | 0                                                                                   |
| Confl. Peds. (#/hr)               | 8                                                                                 |                                                                                   | 6                                                                                 | 6                                                                                 |                                                                                   | 8                                                                                 | 9                                                                                   |                                                                                     | 9                                                                                   | 9                                                                                   |                                                                                     | 9                                                                                   |
| Confl. Bikes (#/hr)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 1                                                                                 |                                                                                     |                                                                                     | 3                                                                                   |                                                                                     |                                                                                     | 1                                                                                   |
| Heavy Vehicles (%)                | 1%                                                                                | 0%                                                                                | 1%                                                                                | 0%                                                                                | 0%                                                                                | 3%                                                                                | 1%                                                                                  | 2%                                                                                  | 0%                                                                                  | 0%                                                                                  | 2%                                                                                  | 1%                                                                                  |
| Turn Type                         | Prot                                                                              | NA                                                                                | pm+ov                                                                             | Prot                                                                              | NA                                                                                |                                                                                   | Prot                                                                                | NA                                                                                  |                                                                                     | Prot                                                                                | NA                                                                                  |                                                                                     |
| Protected Phases                  | 5                                                                                 | 2                                                                                 | 7                                                                                 | 1                                                                                 | 6                                                                                 |                                                                                   | 7                                                                                   | 4                                                                                   |                                                                                     | 3                                                                                   | 8                                                                                   |                                                                                     |
| Permitted Phases                  |                                                                                   |                                                                                   | 2                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Green, G (s)             | 28.4                                                                              | 25.5                                                                              | 40.5                                                                              | 12.0                                                                              | 9.1                                                                               |                                                                                   | 15.0                                                                                | 40.3                                                                                |                                                                                     | 2.2                                                                                 | 27.5                                                                                |                                                                                     |
| Effective Green, g (s)            | 28.4                                                                              | 25.5                                                                              | 40.5                                                                              | 12.0                                                                              | 9.1                                                                               |                                                                                   | 15.0                                                                                | 40.3                                                                                |                                                                                     | 2.2                                                                                 | 27.5                                                                                |                                                                                     |
| Actuated g/C Ratio                | 0.28                                                                              | 0.26                                                                              | 0.40                                                                              | 0.12                                                                              | 0.09                                                                              |                                                                                   | 0.15                                                                                | 0.40                                                                                |                                                                                     | 0.02                                                                                | 0.28                                                                                |                                                                                     |
| Clearance Time (s)                | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                                 | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Vehicle Extension (s)             | 1.5                                                                               | 1.5                                                                               | 0.5                                                                               | 2.0                                                                               | 2.0                                                                               |                                                                                   | 0.5                                                                                 | 0.5                                                                                 |                                                                                     | 0.5                                                                                 | 0.5                                                                                 |                                                                                     |
| Lane Grp Cap (vph)                | 507                                                                               | 484                                                                               | 639                                                                               | 216                                                                               | 151                                                                               |                                                                                   | 520                                                                                 | 1419                                                                                |                                                                                     | 39                                                                                  | 944                                                                                 |                                                                                     |
| v/s Ratio Prot                    | c0.18                                                                             | 0.01                                                                              | c0.11                                                                             | c0.03                                                                             | 0.02                                                                              |                                                                                   | c0.13                                                                               | 0.29                                                                                |                                                                                     | 0.01                                                                                | c0.33                                                                               |                                                                                     |
| v/s Ratio Perm                    |                                                                                   |                                                                                   | 0.19                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| v/c Ratio                         | 0.63                                                                              | 0.03                                                                              | 0.74                                                                              | 0.26                                                                              | 0.18                                                                              |                                                                                   | 0.87                                                                                | 0.72                                                                                |                                                                                     | 0.49                                                                                | 1.19                                                                                |                                                                                     |
| Uniform Delay, d1                 | 31.2                                                                              | 28.0                                                                              | 25.2                                                                              | 40.0                                                                              | 42.0                                                                              |                                                                                   | 41.6                                                                                | 25.2                                                                                |                                                                                     | 48.3                                                                                | 36.2                                                                                |                                                                                     |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Incremental Delay, d2             | 1.7                                                                               | 0.0                                                                               | 3.8                                                                               | 0.2                                                                               | 0.2                                                                               |                                                                                   | 14.5                                                                                | 3.3                                                                                 |                                                                                     | 3.5                                                                                 | 97.6                                                                                |                                                                                     |
| Delay (s)                         | 32.9                                                                              | 28.0                                                                              | 29.0                                                                              | 40.2                                                                              | 42.2                                                                              |                                                                                   | 56.1                                                                                | 28.4                                                                                |                                                                                     | 51.8                                                                                | 133.8                                                                               |                                                                                     |
| Level of Service                  | C                                                                                 | C                                                                                 | C                                                                                 | D                                                                                 | D                                                                                 |                                                                                   | E                                                                                   | C                                                                                   |                                                                                     | D                                                                                   | F                                                                                   |                                                                                     |
| Approach Delay (s)                |                                                                                   | 30.4                                                                              |                                                                                   |                                                                                   | 41.3                                                                              |                                                                                   |                                                                                     | 36.9                                                                                |                                                                                     |                                                                                     | 132.5                                                                               |                                                                                     |
| Approach LOS                      |                                                                                   | C                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                     | D                                                                                   |                                                                                     |                                                                                     | F                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                   |                                                                                   | 65.8                                                                              |                                                                                   |                                                                                   | HCM 2000 Level of Service                                                         |                                                                                     | E                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                   |                                                                                   | 0.85                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 100.0                                                                             |                                                                                   |                                                                                   | Sum of lost time (s)                                                              |                                                                                     | 20.0                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 77.6%                                                                             |                                                                                   |                                                                                   | ICU Level of Service                                                              |                                                                                     | D                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

Queues  
5: SE 192nd Ave & SE 20th St

Background 2027 Traffic Conditions  
PM Peak Hour Conditions



| Lane Group              | EBL  | EBT  | WBL  | WBT  | NBL  | NBT  | SBL   | SBT  |
|-------------------------|------|------|------|------|------|------|-------|------|
| Lane Group Flow (vph)   | 140  | 265  | 153  | 315  | 118  | 1327 | 178   | 1239 |
| v/c Ratio               | 0.48 | 0.78 | 0.41 | 0.83 | 0.66 | 1.01 | 0.75  | 0.87 |
| Control Delay           | 48.9 | 50.5 | 44.6 | 52.4 | 60.7 | 61.2 | 70.7  | 28.3 |
| Queue Delay             | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0   | 0.0  |
| Total Delay             | 48.9 | 50.5 | 44.6 | 52.4 | 60.7 | 61.2 | 70.7  | 28.3 |
| Queue Length 50th (ft)  | 44   | 147  | 47   | 176  | 73   | ~494 | 119   | 323  |
| Queue Length 95th (ft)  | 73   | 217  | 78   | 259  | #150 | #702 | m#211 | #578 |
| Internal Link Dist (ft) |      | 1997 |      | 3145 |      | 1320 |       | 1126 |
| Turn Bay Length (ft)    | 100  |      | 150  |      | 335  |      | 410   |      |
| Base Capacity (vph)     | 450  | 462  | 425  | 451  | 195  | 1309 | 251   | 1430 |
| Starvation Cap Reductn  | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0    |
| Spillback Cap Reductn   | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0    |
| Storage Cap Reductn     | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0    |
| Reduced v/c Ratio       | 0.31 | 0.57 | 0.36 | 0.70 | 0.61 | 1.01 | 0.71  | 0.87 |

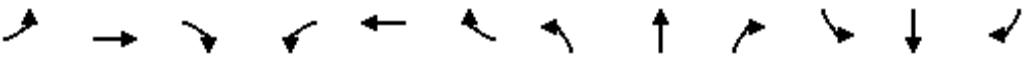
Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.  
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

# HCM Signalized Intersection Capacity Analysis

## 5: SE 192nd Ave & SE 20th St

Background 2027 Traffic Conditions  
PM Peak Hour Conditions

|                                   |  |       |       |      |       |                           |      |       |      |       |       |      |
|-----------------------------------|------------------------------------------------------------------------------------|-------|-------|------|-------|---------------------------|------|-------|------|-------|-------|------|
| Movement                          | EBL                                                                                | EBT   | EBR   | WBL  | WBT   | WBR                       | NBL  | NBT   | NBR  | SBL   | SBT   | SBR  |
| Lane Configurations               | TH                                                                                 | TH    |       | TH   | TH    |                           | TH   | TH    |      | TH    | TH    |      |
| Traffic Volume (vph)              | 134                                                                                | 165   | 89    | 147  | 189   | 113                       | 113  | 1082  | 192  | 171   | 1008  | 181  |
| Future Volume (vph)               | 134                                                                                | 165   | 89    | 147  | 189   | 113                       | 113  | 1082  | 192  | 171   | 1008  | 181  |
| Ideal Flow (vphpl)                | 1900                                                                               | 1900  | 1900  | 1900 | 1900  | 1900                      | 1900 | 1900  | 1900 | 1900  | 1900  | 1900 |
| Total Lost time (s)               | 5.0                                                                                | 5.0   |       | 5.0  | 5.0   |                           | 5.0  | 5.0   |      | 5.0   | 5.0   |      |
| Lane Util. Factor                 | 0.97                                                                               | 1.00  |       | 0.97 | 1.00  |                           | 1.00 | 0.95  |      | 1.00  | 0.95  |      |
| Frpb, ped/bikes                   | 1.00                                                                               | 0.99  |       | 1.00 | 0.99  |                           | 1.00 | 0.99  |      | 1.00  | 1.00  |      |
| Flpb, ped/bikes                   | 1.00                                                                               | 1.00  |       | 1.00 | 1.00  |                           | 1.00 | 1.00  |      | 1.00  | 1.00  |      |
| Frt                               | 1.00                                                                               | 0.95  |       | 1.00 | 0.94  |                           | 1.00 | 0.98  |      | 1.00  | 0.98  |      |
| Flt Protected                     | 0.95                                                                               | 1.00  |       | 0.95 | 1.00  |                           | 0.95 | 1.00  |      | 0.95  | 1.00  |      |
| Satd. Flow (prot)                 | 3467                                                                               | 1772  |       | 3502 | 1762  |                           | 1805 | 3417  |      | 1787  | 3440  |      |
| Flt Permitted                     | 0.95                                                                               | 1.00  |       | 0.95 | 1.00  |                           | 0.95 | 1.00  |      | 0.95  | 1.00  |      |
| Satd. Flow (perm)                 | 3467                                                                               | 1772  |       | 3502 | 1762  |                           | 1805 | 3417  |      | 1787  | 3440  |      |
| Peak-hour factor, PHF             | 0.96                                                                               | 0.96  | 0.96  | 0.96 | 0.96  | 0.96                      | 0.96 | 0.96  | 0.96 | 0.96  | 0.96  | 0.96 |
| Adj. Flow (vph)                   | 140                                                                                | 172   | 93    | 153  | 197   | 118                       | 118  | 1127  | 200  | 178   | 1050  | 189  |
| RTOR Reduction (vph)              | 0                                                                                  | 21    | 0     | 0    | 22    | 0                         | 0    | 13    | 0    | 0     | 13    | 0    |
| Lane Group Flow (vph)             | 140                                                                                | 244   | 0     | 153  | 293   | 0                         | 118  | 1314  | 0    | 178   | 1226  | 0    |
| Confl. Peds. (#/hr)               | 3                                                                                  |       | 1     | 1    |       | 3                         | 1    |       | 5    | 5     |       | 1    |
| Confl. Bikes (#/hr)               |                                                                                    |       | 1     |      |       | 4                         |      |       | 5    |       |       | 2    |
| Heavy Vehicles (%)                | 1%                                                                                 | 0%    | 3%    | 0%   | 1%    | 1%                        | 0%   | 3%    | 1%   | 1%    | 2%    | 3%   |
| Turn Type                         | Prot                                                                               | NA    |       | Prot | NA    |                           | Prot | NA    |      | Prot  | NA    |      |
| Protected Phases                  | 5                                                                                  | 2     |       | 1    | 6     |                           | 7    | 4     |      | 3     | 8     |      |
| Permitted Phases                  |                                                                                    |       |       |      |       |                           |      |       |      |       |       |      |
| Actuated Green, G (s)             | 8.4                                                                                | 18.0  |       | 10.8 | 20.4  |                           | 10.0 | 37.9  |      | 13.3  | 41.2  |      |
| Effective Green, g (s)            | 8.4                                                                                | 18.0  |       | 10.8 | 20.4  |                           | 10.0 | 37.9  |      | 13.3  | 41.2  |      |
| Actuated g/C Ratio                | 0.08                                                                               | 0.18  |       | 0.11 | 0.20  |                           | 0.10 | 0.38  |      | 0.13  | 0.41  |      |
| Clearance Time (s)                | 5.0                                                                                | 5.0   |       | 5.0  | 5.0   |                           | 5.0  | 5.0   |      | 5.0   | 5.0   |      |
| Vehicle Extension (s)             | 2.0                                                                                | 2.0   |       | 2.0  | 2.0   |                           | 2.0  | 2.0   |      | 2.0   | 2.0   |      |
| Lane Grp Cap (vph)                | 291                                                                                | 318   |       | 378  | 359   |                           | 180  | 1295  |      | 237   | 1417  |      |
| v/s Ratio Prot                    | 0.04                                                                               | c0.14 |       | 0.04 | c0.17 |                           | 0.07 | c0.38 |      | c0.10 | c0.36 |      |
| v/s Ratio Perm                    |                                                                                    |       |       |      |       |                           |      |       |      |       |       |      |
| v/c Ratio                         | 0.48                                                                               | 0.77  |       | 0.40 | 0.82  |                           | 0.66 | 1.01  |      | 0.75  | 0.87  |      |
| Uniform Delay, d1                 | 43.7                                                                               | 39.0  |       | 41.6 | 38.0  |                           | 43.3 | 31.1  |      | 41.8  | 26.9  |      |
| Progression Factor                | 1.00                                                                               | 1.00  |       | 1.00 | 1.00  |                           | 1.00 | 1.00  |      | 1.32  | 0.72  |      |
| Incremental Delay, d2             | 0.5                                                                                | 9.5   |       | 0.3  | 12.6  |                           | 6.4  | 28.7  |      | 9.0   | 4.5   |      |
| Delay (s)                         | 44.2                                                                               | 48.5  |       | 41.9 | 50.6  |                           | 49.7 | 59.8  |      | 64.0  | 23.7  |      |
| Level of Service                  | D                                                                                  | D     |       | D    | D     |                           | D    | E     |      | E     | C     |      |
| Approach Delay (s)                |                                                                                    | 47.0  |       |      | 47.8  |                           |      | 58.9  |      |       | 28.8  |      |
| Approach LOS                      |                                                                                    | D     |       |      | D     |                           |      | E     |      |       | C     |      |
| <b>Intersection Summary</b>       |                                                                                    |       |       |      |       |                           |      |       |      |       |       |      |
| HCM 2000 Control Delay            |                                                                                    |       | 44.8  |      |       | HCM 2000 Level of Service |      |       |      | D     |       |      |
| HCM 2000 Volume to Capacity ratio |                                                                                    |       | 0.92  |      |       |                           |      |       |      |       |       |      |
| Actuated Cycle Length (s)         |                                                                                    |       | 100.0 |      |       | Sum of lost time (s)      |      |       | 20.0 |       |       |      |
| Intersection Capacity Utilization |                                                                                    |       | 83.5% |      |       | ICU Level of Service      |      |       | E    |       |       |      |
| Analysis Period (min)             |                                                                                    |       | 15    |      |       |                           |      |       |      |       |       |      |
| c Critical Lane Group             |                                                                                    |       |       |      |       |                           |      |       |      |       |       |      |

| Intersection             |        |        |        |      |      |      |
|--------------------------|--------|--------|--------|------|------|------|
| Int Delay, s/veh         | 0      |        |        |      |      |      |
| Movement                 | EBL    | EBR    | NBL    | NBT  | SBT  | SBR  |
| Lane Configurations      |        | ↗      |        | ↑↑   | ↑↑   |      |
| Traffic Vol, veh/h       | 0      | 2      | 0      | 1392 | 1284 | 13   |
| Future Vol, veh/h        | 0      | 2      | 0      | 1392 | 1284 | 13   |
| Conflicting Peds, #/hr   | 0      | 0      | 0      | 0    | 0    | 0    |
| Sign Control             | Stop   | Stop   | Free   | Free | Free | Free |
| RT Channelized           | -      | None   | -      | None | -    | None |
| Storage Length           | -      | 0      | -      | -    | -    | -    |
| Veh in Median Storage, # | 0      | -      | -      | 0    | 0    | -    |
| Grade, %                 | 0      | -      | -      | 0    | 0    | -    |
| Peak Hour Factor         | 91     | 91     | 91     | 91   | 91   | 91   |
| Heavy Vehicles, %        | 0      | 0      | 0      | 2    | 1    | 0    |
| Mvmt Flow                | 0      | 2      | 0      | 1530 | 1411 | 14   |
| Major/Minor              | Minor2 | Major1 | Major2 |      |      |      |
| Conflicting Flow All     | -      | 713    | -      | 0    | -    | 0    |
| Stage 1                  | -      | -      | -      | -    | -    | -    |
| Stage 2                  | -      | -      | -      | -    | -    | -    |
| Critical Hdwy            | -      | 6.9    | -      | -    | -    | -    |
| Critical Hdwy Stg 1      | -      | -      | -      | -    | -    | -    |
| Critical Hdwy Stg 2      | -      | -      | -      | -    | -    | -    |
| Follow-up Hdwy           | -      | 3.3    | -      | -    | -    | -    |
| Pot Cap-1 Maneuver       | 0      | 379    | 0      | -    | -    | -    |
| Stage 1                  | 0      | -      | 0      | -    | -    | -    |
| Stage 2                  | 0      | -      | 0      | -    | -    | -    |
| Platoon blocked, %       |        |        |        | -    | -    | -    |
| Mov Cap-1 Maneuver       | -      | 379    | -      | -    | -    | -    |
| Mov Cap-2 Maneuver       | -      | -      | -      | -    | -    | -    |
| Stage 1                  | -      | -      | -      | -    | -    | -    |
| Stage 2                  | -      | -      | -      | -    | -    | -    |
| Approach                 | EB     | NB     | SB     |      |      |      |
| HCM Control Delay, s     | 14.6   | 0      | 0      |      |      |      |
| HCM LOS                  | B      |        |        |      |      |      |
| Minor Lane/Major Mvmt    | NBT    | EBLn1  | SBT    | SBR  |      |      |
| Capacity (veh/h)         | -      | 379    | -      | -    |      |      |
| HCM Lane V/C Ratio       | -      | 0.006  | -      | -    |      |      |
| HCM Control Delay (s)    | -      | 14.6   | -      | -    |      |      |
| HCM Lane LOS             | -      | B      | -      | -    |      |      |
| HCM 95th %tile Q(veh)    | -      | 0      | -      | -    |      |      |



| Intersection             |        |                                                                                   |                                                                                   |        |                                                                                   |      |
|--------------------------|--------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|--------|-----------------------------------------------------------------------------------|------|
| Int Delay, s/veh         | 0.6    |                                                                                   |                                                                                   |        |                                                                                   |      |
| Movement                 | EBL    | EBT                                                                               | WBT                                                                               | WBR    | SBL                                                                               | SBR  |
| Lane Configurations      |        |  |  |        |  |      |
| Traffic Vol, veh/h       | 14     | 268                                                                               | 273                                                                               | 11     | 12                                                                                | 9    |
| Future Vol, veh/h        | 14     | 268                                                                               | 273                                                                               | 11     | 12                                                                                | 9    |
| Conflicting Peds, #/hr   | 0      | 0                                                                                 | 0                                                                                 | 0      | 0                                                                                 | 0    |
| Sign Control             | Free   | Free                                                                              | Free                                                                              | Free   | Stop                                                                              | Stop |
| RT Channelized           | -      | None                                                                              | -                                                                                 | None   | -                                                                                 | None |
| Storage Length           | -      | -                                                                                 | -                                                                                 | -      | 0                                                                                 | -    |
| Veh in Median Storage, # | -      | 0                                                                                 | 0                                                                                 | -      | 0                                                                                 | -    |
| Grade, %                 | -      | 0                                                                                 | 0                                                                                 | -      | 0                                                                                 | -    |
| Peak Hour Factor         | 91     | 91                                                                                | 91                                                                                | 91     | 91                                                                                | 91   |
| Heavy Vehicles, %        | 0      | 1                                                                                 | 1                                                                                 | 0      | 0                                                                                 | 0    |
| Mvmt Flow                | 15     | 295                                                                               | 300                                                                               | 12     | 13                                                                                | 10   |
|                          |        |                                                                                   |                                                                                   |        |                                                                                   |      |
| Major/Minor              | Major1 | Major2                                                                            |                                                                                   | Minor2 |                                                                                   |      |
| Conflicting Flow All     | 312    | 0                                                                                 | -                                                                                 | 0      | 631                                                                               | 306  |
| Stage 1                  | -      | -                                                                                 | -                                                                                 | -      | 306                                                                               | -    |
| Stage 2                  | -      | -                                                                                 | -                                                                                 | -      | 325                                                                               | -    |
| Critical Hdwy            | 4.1    | -                                                                                 | -                                                                                 | -      | 6.4                                                                               | 6.2  |
| Critical Hdwy Stg 1      | -      | -                                                                                 | -                                                                                 | -      | 5.4                                                                               | -    |
| Critical Hdwy Stg 2      | -      | -                                                                                 | -                                                                                 | -      | 5.4                                                                               | -    |
| Follow-up Hdwy           | 2.2    | -                                                                                 | -                                                                                 | -      | 3.5                                                                               | 3.3  |
| Pot Cap-1 Maneuver       | 1260   | -                                                                                 | -                                                                                 | -      | 448                                                                               | 739  |
| Stage 1                  | -      | -                                                                                 | -                                                                                 | -      | 751                                                                               | -    |
| Stage 2                  | -      | -                                                                                 | -                                                                                 | -      | 737                                                                               | -    |
| Platoon blocked, %       |        | -                                                                                 | -                                                                                 | -      |                                                                                   |      |
| Mov Cap-1 Maneuver       | 1260   | -                                                                                 | -                                                                                 | -      | 442                                                                               | 739  |
| Mov Cap-2 Maneuver       | -      | -                                                                                 | -                                                                                 | -      | 442                                                                               | -    |
| Stage 1                  | -      | -                                                                                 | -                                                                                 | -      | 740                                                                               | -    |
| Stage 2                  | -      | -                                                                                 | -                                                                                 | -      | 737                                                                               | -    |
|                          |        |                                                                                   |                                                                                   |        |                                                                                   |      |
|                          |        |                                                                                   |                                                                                   |        |                                                                                   |      |
| Approach                 | EB     | WB                                                                                |                                                                                   | SB     |                                                                                   |      |
| HCM Control Delay, s     | 0.4    | 0                                                                                 |                                                                                   | 12     |                                                                                   |      |
| HCM LOS                  | B      |                                                                                   |                                                                                   |        |                                                                                   |      |
|                          |        |                                                                                   |                                                                                   |        |                                                                                   |      |
|                          |        |                                                                                   |                                                                                   |        |                                                                                   |      |
| Minor Lane/Major Mvmt    | EBL    | EBT                                                                               | WBT                                                                               | WBR    | SBLn1                                                                             |      |
| Capacity (veh/h)         | 1260   | -                                                                                 | -                                                                                 | -      | 534                                                                               |      |
| HCM Lane V/C Ratio       | 0.012  | -                                                                                 | -                                                                                 | -      | 0.043                                                                             |      |
| HCM Control Delay (s)    | 7.9    | 0                                                                                 | -                                                                                 | -      | 12                                                                                |      |
| HCM Lane LOS             | A      | A                                                                                 | -                                                                                 | -      | B                                                                                 |      |
| HCM 95th %tile Q(veh)    | 0      | -                                                                                 | -                                                                                 | -      | 0.1                                                                               |      |

## Appendix F 2027 Total Operations (Proposed Zoning) Worksheets

## Queues

1: SE 164th Ave &amp; SE 15th St

## Total 2027 Traffic Conditions

AM Peak Hour Conditions

|                         |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                               | NBT                                                                                | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Group Flow (vph)   | 17                                                                                | 77                                                                                | 59                                                                                | 54                                                                                | 86                                                                                | 64                                                                                | 1150                                                                               | 79                                                                                  | 77                                                                                  | 1063                                                                                | 19                                                                                  |
| v/c Ratio               | 0.03                                                                              | 0.10                                                                              | 0.09                                                                              | 0.06                                                                              | 0.11                                                                              | 0.44                                                                              | 0.77                                                                               | 0.14                                                                                | 0.50                                                                                | 0.69                                                                                | 0.03                                                                                |
| Control Delay           | 19.3                                                                              | 14.1                                                                              | 18.9                                                                              | 24.2                                                                              | 4.6                                                                               | 61.6                                                                              | 41.9                                                                               | 3.5                                                                                 | 62.5                                                                                | 38.9                                                                                | 0.1                                                                                 |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 19.3                                                                              | 14.1                                                                              | 18.9                                                                              | 24.2                                                                              | 4.6                                                                               | 61.6                                                                              | 41.9                                                                               | 3.5                                                                                 | 62.5                                                                                | 38.9                                                                                | 0.1                                                                                 |
| Queue Length 50th (ft)  | 6                                                                                 | 14                                                                                | 23                                                                                | 21                                                                                | 0                                                                                 | 48                                                                                | 297                                                                                | 0                                                                                   | 58                                                                                  | 264                                                                                 | 0                                                                                   |
| Queue Length 95th (ft)  | 23                                                                                | 55                                                                                | 56                                                                                | 62                                                                                | 30                                                                                | 92                                                                                | 320                                                                                | 22                                                                                  | 105                                                                                 | 285                                                                                 | 0                                                                                   |
| Internal Link Dist (ft) |                                                                                   | 600                                                                               |                                                                                   | 638                                                                               |                                                                                   |                                                                                   | 842                                                                                |                                                                                     |                                                                                     | 586                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 100                                                                               |                                                                                   | 250                                                                               |                                                                                   | 325                                                                               | 150                                                                               |                                                                                    | 150                                                                                 | 230                                                                                 |                                                                                     | 230                                                                                 |
| Base Capacity (vph)     | 723                                                                               | 749                                                                               | 668                                                                               | 900                                                                               | 785                                                                               | 167                                                                               | 2014                                                                               | 706                                                                                 | 171                                                                                 | 2014                                                                                | 687                                                                                 |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.02                                                                              | 0.10                                                                              | 0.09                                                                              | 0.06                                                                              | 0.11                                                                              | 0.38                                                                              | 0.57                                                                               | 0.11                                                                                | 0.45                                                                                | 0.53                                                                                | 0.03                                                                                |
| Intersection Summary    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM Signalized Intersection Capacity Analysis

1: SE 164th Ave & SE 15th St

Total 2027 Traffic Conditions

AM Peak Hour Conditions

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Traffic Volume (vph)              | 16                                                                                | 28                                                                                | 44                                                                                | 55                                                                                | 51                                                                                | 81                                                                                | 60                                                                                  | 1081                                                                                | 74                                                                                  | 72                                                                                  | 999                                                                                 | 18                                                                                  |
| Future Volume (vph)               | 16                                                                                | 28                                                                                | 44                                                                                | 55                                                                                | 51                                                                                | 81                                                                                | 60                                                                                  | 1081                                                                                | 74                                                                                  | 72                                                                                  | 999                                                                                 | 18                                                                                  |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 4.5                                                                               | 5.0                                                                               |                                                                                   | 4.5                                                                               | 5.0                                                                               | 5.0                                                                               | 4.5                                                                                 | 5.0                                                                                 | 5.0                                                                                 | 4.5                                                                                 | 5.0                                                                                 | 5.0                                                                                 |
| Lane Util. Factor                 | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 0.91                                                                                | 1.00                                                                                | 1.00                                                                                | 0.91                                                                                | 1.00                                                                                |
| Frpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 0.99                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Flpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Frt                               | 1.00                                                                              | 0.91                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 0.85                                                                              | 1.00                                                                                | 1.00                                                                                | 0.85                                                                                | 1.00                                                                                | 1.00                                                                                | 0.85                                                                                |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                |
| Satd. Flow (prot)                 | 1802                                                                              | 1695                                                                              |                                                                                   | 1752                                                                              | 1900                                                                              | 1546                                                                              | 1805                                                                                | 5036                                                                                | 1615                                                                                | 1752                                                                                | 5036                                                                                | 1568                                                                                |
| Flt Permitted                     | 0.72                                                                              | 1.00                                                                              |                                                                                   | 0.66                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                |
| Satd. Flow (perm)                 | 1369                                                                              | 1695                                                                              |                                                                                   | 1211                                                                              | 1900                                                                              | 1546                                                                              | 1805                                                                                | 5036                                                                                | 1615                                                                                | 1752                                                                                | 5036                                                                                | 1568                                                                                |
| Peak-hour factor, PHF             | 0.94                                                                              | 0.94                                                                              | 0.94                                                                              | 0.94                                                                              | 0.94                                                                              | 0.94                                                                              | 0.94                                                                                | 0.94                                                                                | 0.94                                                                                | 0.94                                                                                | 0.94                                                                                | 0.94                                                                                |
| Adj. Flow (vph)                   | 17                                                                                | 30                                                                                | 47                                                                                | 59                                                                                | 54                                                                                | 86                                                                                | 64                                                                                  | 1150                                                                                | 79                                                                                  | 77                                                                                  | 1063                                                                                | 19                                                                                  |
| RTOR Reduction (vph)              | 0                                                                                 | 28                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 48                                                                                | 0                                                                                   | 0                                                                                   | 55                                                                                  | 0                                                                                   | 0                                                                                   | 13                                                                                  |
| Lane Group Flow (vph)             | 17                                                                                | 49                                                                                | 0                                                                                 | 59                                                                                | 54                                                                                | 38                                                                                | 64                                                                                  | 1150                                                                                | 24                                                                                  | 77                                                                                  | 1063                                                                                | 6                                                                                   |
| Confl. Peds. (#/hr)               | 1                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 1                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Heavy Vehicles (%)                | 0%                                                                                | 0%                                                                                | 3%                                                                                | 3%                                                                                | 0%                                                                                | 3%                                                                                | 0%                                                                                  | 3%                                                                                  | 0%                                                                                  | 3%                                                                                  | 3%                                                                                  | 3%                                                                                  |
| Turn Type                         | pm+pt                                                                             | NA                                                                                |                                                                                   | pm+pt                                                                             | NA                                                                                | Perm                                                                              | Prot                                                                                | NA                                                                                  | Perm                                                                                | Prot                                                                                | NA                                                                                  | Perm                                                                                |
| Protected Phases                  | 5                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 6                                                                                 |                                                                                   | 7                                                                                   | 4                                                                                   |                                                                                     | 3                                                                                   | 8                                                                                   |                                                                                     |
| Permitted Phases                  | 2                                                                                 |                                                                                   |                                                                                   | 6                                                                                 |                                                                                   | 6                                                                                 |                                                                                     |                                                                                     | 4                                                                                   |                                                                                     |                                                                                     | 8                                                                                   |
| Actuated Green, G (s)             | 52.2                                                                              | 49.4                                                                              |                                                                                   | 59.8                                                                              | 53.2                                                                              | 53.2                                                                              | 8.4                                                                                 | 35.7                                                                                | 35.7                                                                                | 9.3                                                                                 | 36.6                                                                                | 36.6                                                                                |
| Effective Green, g (s)            | 52.2                                                                              | 49.4                                                                              |                                                                                   | 59.8                                                                              | 53.2                                                                              | 53.2                                                                              | 8.4                                                                                 | 35.7                                                                                | 35.7                                                                                | 9.3                                                                                 | 36.6                                                                                | 36.6                                                                                |
| Actuated g/C Ratio                | 0.44                                                                              | 0.41                                                                              |                                                                                   | 0.50                                                                              | 0.44                                                                              | 0.44                                                                              | 0.07                                                                                | 0.30                                                                                | 0.30                                                                                | 0.08                                                                                | 0.31                                                                                | 0.31                                                                                |
| Clearance Time (s)                | 4.5                                                                               | 5.0                                                                               |                                                                                   | 4.5                                                                               | 5.0                                                                               | 5.0                                                                               | 4.5                                                                                 | 5.0                                                                                 | 5.0                                                                                 | 4.5                                                                                 | 5.0                                                                                 | 5.0                                                                                 |
| Vehicle Extension (s)             | 3.0                                                                               | 2.0                                                                               |                                                                                   | 3.0                                                                               | 2.0                                                                               | 2.0                                                                               | 3.0                                                                                 | 2.0                                                                                 | 2.0                                                                                 | 3.0                                                                                 | 2.0                                                                                 | 2.0                                                                                 |
| Lane Grp Cap (vph)                | 605                                                                               | 697                                                                               |                                                                                   | 633                                                                               | 842                                                                               | 685                                                                               | 126                                                                                 | 1498                                                                                | 480                                                                                 | 135                                                                                 | 1535                                                                                | 478                                                                                 |
| v/s Ratio Prot                    | 0.00                                                                              | 0.03                                                                              |                                                                                   | c0.01                                                                             | 0.03                                                                              |                                                                                   | 0.04                                                                                | c0.23                                                                               |                                                                                     | c0.04                                                                               | 0.21                                                                                |                                                                                     |
| v/s Ratio Perm                    | 0.01                                                                              |                                                                                   |                                                                                   | c0.04                                                                             |                                                                                   | 0.02                                                                              |                                                                                     |                                                                                     | 0.01                                                                                |                                                                                     |                                                                                     | 0.00                                                                                |
| v/c Ratio                         | 0.03                                                                              | 0.07                                                                              |                                                                                   | 0.09                                                                              | 0.06                                                                              | 0.06                                                                              | 0.51                                                                                | 0.77                                                                                | 0.05                                                                                | 0.57                                                                                | 0.69                                                                                | 0.01                                                                                |
| Uniform Delay, d1                 | 19.3                                                                              | 21.4                                                                              |                                                                                   | 15.7                                                                              | 19.1                                                                              | 19.1                                                                              | 53.8                                                                                | 38.4                                                                                | 30.0                                                                                | 53.4                                                                                | 36.7                                                                                | 29.1                                                                                |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Incremental Delay, d2             | 0.0                                                                               | 0.2                                                                               |                                                                                   | 0.1                                                                               | 0.0                                                                               | 0.0                                                                               | 3.2                                                                                 | 2.2                                                                                 | 0.0                                                                                 | 5.7                                                                                 | 1.1                                                                                 | 0.0                                                                                 |
| Delay (s)                         | 19.4                                                                              | 21.6                                                                              |                                                                                   | 15.8                                                                              | 19.1                                                                              | 19.1                                                                              | 57.0                                                                                | 40.6                                                                                | 30.1                                                                                | 59.1                                                                                | 37.8                                                                                | 29.1                                                                                |
| Level of Service                  | B                                                                                 | C                                                                                 |                                                                                   | B                                                                                 | B                                                                                 | B                                                                                 | E                                                                                   | D                                                                                   | C                                                                                   | E                                                                                   | D                                                                                   | C                                                                                   |
| Approach Delay (s)                |                                                                                   | 21.2                                                                              |                                                                                   |                                                                                   | 18.1                                                                              |                                                                                   |                                                                                     | 40.7                                                                                |                                                                                     |                                                                                     | 39.1                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | C                                                                                 |                                                                                   |                                                                                   | B                                                                                 |                                                                                   |                                                                                     | D                                                                                   |                                                                                     |                                                                                     | D                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                   |                                                                                   | 37.7                                                                              |                                                                                   |                                                                                   |                                                                                   | HCM 2000 Level of Service                                                           |                                                                                     |                                                                                     | D                                                                                   |                                                                                     |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                   |                                                                                   | 0.38                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 120.0                                                                             |                                                                                   |                                                                                   |                                                                                   | Sum of lost time (s)                                                                |                                                                                     |                                                                                     | 19.0                                                                                |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 49.7%                                                                             |                                                                                   |                                                                                   |                                                                                   | ICU Level of Service                                                                |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

| Intersection             |                                                                                   |      |        |                                                                                   |                                                                                   |      |
|--------------------------|-----------------------------------------------------------------------------------|------|--------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|
| Int Delay, s/veh         | 1                                                                                 |      |        |                                                                                   |                                                                                   |      |
| Movement                 | EBT                                                                               | EBR  | WBL    | WBT                                                                               | NBL                                                                               | NBR  |
| Lane Configurations      |  |      |        |  |  |      |
| Traffic Vol, veh/h       | 207                                                                               | 10   | 8      | 200                                                                               | 16                                                                                | 20   |
| Future Vol, veh/h        | 207                                                                               | 10   | 8      | 200                                                                               | 16                                                                                | 20   |
| Conflicting Peds, #/hr   | 0                                                                                 | 3    | 3      | 0                                                                                 | 3                                                                                 | 0    |
| Sign Control             | Free                                                                              | Free | Free   | Free                                                                              | Stop                                                                              | Stop |
| RT Channelized           | -                                                                                 | None | -      | None                                                                              | -                                                                                 | None |
| Storage Length           | -                                                                                 | -    | -      | -                                                                                 | 0                                                                                 | -    |
| Veh in Median Storage, # | 0                                                                                 | -    | -      | 0                                                                                 | 0                                                                                 | -    |
| Grade, %                 | 0                                                                                 | -    | -      | 0                                                                                 | 0                                                                                 | -    |
| Peak Hour Factor         | 77                                                                                | 77   | 77     | 77                                                                                | 77                                                                                | 77   |
| Heavy Vehicles, %        | 3                                                                                 | 3    | 3      | 3                                                                                 | 0                                                                                 | 0    |
| Mvmt Flow                | 269                                                                               | 13   | 10     | 260                                                                               | 21                                                                                | 26   |
|                          |                                                                                   |      |        |                                                                                   |                                                                                   |      |
| Major/Minor              | Major1                                                                            |      | Major2 |                                                                                   | Minor1                                                                            |      |
| Conflicting Flow All     | 0                                                                                 | 0    | 285    | 0                                                                                 | 562                                                                               | 279  |
| Stage 1                  | -                                                                                 | -    | -      | -                                                                                 | 279                                                                               | -    |
| Stage 2                  | -                                                                                 | -    | -      | -                                                                                 | 283                                                                               | -    |
| Critical Hdwy            | -                                                                                 | -    | 4.13   | -                                                                                 | 6.4                                                                               | 6.2  |
| Critical Hdwy Stg 1      | -                                                                                 | -    | -      | -                                                                                 | 5.4                                                                               | -    |
| Critical Hdwy Stg 2      | -                                                                                 | -    | -      | -                                                                                 | 5.4                                                                               | -    |
| Follow-up Hdwy           | -                                                                                 | -    | 2.227  | -                                                                                 | 3.5                                                                               | 3.3  |
| Pot Cap-1 Maneuver       | -                                                                                 | -    | 1271   | -                                                                                 | 492                                                                               | 765  |
| Stage 1                  | -                                                                                 | -    | -      | -                                                                                 | 773                                                                               | -    |
| Stage 2                  | -                                                                                 | -    | -      | -                                                                                 | 770                                                                               | -    |
| Platoon blocked, %       | -                                                                                 | -    |        | -                                                                                 |                                                                                   |      |
| Mov Cap-1 Maneuver       | -                                                                                 | -    | 1267   | -                                                                                 | 485                                                                               | 763  |
| Mov Cap-2 Maneuver       | -                                                                                 | -    | -      | -                                                                                 | 485                                                                               | -    |
| Stage 1                  | -                                                                                 | -    | -      | -                                                                                 | 771                                                                               | -    |
| Stage 2                  | -                                                                                 | -    | -      | -                                                                                 | 761                                                                               | -    |
|                          |                                                                                   |      |        |                                                                                   |                                                                                   |      |
|                          |                                                                                   |      |        |                                                                                   |                                                                                   |      |
| Approach                 | EB                                                                                |      | WB     |                                                                                   | NB                                                                                |      |
| HCM Control Delay, s     | 0                                                                                 |      | 0.3    |                                                                                   | 11.4                                                                              |      |
| HCM LOS                  |                                                                                   |      |        |                                                                                   | B                                                                                 |      |
|                          |                                                                                   |      |        |                                                                                   |                                                                                   |      |
|                          |                                                                                   |      |        |                                                                                   |                                                                                   |      |
| Minor Lane/Major Mvmt    | NBLn1                                                                             | EBT  | EBR    | WBL                                                                               | WBT                                                                               |      |
| Capacity (veh/h)         | 608                                                                               | -    | -      | 1267                                                                              | -                                                                                 |      |
| HCM Lane V/C Ratio       | 0.077                                                                             | -    | -      | 0.008                                                                             | -                                                                                 |      |
| HCM Control Delay (s)    | 11.4                                                                              | -    | -      | 7.9                                                                               | 0                                                                                 |      |
| HCM Lane LOS             | B                                                                                 | -    | -      | A                                                                                 | A                                                                                 |      |
| HCM 95th %tile Q(veh)    | 0.2                                                                               | -    | -      | 0                                                                                 | -                                                                                 |      |



Queues  
3: SE 192nd Ave & SE 15th St

Total 2027 Traffic Conditions  
AM Peak Hour Conditions

|                         |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                               | NBT                                                                                | SBL                                                                                 | SBT                                                                                 |
| Lane Group Flow (vph)   | 165                                                                               | 123                                                                               | 26                                                                                | 60                                                                                | 54                                                                                | 54                                                                                | 939                                                                                | 27                                                                                  | 836                                                                                 |
| v/c Ratio               | 0.73                                                                              | 0.31                                                                              | 0.26                                                                              | 0.41                                                                              | 0.17                                                                              | 0.40                                                                              | 0.47                                                                               | 0.28                                                                                | 0.43                                                                                |
| Control Delay           | 60.3                                                                              | 15.6                                                                              | 51.4                                                                              | 50.5                                                                              | 1.2                                                                               | 44.2                                                                              | 14.6                                                                               | 52.0                                                                                | 17.0                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 60.3                                                                              | 15.6                                                                              | 51.4                                                                              | 50.5                                                                              | 1.2                                                                               | 44.2                                                                              | 14.6                                                                               | 52.0                                                                                | 17.0                                                                                |
| Queue Length 50th (ft)  | 103                                                                               | 22                                                                                | 16                                                                                | 38                                                                                | 0                                                                                 | 27                                                                                | 164                                                                                | 17                                                                                  | 164                                                                                 |
| Queue Length 95th (ft)  | 162                                                                               | 67                                                                                | 43                                                                                | 72                                                                                | 0                                                                                 | m43                                                                               | 143                                                                                | 44                                                                                  | 293                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 318                                                                               |                                                                                   | 1016                                                                              |                                                                                   |                                                                                   | 1126                                                                               |                                                                                     | 227                                                                                 |
| Turn Bay Length (ft)    | 115                                                                               |                                                                                   | 110                                                                               |                                                                                   | 110                                                                               | 150                                                                               |                                                                                    | 475                                                                                 |                                                                                     |
| Base Capacity (vph)     | 350                                                                               | 471                                                                               | 100                                                                               | 173                                                                               | 320                                                                               | 150                                                                               | 2055                                                                               | 109                                                                                 | 1971                                                                                |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.47                                                                              | 0.26                                                                              | 0.26                                                                              | 0.35                                                                              | 0.17                                                                              | 0.36                                                                              | 0.46                                                                               | 0.25                                                                                | 0.42                                                                                |

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

# HCM Signalized Intersection Capacity Analysis

## 3: SE 192nd Ave & SE 15th St

Total 2027 Traffic Conditions  
AM Peak Hour Conditions

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Traffic Volume (vph)              | 152                                                                               | 41                                                                                | 72                                                                                | 24                                                                                | 55                                                                                | 50                                                                                | 50                                                                                 | 839                                                                                 | 25                                                                                  | 25                                                                                  | 697                                                                                 | 72                                                                                  |
| Future Volume (vph)               | 152                                                                               | 41                                                                                | 72                                                                                | 24                                                                                | 55                                                                                | 50                                                                                | 50                                                                                 | 839                                                                                 | 25                                                                                  | 25                                                                                  | 697                                                                                 | 72                                                                                  |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                                | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Lane Util. Factor                 | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                               | 0.95                                                                                |                                                                                     | 1.00                                                                                | 0.95                                                                                |                                                                                     |
| Frpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 0.99                                                                              | 1.00                                                                               | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Flpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                               | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Frt                               | 1.00                                                                              | 0.90                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 0.85                                                                              | 1.00                                                                               | 1.00                                                                                |                                                                                     | 1.00                                                                                | 0.99                                                                                |                                                                                     |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                               | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (prot)                 | 1752                                                                              | 1719                                                                              |                                                                                   | 1805                                                                              | 1845                                                                              | 1555                                                                              | 1805                                                                               | 3490                                                                                |                                                                                     | 1752                                                                                | 3449                                                                                |                                                                                     |
| Flt Permitted                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                               | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (perm)                 | 1752                                                                              | 1719                                                                              |                                                                                   | 1805                                                                              | 1845                                                                              | 1555                                                                              | 1805                                                                               | 3490                                                                                |                                                                                     | 1752                                                                                | 3449                                                                                |                                                                                     |
| Peak-hour factor, PHF             | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Adj. Flow (vph)                   | 165                                                                               | 45                                                                                | 78                                                                                | 26                                                                                | 60                                                                                | 54                                                                                | 54                                                                                 | 912                                                                                 | 27                                                                                  | 27                                                                                  | 758                                                                                 | 78                                                                                  |
| RTOR Reduction (vph)              | 0                                                                                 | 63                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 48                                                                                | 0                                                                                  | 2                                                                                   | 0                                                                                   | 0                                                                                   | 7                                                                                   | 0                                                                                   |
| Lane Group Flow (vph)             | 165                                                                               | 60                                                                                | 0                                                                                 | 26                                                                                | 60                                                                                | 6                                                                                 | 54                                                                                 | 937                                                                                 | 0                                                                                   | 27                                                                                  | 829                                                                                 | 0                                                                                   |
| Confl. Peds. (#/hr)               | 1                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 1                                                                                 |                                                                                    |                                                                                     | 3                                                                                   | 3                                                                                   |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | 1                                                                                   |                                                                                     |                                                                                     | 1                                                                                   |
| Heavy Vehicles (%)                | 3%                                                                                | 0%                                                                                | 0%                                                                                | 0%                                                                                | 3%                                                                                | 3%                                                                                | 0%                                                                                 | 3%                                                                                  | 0%                                                                                  | 3%                                                                                  | 3%                                                                                  | 3%                                                                                  |
| Turn Type                         | Prot                                                                              | NA                                                                                |                                                                                   | Prot                                                                              | NA                                                                                | pm+ov                                                                             | Prot                                                                               | NA                                                                                  |                                                                                     | Prot                                                                                | NA                                                                                  |                                                                                     |
| Protected Phases                  | 5                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 6                                                                                 | 3                                                                                 | 7                                                                                  | 4                                                                                   |                                                                                     | 3                                                                                   | 8                                                                                   |                                                                                     |
| Permitted Phases                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 6                                                                                 |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Green, G (s)             | 14.9                                                                              | 19.3                                                                              |                                                                                   | 2.6                                                                               | 7.0                                                                               | 11.6                                                                              | 6.6                                                                                | 53.5                                                                                |                                                                                     | 4.6                                                                                 | 51.5                                                                                |                                                                                     |
| Effective Green, g (s)            | 14.9                                                                              | 19.3                                                                              |                                                                                   | 2.6                                                                               | 7.0                                                                               | 11.6                                                                              | 6.6                                                                                | 53.5                                                                                |                                                                                     | 4.6                                                                                 | 51.5                                                                                |                                                                                     |
| Actuated g/C Ratio                | 0.15                                                                              | 0.19                                                                              |                                                                                   | 0.03                                                                              | 0.07                                                                              | 0.12                                                                              | 0.07                                                                               | 0.54                                                                                |                                                                                     | 0.05                                                                                | 0.52                                                                                |                                                                                     |
| Clearance Time (s)                | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                                | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Vehicle Extension (s)             | 1.0                                                                               | 1.0                                                                               |                                                                                   | 1.0                                                                               | 1.0                                                                               | 1.0                                                                               | 1.0                                                                                | 1.0                                                                                 |                                                                                     | 1.0                                                                                 | 1.0                                                                                 |                                                                                     |
| Lane Grp Cap (vph)                | 261                                                                               | 331                                                                               |                                                                                   | 46                                                                                | 129                                                                               | 180                                                                               | 119                                                                                | 1867                                                                                |                                                                                     | 80                                                                                  | 1776                                                                                |                                                                                     |
| v/s Ratio Prot                    | c0.09                                                                             | c0.03                                                                             |                                                                                   | 0.01                                                                              | c0.03                                                                             | 0.00                                                                              | 0.03                                                                               | c0.27                                                                               |                                                                                     | 0.02                                                                                | c0.24                                                                               |                                                                                     |
| v/s Ratio Perm                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 0.00                                                                              |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| v/c Ratio                         | 0.63                                                                              | 0.18                                                                              |                                                                                   | 0.57                                                                              | 0.47                                                                              | 0.03                                                                              | 0.45                                                                               | 0.50                                                                                |                                                                                     | 0.34                                                                                | 0.47                                                                                |                                                                                     |
| Uniform Delay, d1                 | 40.0                                                                              | 33.7                                                                              |                                                                                   | 48.1                                                                              | 44.7                                                                              | 39.2                                                                              | 45.0                                                                               | 14.8                                                                                |                                                                                     | 46.2                                                                                | 15.5                                                                                |                                                                                     |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 0.86                                                                               | 0.90                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Incremental Delay, d2             | 3.6                                                                               | 0.1                                                                               |                                                                                   | 9.1                                                                               | 1.0                                                                               | 0.0                                                                               | 0.8                                                                                | 0.7                                                                                 |                                                                                     | 0.9                                                                                 | 0.1                                                                                 |                                                                                     |
| Delay (s)                         | 43.6                                                                              | 33.8                                                                              |                                                                                   | 57.3                                                                              | 45.7                                                                              | 39.3                                                                              | 39.5                                                                               | 14.0                                                                                |                                                                                     | 47.1                                                                                | 15.6                                                                                |                                                                                     |
| Level of Service                  | D                                                                                 | C                                                                                 |                                                                                   | E                                                                                 | D                                                                                 | D                                                                                 | D                                                                                  | B                                                                                   |                                                                                     | D                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay (s)                |                                                                                   | 39.4                                                                              |                                                                                   |                                                                                   | 45.4                                                                              |                                                                                   |                                                                                    | 15.4                                                                                |                                                                                     |                                                                                     | 16.5                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                    | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                   |                                                                                   | 20.7                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                   |                                                                                   | 0.53                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 100.0                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 55.8%                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

Queues  
4: SE 192nd Ave & Mill Plain Blvd

Total 2027 Traffic Conditions  
AM Peak Hour Conditions

|                         |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | NBL                                                                               | NBT                                                                                | SBL                                                                                 | SBT                                                                                 |
| Lane Group Flow (vph)   | 136                                                                               | 118                                                                               | 208                                                                               | 166                                                                               | 234                                                                               | 512                                                                               | 925                                                                                | 100                                                                                 | 805                                                                                 |
| v/c Ratio               | 0.70                                                                              | 0.40                                                                              | 0.35                                                                              | 0.79                                                                              | 0.73                                                                              | 0.87                                                                              | 0.59                                                                               | 0.70                                                                                | 0.67                                                                                |
| Control Delay           | 61.7                                                                              | 39.3                                                                              | 6.6                                                                               | 69.6                                                                              | 44.9                                                                              | 59.1                                                                              | 24.4                                                                               | 69.1                                                                                | 30.5                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 61.7                                                                              | 39.3                                                                              | 6.6                                                                               | 69.6                                                                              | 44.9                                                                              | 59.1                                                                              | 24.4                                                                               | 69.1                                                                                | 30.5                                                                                |
| Queue Length 50th (ft)  | 84                                                                                | 70                                                                                | 22                                                                                | 103                                                                               | 120                                                                               | 165                                                                               | 220                                                                                | 63                                                                                  | 214                                                                                 |
| Queue Length 95th (ft)  | 116                                                                               | 84                                                                                | 30                                                                                | 139                                                                               | 135                                                                               | #232                                                                              | 277                                                                                | 94                                                                                  | 243                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 628                                                                               |                                                                                   |                                                                                   | 391                                                                               |                                                                                   | 457                                                                                |                                                                                     | 709                                                                                 |
| Turn Bay Length (ft)    | 240                                                                               |                                                                                   | 130                                                                               |                                                                                   |                                                                                   | 205                                                                               |                                                                                    | 150                                                                                 |                                                                                     |
| Base Capacity (vph)     | 233                                                                               | 516                                                                               | 601                                                                               | 227                                                                               | 507                                                                               | 589                                                                               | 1561                                                                               | 176                                                                                 | 1202                                                                                |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.58                                                                              | 0.23                                                                              | 0.35                                                                              | 0.73                                                                              | 0.46                                                                              | 0.87                                                                              | 0.59                                                                               | 0.57                                                                                | 0.67                                                                                |

Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.

# HCM Signalized Intersection Capacity Analysis

## 4: SE 192nd Ave & Mill Plain Blvd

Total 2027 Traffic Conditions  
AM Peak Hour Conditions

|                                   |  |  |  |  |  |  |   |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |  |  |  |                                                                                   |  |  |                                                                                     |  |  |  |
| Traffic Volume (vph)              | 101                                                                               | 87                                                                                | 154                                                                               | 123                                                                               | 96                                                                                | 77                                                                                | 379                                                                                 | 502                                                                                 | 183                                                                                 | 74                                                                                  | 450                                                                                 | 146                                                                                 |
| Future Volume (vph)               | 101                                                                               | 87                                                                                | 154                                                                               | 123                                                                               | 96                                                                                | 77                                                                                | 379                                                                                 | 502                                                                                 | 183                                                                                 | 74                                                                                  | 450                                                                                 | 146                                                                                 |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                                 | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Lane Util. Factor                 | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              |                                                                                   | 0.97                                                                                | 0.95                                                                                |                                                                                     | 1.00                                                                                | 0.95                                                                                |                                                                                     |
| Frpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              | 0.99                                                                              | 1.00                                                                              | 0.99                                                                              |                                                                                   | 1.00                                                                                | 0.99                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Flpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Frt                               | 1.00                                                                              | 1.00                                                                              | 0.85                                                                              | 1.00                                                                              | 0.93                                                                              |                                                                                   | 1.00                                                                                | 0.96                                                                                |                                                                                     | 1.00                                                                                | 0.96                                                                                |                                                                                     |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                                | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (prot)                 | 1752                                                                              | 1845                                                                              | 1552                                                                              | 1752                                                                              | 1711                                                                              |                                                                                   | 3433                                                                                | 3340                                                                                |                                                                                     | 1752                                                                                | 3363                                                                                |                                                                                     |
| Flt Permitted                     | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                                | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (perm)                 | 1752                                                                              | 1845                                                                              | 1552                                                                              | 1752                                                                              | 1711                                                                              |                                                                                   | 3433                                                                                | 3340                                                                                |                                                                                     | 1752                                                                                | 3363                                                                                |                                                                                     |
| Peak-hour factor, PHF             | 0.74                                                                              | 0.74                                                                              | 0.74                                                                              | 0.74                                                                              | 0.74                                                                              | 0.74                                                                              | 0.74                                                                                | 0.74                                                                                | 0.74                                                                                | 0.74                                                                                | 0.74                                                                                | 0.74                                                                                |
| Adj. Flow (vph)                   | 136                                                                               | 118                                                                               | 208                                                                               | 166                                                                               | 130                                                                               | 104                                                                               | 512                                                                                 | 678                                                                                 | 247                                                                                 | 100                                                                                 | 608                                                                                 | 197                                                                                 |
| RTOR Reduction (vph)              | 0                                                                                 | 0                                                                                 | 86                                                                                | 0                                                                                 | 33                                                                                | 0                                                                                 | 0                                                                                   | 29                                                                                  | 0                                                                                   | 0                                                                                   | 28                                                                                  | 0                                                                                   |
| Lane Group Flow (vph)             | 136                                                                               | 118                                                                               | 122                                                                               | 166                                                                               | 201                                                                               | 0                                                                                 | 512                                                                                 | 896                                                                                 | 0                                                                                   | 100                                                                                 | 777                                                                                 | 0                                                                                   |
| Confl. Peds. (#/hr)               | 1                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                 | 3                                                                                   |                                                                                     | 3                                                                                   | 3                                                                                   |                                                                                     | 3                                                                                   |
| Confl. Bikes (#/hr)               |                                                                                   |                                                                                   | 1                                                                                 |                                                                                   |                                                                                   | 1                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     | 1                                                                                   |
| Heavy Vehicles (%)                | 3%                                                                                | 3%                                                                                | 3%                                                                                | 3%                                                                                | 3%                                                                                | 3%                                                                                | 2%                                                                                  | 3%                                                                                  | 3%                                                                                  | 3%                                                                                  | 3%                                                                                  | 3%                                                                                  |
| Turn Type                         | Prot                                                                              | NA                                                                                | pm+ov                                                                             | Prot                                                                              | NA                                                                                |                                                                                   | Prot                                                                                | NA                                                                                  |                                                                                     | Prot                                                                                | NA                                                                                  |                                                                                     |
| Protected Phases                  | 5                                                                                 | 2                                                                                 | 7                                                                                 | 1                                                                                 | 6                                                                                 |                                                                                   | 7                                                                                   | 4                                                                                   |                                                                                     | 3                                                                                   | 8                                                                                   |                                                                                     |
| Permitted Phases                  |                                                                                   |                                                                                   | 2                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Green, G (s)             | 11.1                                                                              | 16.0                                                                              | 34.2                                                                              | 11.9                                                                              | 16.8                                                                              |                                                                                   | 18.2                                                                                | 44.9                                                                                |                                                                                     | 7.2                                                                                 | 33.9                                                                                |                                                                                     |
| Effective Green, g (s)            | 11.1                                                                              | 16.0                                                                              | 34.2                                                                              | 11.9                                                                              | 16.8                                                                              |                                                                                   | 18.2                                                                                | 44.9                                                                                |                                                                                     | 7.2                                                                                 | 33.9                                                                                |                                                                                     |
| Actuated g/C Ratio                | 0.11                                                                              | 0.16                                                                              | 0.34                                                                              | 0.12                                                                              | 0.17                                                                              |                                                                                   | 0.18                                                                                | 0.45                                                                                |                                                                                     | 0.07                                                                                | 0.34                                                                                |                                                                                     |
| Clearance Time (s)                | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                                 | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Vehicle Extension (s)             | 1.5                                                                               | 1.5                                                                               | 0.5                                                                               | 2.0                                                                               | 2.0                                                                               |                                                                                   | 0.5                                                                                 | 0.5                                                                                 |                                                                                     | 0.5                                                                                 | 0.5                                                                                 |                                                                                     |
| Lane Grp Cap (vph)                | 194                                                                               | 295                                                                               | 530                                                                               | 208                                                                               | 287                                                                               |                                                                                   | 624                                                                                 | 1499                                                                                |                                                                                     | 126                                                                                 | 1140                                                                                |                                                                                     |
| v/s Ratio Prot                    | c0.08                                                                             | c0.06                                                                             | 0.04                                                                              | 0.09                                                                              | c0.12                                                                             |                                                                                   | c0.15                                                                               | 0.27                                                                                |                                                                                     | 0.06                                                                                | c0.23                                                                               |                                                                                     |
| v/s Ratio Perm                    |                                                                                   |                                                                                   | 0.04                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| v/c Ratio                         | 0.70                                                                              | 0.40                                                                              | 0.23                                                                              | 0.80                                                                              | 0.70                                                                              |                                                                                   | 0.82                                                                                | 0.60                                                                                |                                                                                     | 0.79                                                                                | 0.68                                                                                |                                                                                     |
| Uniform Delay, d1                 | 42.9                                                                              | 37.7                                                                              | 23.5                                                                              | 42.9                                                                              | 39.2                                                                              |                                                                                   | 39.3                                                                                | 20.8                                                                                |                                                                                     | 45.7                                                                                | 28.4                                                                                |                                                                                     |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Incremental Delay, d2             | 9.0                                                                               | 0.3                                                                               | 0.1                                                                               | 17.7                                                                              | 5.9                                                                               |                                                                                   | 8.1                                                                                 | 1.8                                                                                 |                                                                                     | 26.5                                                                                | 1.4                                                                                 |                                                                                     |
| Delay (s)                         | 51.8                                                                              | 38.0                                                                              | 23.6                                                                              | 60.6                                                                              | 45.1                                                                              |                                                                                   | 47.4                                                                                | 22.5                                                                                |                                                                                     | 72.2                                                                                | 29.8                                                                                |                                                                                     |
| Level of Service                  | D                                                                                 | D                                                                                 | C                                                                                 | E                                                                                 | D                                                                                 |                                                                                   | D                                                                                   | C                                                                                   |                                                                                     | E                                                                                   | C                                                                                   |                                                                                     |
| Approach Delay (s)                |                                                                                   | 35.6                                                                              |                                                                                   |                                                                                   | 51.6                                                                              |                                                                                   |                                                                                     | 31.4                                                                                |                                                                                     |                                                                                     | 34.4                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                     | C                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                   |                                                                                   | 35.4                                                                              |                                                                                   |                                                                                   | HCM 2000 Level of Service                                                         |                                                                                     |                                                                                     |                                                                                     | D                                                                                   |                                                                                     |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                   |                                                                                   | 0.71                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 100.0                                                                             |                                                                                   |                                                                                   | Sum of lost time (s)                                                              |                                                                                     |                                                                                     |                                                                                     | 20.0                                                                                |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 60.7%                                                                             |                                                                                   |                                                                                   | ICU Level of Service                                                              |                                                                                     |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

Queues  
5: SE 192nd Ave & SE 20th St

Total 2027 Traffic Conditions  
AM Peak Hour Conditions

|                         |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | WBL                                                                               | WBT                                                                               | NBL                                                                               | NBT                                                                               | SBL                                                                                | SBT                                                                                 |
| Lane Group Flow (vph)   | 177                                                                               | 211                                                                               | 138                                                                               | 283                                                                               | 53                                                                                | 1063                                                                              | 95                                                                                 | 975                                                                                 |
| v/c Ratio               | 0.55                                                                              | 0.60                                                                              | 0.48                                                                              | 0.82                                                                              | 0.41                                                                              | 0.67                                                                              | 0.61                                                                               | 0.60                                                                                |
| Control Delay           | 49.5                                                                              | 38.8                                                                              | 49.0                                                                              | 50.9                                                                              | 52.9                                                                              | 26.9                                                                              | 73.5                                                                               | 18.0                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 |
| Total Delay             | 49.5                                                                              | 38.8                                                                              | 49.0                                                                              | 50.9                                                                              | 52.9                                                                              | 26.9                                                                              | 73.5                                                                               | 18.0                                                                                |
| Queue Length 50th (ft)  | 56                                                                                | 108                                                                               | 44                                                                                | 146                                                                               | 33                                                                                | 288                                                                               | 64                                                                                 | 250                                                                                 |
| Queue Length 95th (ft)  | 76                                                                                | 145                                                                               | 63                                                                                | 187                                                                               | 61                                                                                | 346                                                                               | 99                                                                                 | 219                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 1997                                                                              |                                                                                   | 3145                                                                              |                                                                                   | 1320                                                                              |                                                                                    | 1126                                                                                |
| Turn Bay Length (ft)    | 100                                                                               |                                                                                   | 150                                                                               |                                                                                   | 335                                                                               |                                                                                   | 410                                                                                |                                                                                     |
| Base Capacity (vph)     | 408                                                                               | 455                                                                               | 374                                                                               | 445                                                                               | 175                                                                               | 1575                                                                              | 180                                                                                | 1622                                                                                |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |
| Reduced v/c Ratio       | 0.43                                                                              | 0.46                                                                              | 0.37                                                                              | 0.64                                                                              | 0.30                                                                              | 0.67                                                                              | 0.53                                                                               | 0.60                                                                                |
| Intersection Summary    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |



# HCM Signalized Intersection Capacity Analysis

## 5: SE 192nd Ave & SE 20th St

Total 2027 Traffic Conditions  
AM Peak Hour Conditions

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |                                                                                   |  |  |                                                                                   |  |  |                                                                                     |  |  |                                                                                     |
| Traffic Volume (vph)              | 140                                                                               | 111                                                                               | 55                                                                                | 109                                                                               | 114                                                                               | 110                                                                               | 42                                                                                 | 749                                                                                 | 91                                                                                  | 75                                                                                  | 681                                                                                 | 89                                                                                  |
| Future Volume (vph)               | 140                                                                               | 111                                                                               | 55                                                                                | 109                                                                               | 114                                                                               | 110                                                                               | 42                                                                                 | 749                                                                                 | 91                                                                                  | 75                                                                                  | 681                                                                                 | 89                                                                                  |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                                | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Lane Util. Factor                 | 0.97                                                                              | 1.00                                                                              |                                                                                   | 0.97                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                               | 0.95                                                                                |                                                                                     | 1.00                                                                                | 0.95                                                                                |                                                                                     |
| Frpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 0.99                                                                              |                                                                                   | 1.00                                                                               | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Flpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                               | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Frt                               | 1.00                                                                              | 0.95                                                                              |                                                                                   | 1.00                                                                              | 0.93                                                                              |                                                                                   | 1.00                                                                               | 0.98                                                                                |                                                                                     | 1.00                                                                                | 0.98                                                                                |                                                                                     |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                               | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (prot)                 | 3400                                                                              | 1750                                                                              |                                                                                   | 3400                                                                              | 1711                                                                              |                                                                                   | 1752                                                                               | 3438                                                                                |                                                                                     | 1752                                                                                | 3434                                                                                |                                                                                     |
| Flt Permitted                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                               | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (perm)                 | 3400                                                                              | 1750                                                                              |                                                                                   | 3400                                                                              | 1711                                                                              |                                                                                   | 1752                                                                               | 3438                                                                                |                                                                                     | 1752                                                                                | 3434                                                                                |                                                                                     |
| Peak-hour factor, PHF             | 0.79                                                                              | 0.79                                                                              | 0.79                                                                              | 0.79                                                                              | 0.79                                                                              | 0.79                                                                              | 0.79                                                                               | 0.79                                                                                | 0.79                                                                                | 0.79                                                                                | 0.79                                                                                | 0.79                                                                                |
| Adj. Flow (vph)                   | 177                                                                               | 141                                                                               | 70                                                                                | 138                                                                               | 144                                                                               | 139                                                                               | 53                                                                                 | 948                                                                                 | 115                                                                                 | 95                                                                                  | 862                                                                                 | 113                                                                                 |
| RTOR Reduction (vph)              | 0                                                                                 | 19                                                                                | 0                                                                                 | 0                                                                                 | 38                                                                                | 0                                                                                 | 0                                                                                  | 8                                                                                   | 0                                                                                   | 0                                                                                   | 8                                                                                   | 0                                                                                   |
| Lane Group Flow (vph)             | 177                                                                               | 192                                                                               | 0                                                                                 | 138                                                                               | 245                                                                               | 0                                                                                 | 53                                                                                 | 1055                                                                                | 0                                                                                   | 95                                                                                  | 967                                                                                 | 0                                                                                   |
| Confl. Peds. (#/hr)               | 2                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 2                                                                                 | 2                                                                                  |                                                                                     | 2                                                                                   | 2                                                                                   |                                                                                     | 2                                                                                   |
| Confl. Bikes (#/hr)               |                                                                                   |                                                                                   | 2                                                                                 |                                                                                   |                                                                                   | 2                                                                                 |                                                                                    |                                                                                     | 2                                                                                   |                                                                                     |                                                                                     | 1                                                                                   |
| Heavy Vehicles (%)                | 3%                                                                                | 3%                                                                                | 2%                                                                                | 3%                                                                                | 1%                                                                                | 3%                                                                                | 3%                                                                                 | 3%                                                                                  | 3%                                                                                  | 3%                                                                                  | 3%                                                                                  | 3%                                                                                  |
| Turn Type                         | Prot                                                                              | NA                                                                                |                                                                                   | Prot                                                                              | NA                                                                                |                                                                                   | Prot                                                                               | NA                                                                                  |                                                                                     | Prot                                                                                | NA                                                                                  |                                                                                     |
| Protected Phases                  | 5                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 6                                                                                 |                                                                                   | 7                                                                                  | 4                                                                                   |                                                                                     | 3                                                                                   | 8                                                                                   |                                                                                     |
| Permitted Phases                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Green, G (s)             | 9.5                                                                               | 19.2                                                                              |                                                                                   | 8.4                                                                               | 18.1                                                                              |                                                                                   | 6.4                                                                                | 44.5                                                                                |                                                                                     | 7.9                                                                                 | 46.0                                                                                |                                                                                     |
| Effective Green, g (s)            | 9.5                                                                               | 19.2                                                                              |                                                                                   | 8.4                                                                               | 18.1                                                                              |                                                                                   | 6.4                                                                                | 44.5                                                                                |                                                                                     | 7.9                                                                                 | 46.0                                                                                |                                                                                     |
| Actuated g/C Ratio                | 0.10                                                                              | 0.19                                                                              |                                                                                   | 0.08                                                                              | 0.18                                                                              |                                                                                   | 0.06                                                                               | 0.44                                                                                |                                                                                     | 0.08                                                                                | 0.46                                                                                |                                                                                     |
| Clearance Time (s)                | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                                | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Vehicle Extension (s)             | 2.0                                                                               | 2.0                                                                               |                                                                                   | 2.0                                                                               | 2.0                                                                               |                                                                                   | 2.0                                                                                | 2.0                                                                                 |                                                                                     | 2.0                                                                                 | 2.0                                                                                 |                                                                                     |
| Lane Grp Cap (vph)                | 323                                                                               | 336                                                                               |                                                                                   | 285                                                                               | 309                                                                               |                                                                                   | 112                                                                                | 1529                                                                                |                                                                                     | 138                                                                                 | 1579                                                                                |                                                                                     |
| v/s Ratio Prot                    | c0.05                                                                             | 0.11                                                                              |                                                                                   | 0.04                                                                              | c0.14                                                                             |                                                                                   | 0.03                                                                               | c0.31                                                                               |                                                                                     | c0.05                                                                               | 0.28                                                                                |                                                                                     |
| v/s Ratio Perm                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| v/c Ratio                         | 0.55                                                                              | 0.57                                                                              |                                                                                   | 0.48                                                                              | 0.79                                                                              |                                                                                   | 0.47                                                                               | 0.69                                                                                |                                                                                     | 0.69                                                                                | 0.61                                                                                |                                                                                     |
| Uniform Delay, d1                 | 43.2                                                                              | 36.7                                                                              |                                                                                   | 43.7                                                                              | 39.2                                                                              |                                                                                   | 45.2                                                                               | 22.2                                                                                |                                                                                     | 44.9                                                                                | 20.3                                                                                |                                                                                     |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                               | 1.00                                                                                |                                                                                     | 1.33                                                                                | 0.73                                                                                |                                                                                     |
| Incremental Delay, d2             | 1.0                                                                               | 1.5                                                                               |                                                                                   | 0.5                                                                               | 12.3                                                                              |                                                                                   | 1.1                                                                                | 2.6                                                                                 |                                                                                     | 10.4                                                                                | 0.5                                                                                 |                                                                                     |
| Delay (s)                         | 44.2                                                                              | 38.1                                                                              |                                                                                   | 44.2                                                                              | 51.5                                                                              |                                                                                   | 46.3                                                                               | 24.8                                                                                |                                                                                     | 70.0                                                                                | 15.3                                                                                |                                                                                     |
| Level of Service                  | D                                                                                 | D                                                                                 |                                                                                   | D                                                                                 | D                                                                                 |                                                                                   | D                                                                                  | C                                                                                   |                                                                                     | E                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay (s)                |                                                                                   | 40.9                                                                              |                                                                                   |                                                                                   | 49.1                                                                              |                                                                                   |                                                                                    | 25.8                                                                                |                                                                                     |                                                                                     | 20.2                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                    | C                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                   |                                                                                   | 29.0                                                                              |                                                                                   |                                                                                   | HCM 2000 Level of Service                                                         |                                                                                    |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                   |                                                                                   | 0.70                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 100.0                                                                             |                                                                                   |                                                                                   | Sum of lost time (s)                                                              |                                                                                    |                                                                                     | 20.0                                                                                |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 61.8%                                                                             |                                                                                   |                                                                                   | ICU Level of Service                                                              |                                                                                    |                                                                                     | B                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

| Intersection             |        |        |        |      |      |      |
|--------------------------|--------|--------|--------|------|------|------|
| Int Delay, s/veh         | 0      |        |        |      |      |      |
| Movement                 | EBL    | EBR    | NBL    | NBT  | SBT  | SBR  |
| Lane Configurations      |        | ↗      |        | ↑↑   | ↑↑   |      |
| Traffic Vol, veh/h       | 0      | 7      | 0      | 1041 | 787  | 7    |
| Future Vol, veh/h        | 0      | 7      | 0      | 1041 | 787  | 7    |
| Conflicting Peds, #/hr   | 0      | 0      | 0      | 0    | 0    | 0    |
| Sign Control             | Stop   | Stop   | Free   | Free | Free | Free |
| RT Channelized           | -      | None   | -      | None | -    | None |
| Storage Length           | -      | 0      | -      | -    | -    | -    |
| Veh in Median Storage, # | 0      | -      | -      | 0    | 0    | -    |
| Grade, %                 | 0      | -      | -      | 0    | 0    | -    |
| Peak Hour Factor         | 92     | 92     | 92     | 92   | 92   | 92   |
| Heavy Vehicles, %        | 0      | 0      | 0      | 3    | 3    | 0    |
| Mvmt Flow                | 0      | 8      | 0      | 1132 | 855  | 8    |
| Major/Minor              | Minor2 | Major1 | Major2 |      |      |      |
| Conflicting Flow All     | -      | 432    | -      | 0    | -    | 0    |
| Stage 1                  | -      | -      | -      | -    | -    | -    |
| Stage 2                  | -      | -      | -      | -    | -    | -    |
| Critical Hdwy            | -      | 6.9    | -      | -    | -    | -    |
| Critical Hdwy Stg 1      | -      | -      | -      | -    | -    | -    |
| Critical Hdwy Stg 2      | -      | -      | -      | -    | -    | -    |
| Follow-up Hdwy           | -      | 3.3    | -      | -    | -    | -    |
| Pot Cap-1 Maneuver       | 0      | 577    | 0      | -    | -    | -    |
| Stage 1                  | 0      | -      | 0      | -    | -    | -    |
| Stage 2                  | 0      | -      | 0      | -    | -    | -    |
| Platoon blocked, %       |        |        |        | -    | -    | -    |
| Mov Cap-1 Maneuver       | -      | 577    | -      | -    | -    | -    |
| Mov Cap-2 Maneuver       | -      | -      | -      | -    | -    | -    |
| Stage 1                  | -      | -      | -      | -    | -    | -    |
| Stage 2                  | -      | -      | -      | -    | -    | -    |
| Approach                 | EB     | NB     | SB     |      |      |      |
| HCM Control Delay, s     | 11.3   | 0      | 0      |      |      |      |
| HCM LOS                  | B      |        |        |      |      |      |
| Minor Lane/Major Mvmt    | NBT    | EBLn1  | SBT    | SBR  |      |      |
| Capacity (veh/h)         | -      | 577    | -      | -    |      |      |
| HCM Lane V/C Ratio       | -      | 0.013  | -      | -    |      |      |
| HCM Control Delay (s)    | -      | 11.3   | -      | -    |      |      |
| HCM Lane LOS             | -      | B      | -      | -    |      |      |
| HCM 95th %tile Q(veh)    | -      | 0      | -      | -    |      |      |

| Intersection             |        |                                                                                   |                                                                                   |        |                                                                                   |      |
|--------------------------|--------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|--------|-----------------------------------------------------------------------------------|------|
| Int Delay, s/veh         | 1.6    |                                                                                   |                                                                                   |        |                                                                                   |      |
| Movement                 | EBL    | EBT                                                                               | WBT                                                                               | WBR    | SBL                                                                               | SBR  |
| Lane Configurations      |        |  |  |        |  |      |
| Traffic Vol, veh/h       | 9      | 229                                                                               | 171                                                                               | 6      | 36                                                                                | 27   |
| Future Vol, veh/h        | 9      | 229                                                                               | 171                                                                               | 6      | 36                                                                                | 27   |
| Conflicting Peds, #/hr   | 0      | 0                                                                                 | 0                                                                                 | 0      | 0                                                                                 | 0    |
| Sign Control             | Free   | Free                                                                              | Free                                                                              | Free   | Stop                                                                              | Stop |
| RT Channelized           | -      | None                                                                              | -                                                                                 | None   | -                                                                                 | None |
| Storage Length           | -      | -                                                                                 | -                                                                                 | -      | 0                                                                                 | -    |
| Veh in Median Storage, # | -      | 0                                                                                 | 0                                                                                 | -      | 0                                                                                 | -    |
| Grade, %                 | -      | 0                                                                                 | 0                                                                                 | -      | 0                                                                                 | -    |
| Peak Hour Factor         | 92     | 92                                                                                | 92                                                                                | 92     | 92                                                                                | 92   |
| Heavy Vehicles, %        | 0      | 0                                                                                 | 3                                                                                 | 0      | 0                                                                                 | 0    |
| Mvmt Flow                | 10     | 249                                                                               | 186                                                                               | 7      | 39                                                                                | 29   |
| Major/Minor              | Major1 | Major2                                                                            |                                                                                   | Minor2 |                                                                                   |      |
| Conflicting Flow All     | 193    | 0                                                                                 | -                                                                                 | 0      | 459                                                                               | 190  |
| Stage 1                  | -      | -                                                                                 | -                                                                                 | -      | 190                                                                               | -    |
| Stage 2                  | -      | -                                                                                 | -                                                                                 | -      | 269                                                                               | -    |
| Critical Hdwy            | 4.1    | -                                                                                 | -                                                                                 | -      | 6.4                                                                               | 6.2  |
| Critical Hdwy Stg 1      | -      | -                                                                                 | -                                                                                 | -      | 5.4                                                                               | -    |
| Critical Hdwy Stg 2      | -      | -                                                                                 | -                                                                                 | -      | 5.4                                                                               | -    |
| Follow-up Hdwy           | 2.2    | -                                                                                 | -                                                                                 | -      | 3.5                                                                               | 3.3  |
| Pot Cap-1 Maneuver       | 1392   | -                                                                                 | -                                                                                 | -      | 564                                                                               | 857  |
| Stage 1                  | -      | -                                                                                 | -                                                                                 | -      | 847                                                                               | -    |
| Stage 2                  | -      | -                                                                                 | -                                                                                 | -      | 781                                                                               | -    |
| Platoon blocked, %       |        | -                                                                                 | -                                                                                 | -      |                                                                                   |      |
| Mov Cap-1 Maneuver       | 1392   | -                                                                                 | -                                                                                 | -      | 559                                                                               | 857  |
| Mov Cap-2 Maneuver       | -      | -                                                                                 | -                                                                                 | -      | 559                                                                               | -    |
| Stage 1                  | -      | -                                                                                 | -                                                                                 | -      | 840                                                                               | -    |
| Stage 2                  | -      | -                                                                                 | -                                                                                 | -      | 781                                                                               | -    |
| Approach                 | EB     | WB                                                                                |                                                                                   | SB     |                                                                                   |      |
| HCM Control Delay, s     | 0.3    | 0                                                                                 |                                                                                   | 11.1   |                                                                                   |      |
| HCM LOS                  |        |                                                                                   |                                                                                   | B      |                                                                                   |      |
| Minor Lane/Major Mvmt    | EBL    | EBT                                                                               | WBT                                                                               | WBR    | SBLn1                                                                             |      |
| Capacity (veh/h)         | 1392   | -                                                                                 | -                                                                                 | -      | 657                                                                               |      |
| HCM Lane V/C Ratio       | 0.007  | -                                                                                 | -                                                                                 | -      | 0.104                                                                             |      |
| HCM Control Delay (s)    | 7.6    | 0                                                                                 | -                                                                                 | -      | 11.1                                                                              |      |
| HCM Lane LOS             | A      | A                                                                                 | -                                                                                 | -      | B                                                                                 |      |
| HCM 95th %tile Q(veh)    | 0      | -                                                                                 | -                                                                                 | -      | 0.3                                                                               |      |

## Queues

1: SE 164th Ave &amp; SE 15th St

## Total 2027 Traffic Conditions

PM Peak Hour Conditions

|                         |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                               | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Group Flow (vph)   | 45                                                                                | 128                                                                               | 132                                                                               | 123                                                                               | 111                                                                               | 133                                                                               | 1743                                                                                | 68                                                                                  | 183                                                                                 | 1669                                                                                | 47                                                                                  |
| v/c Ratio               | 0.13                                                                              | 0.40                                                                              | 0.38                                                                              | 0.31                                                                              | 0.27                                                                              | 0.62                                                                              | 0.84                                                                                | 0.10                                                                                | 0.61                                                                                | 0.70                                                                                | 0.06                                                                                |
| Control Delay           | 33.8                                                                              | 45.0                                                                              | 37.0                                                                              | 46.3                                                                              | 10.1                                                                              | 61.9                                                                              | 35.7                                                                                | 1.9                                                                                 | 55.2                                                                                | 27.6                                                                                | 0.1                                                                                 |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 33.8                                                                              | 45.0                                                                              | 37.0                                                                              | 46.3                                                                              | 10.1                                                                              | 61.9                                                                              | 35.7                                                                                | 1.9                                                                                 | 55.2                                                                                | 27.6                                                                                | 0.1                                                                                 |
| Queue Length 50th (ft)  | 26                                                                                | 82                                                                                | 80                                                                                | 85                                                                                | 0                                                                                 | 99                                                                                | 417                                                                                 | 0                                                                                   | 133                                                                                 | 351                                                                                 | 0                                                                                   |
| Queue Length 95th (ft)  | 55                                                                                | 140                                                                               | 132                                                                               | 146                                                                               | 49                                                                                | 156                                                                               | 484                                                                                 | 11                                                                                  | 199                                                                                 | 421                                                                                 | 0                                                                                   |
| Internal Link Dist (ft) |                                                                                   | 642                                                                               |                                                                                   | 766                                                                               |                                                                                   |                                                                                   | 1016                                                                                |                                                                                     |                                                                                     | 601                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 100                                                                               |                                                                                   | 250                                                                               |                                                                                   | 325                                                                               | 150                                                                               |                                                                                     | 150                                                                                 | 230                                                                                 |                                                                                     | 230                                                                                 |
| Base Capacity (vph)     | 388                                                                               | 489                                                                               | 353                                                                               | 541                                                                               | 524                                                                               | 226                                                                               | 2105                                                                                | 705                                                                                 | 299                                                                                 | 2373                                                                                | 783                                                                                 |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.12                                                                              | 0.26                                                                              | 0.37                                                                              | 0.23                                                                              | 0.21                                                                              | 0.59                                                                              | 0.83                                                                                | 0.10                                                                                | 0.61                                                                                | 0.70                                                                                | 0.06                                                                                |
| Intersection Summary    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM Signalized Intersection Capacity Analysis

1: SE 164th Ave & SE 15th St

Total 2027 Traffic Conditions

PM Peak Hour Conditions

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Traffic Volume (vph)              | 40                                                                                | 82                                                                                | 31                                                                                | 116                                                                               | 108                                                                               | 98                                                                                | 117                                                                                 | 1534                                                                                | 60                                                                                  | 161                                                                                 | 1469                                                                                | 41                                                                                  |
| Future Volume (vph)               | 40                                                                                | 82                                                                                | 31                                                                                | 116                                                                               | 108                                                                               | 98                                                                                | 117                                                                                 | 1534                                                                                | 60                                                                                  | 161                                                                                 | 1469                                                                                | 41                                                                                  |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 4.5                                                                               | 5.0                                                                               |                                                                                   | 4.5                                                                               | 5.0                                                                               | 5.0                                                                               | 4.5                                                                                 | 5.0                                                                                 | 5.0                                                                                 | 4.5                                                                                 | 5.0                                                                                 | 5.0                                                                                 |
| Lane Util. Factor                 | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 0.91                                                                                | 1.00                                                                                | 1.00                                                                                | 0.91                                                                                | 1.00                                                                                |
| Frpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 0.98                                                                              | 1.00                                                                                | 1.00                                                                                | 0.98                                                                                | 1.00                                                                                | 1.00                                                                                | 0.98                                                                                |
| Flpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Frt                               | 1.00                                                                              | 0.96                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 0.85                                                                              | 1.00                                                                                | 1.00                                                                                | 0.85                                                                                | 1.00                                                                                | 1.00                                                                                | 0.85                                                                                |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                |
| Satd. Flow (prot)                 | 1805                                                                              | 1787                                                                              |                                                                                   | 1803                                                                              | 1881                                                                              | 1542                                                                              | 1805                                                                                | 5036                                                                                | 1549                                                                                | 1787                                                                                | 5136                                                                                | 1580                                                                                |
| Flt Permitted                     | 0.68                                                                              | 1.00                                                                              |                                                                                   | 0.50                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                |
| Satd. Flow (perm)                 | 1288                                                                              | 1787                                                                              |                                                                                   | 958                                                                               | 1881                                                                              | 1542                                                                              | 1805                                                                                | 5036                                                                                | 1549                                                                                | 1787                                                                                | 5136                                                                                | 1580                                                                                |
| Peak-hour factor, PHF             | 0.88                                                                              | 0.88                                                                              | 0.88                                                                              | 0.88                                                                              | 0.88                                                                              | 0.88                                                                              | 0.88                                                                                | 0.88                                                                                | 0.88                                                                                | 0.88                                                                                | 0.88                                                                                | 0.88                                                                                |
| Adj. Flow (vph)                   | 45                                                                                | 93                                                                                | 35                                                                                | 132                                                                               | 123                                                                               | 111                                                                               | 133                                                                                 | 1743                                                                                | 68                                                                                  | 183                                                                                 | 1669                                                                                | 47                                                                                  |
| RTOR Reduction (vph)              | 0                                                                                 | 12                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 88                                                                                | 0                                                                                   | 0                                                                                   | 40                                                                                  | 0                                                                                   | 0                                                                                   | 25                                                                                  |
| Lane Group Flow (vph)             | 45                                                                                | 116                                                                               | 0                                                                                 | 132                                                                               | 123                                                                               | 23                                                                                | 133                                                                                 | 1743                                                                                | 28                                                                                  | 183                                                                                 | 1669                                                                                | 22                                                                                  |
| Confl. Peds. (#/hr)               |                                                                                   |                                                                                   | 2                                                                                 | 2                                                                                 |                                                                                   |                                                                                   | 1                                                                                   |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 1                                                                                   |
| Confl. Bikes (#/hr)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 4                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Heavy Vehicles (%)                | 0%                                                                                | 1%                                                                                | 3%                                                                                | 0%                                                                                | 1%                                                                                | 3%                                                                                | 0%                                                                                  | 3%                                                                                  | 2%                                                                                  | 1%                                                                                  | 1%                                                                                  | 0%                                                                                  |
| Turn Type                         | pm+pt                                                                             | NA                                                                                |                                                                                   | pm+pt                                                                             | NA                                                                                | Perm                                                                              | Prot                                                                                | NA                                                                                  | Perm                                                                                | Prot                                                                                | NA                                                                                  | Perm                                                                                |
| Protected Phases                  | 5                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 6                                                                                 |                                                                                   | 7                                                                                   | 4                                                                                   |                                                                                     | 3                                                                                   | 8                                                                                   |                                                                                     |
| Permitted Phases                  | 2                                                                                 |                                                                                   |                                                                                   | 6                                                                                 |                                                                                   | 6                                                                                 |                                                                                     |                                                                                     | 4                                                                                   |                                                                                     |                                                                                     | 8                                                                                   |
| Actuated Green, G (s)             | 27.5                                                                              | 20.9                                                                              |                                                                                   | 34.7                                                                              | 24.5                                                                              | 24.5                                                                              | 14.4                                                                                | 49.8                                                                                | 49.8                                                                                | 20.1                                                                                | 55.5                                                                                | 55.5                                                                                |
| Effective Green, g (s)            | 27.5                                                                              | 20.9                                                                              |                                                                                   | 34.7                                                                              | 24.5                                                                              | 24.5                                                                              | 14.4                                                                                | 49.8                                                                                | 49.8                                                                                | 20.1                                                                                | 55.5                                                                                | 55.5                                                                                |
| Actuated g/C Ratio                | 0.23                                                                              | 0.17                                                                              |                                                                                   | 0.29                                                                              | 0.20                                                                              | 0.20                                                                              | 0.12                                                                                | 0.41                                                                                | 0.41                                                                                | 0.17                                                                                | 0.46                                                                                | 0.46                                                                                |
| Clearance Time (s)                | 4.5                                                                               | 5.0                                                                               |                                                                                   | 4.5                                                                               | 5.0                                                                               | 5.0                                                                               | 4.5                                                                                 | 5.0                                                                                 | 5.0                                                                                 | 4.5                                                                                 | 5.0                                                                                 | 5.0                                                                                 |
| Vehicle Extension (s)             | 3.0                                                                               | 2.0                                                                               |                                                                                   | 3.0                                                                               | 2.0                                                                               | 2.0                                                                               | 3.0                                                                                 | 2.0                                                                                 | 2.0                                                                                 | 3.0                                                                                 | 2.0                                                                                 | 2.0                                                                                 |
| Lane Grp Cap (vph)                | 323                                                                               | 311                                                                               |                                                                                   | 348                                                                               | 384                                                                               | 314                                                                               | 216                                                                                 | 2089                                                                                | 642                                                                                 | 299                                                                                 | 2375                                                                                | 730                                                                                 |
| v/s Ratio Prot                    | 0.01                                                                              | 0.06                                                                              |                                                                                   | c0.03                                                                             | 0.07                                                                              |                                                                                   | 0.07                                                                                | c0.35                                                                               |                                                                                     | c0.10                                                                               | 0.32                                                                                |                                                                                     |
| v/s Ratio Perm                    | 0.02                                                                              |                                                                                   |                                                                                   | c0.08                                                                             |                                                                                   | 0.01                                                                              |                                                                                     |                                                                                     | 0.02                                                                                |                                                                                     |                                                                                     | 0.01                                                                                |
| v/c Ratio                         | 0.14                                                                              | 0.37                                                                              |                                                                                   | 0.38                                                                              | 0.32                                                                              | 0.07                                                                              | 0.62                                                                                | 0.83                                                                                | 0.04                                                                                | 0.61                                                                                | 0.70                                                                                | 0.03                                                                                |
| Uniform Delay, d1                 | 36.6                                                                              | 43.8                                                                              |                                                                                   | 32.9                                                                              | 40.7                                                                              | 38.6                                                                              | 50.2                                                                                | 31.4                                                                                | 20.9                                                                                | 46.3                                                                                | 25.7                                                                                | 17.6                                                                                |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Incremental Delay, d2             | 0.2                                                                               | 3.4                                                                               |                                                                                   | 0.7                                                                               | 2.2                                                                               | 0.4                                                                               | 5.1                                                                                 | 2.9                                                                                 | 0.0                                                                                 | 3.7                                                                                 | 0.8                                                                                 | 0.0                                                                                 |
| Delay (s)                         | 36.8                                                                              | 47.1                                                                              |                                                                                   | 33.6                                                                              | 42.9                                                                              | 39.0                                                                              | 55.3                                                                                | 34.3                                                                                | 20.9                                                                                | 50.0                                                                                | 26.5                                                                                | 17.6                                                                                |
| Level of Service                  | D                                                                                 | D                                                                                 |                                                                                   | C                                                                                 | D                                                                                 | D                                                                                 | E                                                                                   | C                                                                                   | C                                                                                   | D                                                                                   | C                                                                                   | B                                                                                   |
| Approach Delay (s)                |                                                                                   | 44.4                                                                              |                                                                                   |                                                                                   | 38.3                                                                              |                                                                                   |                                                                                     | 35.3                                                                                |                                                                                     |                                                                                     | 28.5                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                     | D                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                   |                                                                                   | 33.0                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                   |                                                                                   | 0.66                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 120.0                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 69.0%                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |



HCM 6th TWSC  
2: SE 189th Ave & SE 15th St

Total 2027 Traffic Conditions  
PM Peak Hour Conditions

| Intersection             |                                                                                   |      |        |                                                                                   |                                                                                   |       |
|--------------------------|-----------------------------------------------------------------------------------|------|--------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------|
| Int Delay, s/veh         | 0.8                                                                               |      |        |                                                                                   |                                                                                   |       |
| Movement                 | EBT                                                                               | EBR  | WBL    | WBT                                                                               | NBL                                                                               | NBR   |
| Lane Configurations      |  |      |        |  |  |       |
| Traffic Vol, veh/h       | 291                                                                               | 14   | 22     | 267                                                                               | 12                                                                                | 13    |
| Future Vol, veh/h        | 291                                                                               | 14   | 22     | 267                                                                               | 12                                                                                | 13    |
| Conflicting Peds, #/hr   | 0                                                                                 | 4    | 4      | 0                                                                                 | 6                                                                                 | 0     |
| Sign Control             | Free                                                                              | Free | Free   | Free                                                                              | Stop                                                                              | Stop  |
| RT Channelized           | -                                                                                 | None | -      | None                                                                              | -                                                                                 | None  |
| Storage Length           | -                                                                                 | -    | -      | -                                                                                 | 0                                                                                 | -     |
| Veh in Median Storage, # | 0                                                                                 | -    | -      | 0                                                                                 | 0                                                                                 | -     |
| Grade, %                 | 0                                                                                 | -    | -      | 0                                                                                 | 0                                                                                 | -     |
| Peak Hour Factor         | 86                                                                                | 86   | 86     | 86                                                                                | 86                                                                                | 86    |
| Heavy Vehicles, %        | 1                                                                                 | 3    | 3      | 1                                                                                 | 0                                                                                 | 3     |
| Mvmt Flow                | 338                                                                               | 16   | 26     | 310                                                                               | 14                                                                                | 15    |
|                          |                                                                                   |      |        |                                                                                   |                                                                                   |       |
| Major/Minor              | Major1                                                                            |      | Major2 |                                                                                   | Minor1                                                                            |       |
| Conflicting Flow All     | 0                                                                                 | 0    | 358    | 0                                                                                 | 718                                                                               | 350   |
| Stage 1                  | -                                                                                 | -    | -      | -                                                                                 | 350                                                                               | -     |
| Stage 2                  | -                                                                                 | -    | -      | -                                                                                 | 368                                                                               | -     |
| Critical Hdwy            | -                                                                                 | -    | 4.13   | -                                                                                 | 6.4                                                                               | 6.23  |
| Critical Hdwy Stg 1      | -                                                                                 | -    | -      | -                                                                                 | 5.4                                                                               | -     |
| Critical Hdwy Stg 2      | -                                                                                 | -    | -      | -                                                                                 | 5.4                                                                               | -     |
| Follow-up Hdwy           | -                                                                                 | -    | 2.227  | -                                                                                 | 3.5                                                                               | 3.327 |
| Pot Cap-1 Maneuver       | -                                                                                 | -    | 1195   | -                                                                                 | 399                                                                               | 691   |
| Stage 1                  | -                                                                                 | -    | -      | -                                                                                 | 718                                                                               | -     |
| Stage 2                  | -                                                                                 | -    | -      | -                                                                                 | 704                                                                               | -     |
| Platoon blocked, %       | -                                                                                 | -    |        | -                                                                                 |                                                                                   |       |
| Mov Cap-1 Maneuver       | -                                                                                 | -    | 1190   | -                                                                                 | 385                                                                               | 688   |
| Mov Cap-2 Maneuver       | -                                                                                 | -    | -      | -                                                                                 | 385                                                                               | -     |
| Stage 1                  | -                                                                                 | -    | -      | -                                                                                 | 715                                                                               | -     |
| Stage 2                  | -                                                                                 | -    | -      | -                                                                                 | 681                                                                               | -     |
|                          |                                                                                   |      |        |                                                                                   |                                                                                   |       |
|                          |                                                                                   |      |        |                                                                                   |                                                                                   |       |
| Approach                 | EB                                                                                |      | WB     |                                                                                   | NB                                                                                |       |
| HCM Control Delay, s     | 0                                                                                 |      | 0.6    |                                                                                   | 12.7                                                                              |       |
| HCM LOS                  |                                                                                   |      |        |                                                                                   | B                                                                                 |       |
|                          |                                                                                   |      |        |                                                                                   |                                                                                   |       |
|                          |                                                                                   |      |        |                                                                                   |                                                                                   |       |
| Minor Lane/Major Mvmt    | NBLn1                                                                             | EBT  | EBR    | WBL                                                                               | WBT                                                                               |       |
| Capacity (veh/h)         | 499                                                                               | -    | -      | 1190                                                                              | -                                                                                 |       |
| HCM Lane V/C Ratio       | 0.058                                                                             | -    | -      | 0.021                                                                             | -                                                                                 |       |
| HCM Control Delay (s)    | 12.7                                                                              | -    | -      | 8.1                                                                               | 0                                                                                 |       |
| HCM Lane LOS             | B                                                                                 | -    | -      | A                                                                                 | A                                                                                 |       |
| HCM 95th %tile Q(veh)    | 0.2                                                                               | -    | -      | 0.1                                                                               | -                                                                                 |       |

Queues  
3: SE 192nd Ave & SE 15th St

Total 2027 Traffic Conditions  
PM Peak Hour Conditions

|                         |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                               | NBT                                                                                | SBL                                                                                 | SBT                                                                                 |
| Lane Group Flow (vph)   | 129                                                                               | 191                                                                               | 48                                                                                | 89                                                                                | 227                                                                               | 100                                                                               | 1215                                                                               | 62                                                                                  | 1357                                                                                |
| v/c Ratio               | 0.72                                                                              | 0.74                                                                              | 0.48                                                                              | 0.62                                                                              | 0.60                                                                              | 0.68                                                                              | 0.60                                                                               | 0.49                                                                                | 0.67                                                                                |
| Control Delay           | 64.5                                                                              | 47.8                                                                              | 62.2                                                                              | 62.8                                                                              | 15.0                                                                              | 43.6                                                                              | 16.1                                                                               | 57.3                                                                                | 19.5                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 64.5                                                                              | 47.8                                                                              | 62.2                                                                              | 62.8                                                                              | 15.0                                                                              | 43.6                                                                              | 16.1                                                                               | 57.3                                                                                | 19.5                                                                                |
| Queue Length 50th (ft)  | 80                                                                                | 87                                                                                | 30                                                                                | 56                                                                                | 22                                                                                | 53                                                                                | 232                                                                                | 39                                                                                  | 333                                                                                 |
| Queue Length 95th (ft)  | 139                                                                               | 154                                                                               | #79                                                                               | 106                                                                               | 84                                                                                | m53                                                                               | m116                                                                               | 79                                                                                  | 461                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 206                                                                               |                                                                                   | 1016                                                                              |                                                                                   |                                                                                   | 1126                                                                               |                                                                                     | 238                                                                                 |
| Turn Bay Length (ft)    | 115                                                                               |                                                                                   | 110                                                                               |                                                                                   | 110                                                                               | 150                                                                               |                                                                                    | 475                                                                                 |                                                                                     |
| Base Capacity (vph)     | 232                                                                               | 337                                                                               | 100                                                                               | 172                                                                               | 422                                                                               | 178                                                                               | 2011                                                                               | 177                                                                                 | 2042                                                                                |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.56                                                                              | 0.57                                                                              | 0.48                                                                              | 0.52                                                                              | 0.54                                                                              | 0.56                                                                              | 0.60                                                                               | 0.35                                                                                | 0.66                                                                                |

Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

# HCM Signalized Intersection Capacity Analysis

## 3: SE 192nd Ave & SE 15th St

Total 2027 Traffic Conditions  
PM Peak Hour Conditions

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Traffic Volume (vph)              | 117                                                                               | 80                                                                                | 94                                                                                | 44                                                                                | 81                                                                                | 207                                                                               | 91                                                                                 | 1077                                                                                | 28                                                                                  | 56                                                                                  | 1112                                                                                | 123                                                                                 |
| Future Volume (vph)               | 117                                                                               | 80                                                                                | 94                                                                                | 44                                                                                | 81                                                                                | 207                                                                               | 91                                                                                 | 1077                                                                                | 28                                                                                  | 56                                                                                  | 1112                                                                                | 123                                                                                 |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                                | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Lane Util. Factor                 | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                               | 0.95                                                                                |                                                                                     | 1.00                                                                                | 0.95                                                                                |                                                                                     |
| Frpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 0.99                                                                              | 1.00                                                                               | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Flpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                               | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Frt                               | 1.00                                                                              | 0.92                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 0.85                                                                              | 1.00                                                                               | 1.00                                                                                |                                                                                     | 1.00                                                                                | 0.99                                                                                |                                                                                     |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                               | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (prot)                 | 1787                                                                              | 1738                                                                              |                                                                                   | 1805                                                                              | 1881                                                                              | 1604                                                                              | 1752                                                                               | 3522                                                                                |                                                                                     | 1770                                                                                | 3512                                                                                |                                                                                     |
| Flt Permitted                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                               | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (perm)                 | 1787                                                                              | 1738                                                                              |                                                                                   | 1805                                                                              | 1881                                                                              | 1604                                                                              | 1752                                                                               | 3522                                                                                |                                                                                     | 1770                                                                                | 3512                                                                                |                                                                                     |
| Peak-hour factor, PHF             | 0.91                                                                              | 0.91                                                                              | 0.91                                                                              | 0.91                                                                              | 0.91                                                                              | 0.91                                                                              | 0.91                                                                               | 0.91                                                                                | 0.91                                                                                | 0.91                                                                                | 0.91                                                                                | 0.91                                                                                |
| Adj. Flow (vph)                   | 129                                                                               | 88                                                                                | 103                                                                               | 48                                                                                | 89                                                                                | 227                                                                               | 100                                                                                | 1184                                                                                | 31                                                                                  | 62                                                                                  | 1222                                                                                | 135                                                                                 |
| RTOR Reduction (vph)              | 0                                                                                 | 45                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 159                                                                               | 0                                                                                  | 2                                                                                   | 0                                                                                   | 0                                                                                   | 7                                                                                   | 0                                                                                   |
| Lane Group Flow (vph)             | 129                                                                               | 146                                                                               | 0                                                                                 | 48                                                                                | 89                                                                                | 68                                                                                | 100                                                                                | 1213                                                                                | 0                                                                                   | 62                                                                                  | 1350                                                                                | 0                                                                                   |
| Confl. Peds. (#/hr)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 3                                                                                  |                                                                                     | 4                                                                                   | 4                                                                                   |                                                                                     | 3                                                                                   |
| Confl. Bikes (#/hr)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 1                                                                                 |                                                                                    |                                                                                     | 1                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Heavy Vehicles (%)                | 1%                                                                                | 1%                                                                                | 0%                                                                                | 0%                                                                                | 1%                                                                                | 0%                                                                                | 3%                                                                                 | 2%                                                                                  | 3%                                                                                  | 2%                                                                                  | 1%                                                                                  | 1%                                                                                  |
| Turn Type                         | Prot                                                                              | NA                                                                                |                                                                                   | Prot                                                                              | NA                                                                                | pm+ov                                                                             | Prot                                                                               | NA                                                                                  |                                                                                     | Prot                                                                                | NA                                                                                  |                                                                                     |
| Protected Phases                  | 5                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 6                                                                                 | 3                                                                                 | 7                                                                                  | 4                                                                                   |                                                                                     | 3                                                                                   | 8                                                                                   |                                                                                     |
| Permitted Phases                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 6                                                                                 |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Green, G (s)             | 10.1                                                                              | 12.2                                                                              |                                                                                   | 4.6                                                                               | 6.7                                                                               | 13.8                                                                              | 7.5                                                                                | 56.1                                                                                |                                                                                     | 7.1                                                                                 | 55.7                                                                                |                                                                                     |
| Effective Green, g (s)            | 10.1                                                                              | 12.2                                                                              |                                                                                   | 4.6                                                                               | 6.7                                                                               | 13.8                                                                              | 7.5                                                                                | 56.1                                                                                |                                                                                     | 7.1                                                                                 | 55.7                                                                                |                                                                                     |
| Actuated g/C Ratio                | 0.10                                                                              | 0.12                                                                              |                                                                                   | 0.05                                                                              | 0.07                                                                              | 0.14                                                                              | 0.08                                                                               | 0.56                                                                                |                                                                                     | 0.07                                                                                | 0.56                                                                                |                                                                                     |
| Clearance Time (s)                | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                                | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Vehicle Extension (s)             | 1.0                                                                               | 1.0                                                                               |                                                                                   | 1.0                                                                               | 1.0                                                                               | 1.0                                                                               | 1.0                                                                                | 1.0                                                                                 |                                                                                     | 1.0                                                                                 | 1.0                                                                                 |                                                                                     |
| Lane Grp Cap (vph)                | 180                                                                               | 212                                                                               |                                                                                   | 83                                                                                | 126                                                                               | 301                                                                               | 131                                                                                | 1975                                                                                |                                                                                     | 125                                                                                 | 1956                                                                                |                                                                                     |
| v/s Ratio Prot                    | c0.07                                                                             | c0.08                                                                             |                                                                                   | 0.03                                                                              | 0.05                                                                              | 0.02                                                                              | 0.06                                                                               | c0.34                                                                               |                                                                                     | 0.04                                                                                | c0.38                                                                               |                                                                                     |
| v/s Ratio Perm                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 0.03                                                                              |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| v/c Ratio                         | 0.72                                                                              | 0.69                                                                              |                                                                                   | 0.58                                                                              | 0.71                                                                              | 0.22                                                                              | 0.76                                                                               | 0.61                                                                                |                                                                                     | 0.50                                                                                | 0.69                                                                                |                                                                                     |
| Uniform Delay, d1                 | 43.6                                                                              | 42.1                                                                              |                                                                                   | 46.7                                                                              | 45.7                                                                              | 38.3                                                                              | 45.4                                                                               | 14.7                                                                                |                                                                                     | 44.7                                                                                | 15.9                                                                                |                                                                                     |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 0.78                                                                               | 0.96                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Incremental Delay, d2             | 10.7                                                                              | 7.2                                                                               |                                                                                   | 5.9                                                                               | 13.7                                                                              | 0.1                                                                               | 8.7                                                                                | 0.5                                                                                 |                                                                                     | 1.1                                                                                 | 0.9                                                                                 |                                                                                     |
| Delay (s)                         | 54.3                                                                              | 49.3                                                                              |                                                                                   | 52.7                                                                              | 59.4                                                                              | 38.5                                                                              | 44.1                                                                               | 14.7                                                                                |                                                                                     | 45.9                                                                                | 16.8                                                                                |                                                                                     |
| Level of Service                  | D                                                                                 | D                                                                                 |                                                                                   | D                                                                                 | E                                                                                 | D                                                                                 | D                                                                                  | B                                                                                   |                                                                                     | D                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay (s)                |                                                                                   | 51.3                                                                              |                                                                                   |                                                                                   | 45.5                                                                              |                                                                                   |                                                                                    | 16.9                                                                                |                                                                                     |                                                                                     | 18.1                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                    | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                   |                                                                                   | 23.7                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                   |                                                                                   | 0.73                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 100.0                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 70.5%                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

## Queues

## 4: SE 192nd Ave &amp; Mill Plain Blvd

## Total 2027 Traffic Conditions

PM Peak Hour Conditions

|                         |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | NBL                                                                               | NBT                                                                                 | SBL                                                                                 | SBT                                                                                 |
| Lane Group Flow (vph)   | 318                                                                               | 15                                                                                | 570                                                                               | 57                                                                                | 63                                                                                | 458                                                                               | 1035                                                                                | 19                                                                                  | 1157                                                                                |
| v/c Ratio               | 0.63                                                                              | 0.06                                                                              | 1.19                                                                              | 0.22                                                                              | 0.31                                                                              | 1.10                                                                              | 0.66                                                                                | 0.20                                                                                | 1.05                                                                                |
| Control Delay           | 41.5                                                                              | 31.4                                                                              | 125.5                                                                             | 40.5                                                                              | 21.8                                                                              | 116.2                                                                             | 25.4                                                                                | 50.5                                                                                | 74.8                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 41.5                                                                              | 31.4                                                                              | 125.5                                                                             | 40.5                                                                              | 21.8                                                                              | 116.2                                                                             | 25.4                                                                                | 50.5                                                                                | 74.8                                                                                |
| Queue Length 50th (ft)  | 172                                                                               | 9                                                                                 | ~451                                                                              | 22                                                                                | 15                                                                                | ~172                                                                              | 240                                                                                 | 12                                                                                  | ~413                                                                                |
| Queue Length 95th (ft)  | #468                                                                              | 22                                                                                | #250                                                                              | 73                                                                                | 42                                                                                | #265                                                                              | 379                                                                                 | 35                                                                                  | #548                                                                                |
| Internal Link Dist (ft) |                                                                                   | 628                                                                               |                                                                                   |                                                                                   | 391                                                                               |                                                                                   | 457                                                                                 |                                                                                     | 709                                                                                 |
| Turn Bay Length (ft)    | 240                                                                               |                                                                                   | 130                                                                               |                                                                                   |                                                                                   | 205                                                                               |                                                                                     | 150                                                                                 |                                                                                     |
| Base Capacity (vph)     | 507                                                                               | 513                                                                               | 481                                                                               | 292                                                                               | 479                                                                               | 416                                                                               | 1563                                                                                | 180                                                                                 | 1102                                                                                |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.63                                                                              | 0.03                                                                              | 1.19                                                                              | 0.20                                                                              | 0.13                                                                              | 1.10                                                                              | 0.66                                                                                | 0.11                                                                                | 1.05                                                                                |

## Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

# HCM Signalized Intersection Capacity Analysis

## 4: SE 192nd Ave & Mill Plain Blvd

Total 2027 Traffic Conditions  
PM Peak Hour Conditions

|                                   |  |  |  |  |  |  |   |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |  |  |  |                                                                                   |  |  |                                                                                     |  |  |  |
| Traffic Volume (vph)              | 283                                                                               | 13                                                                                | 507                                                                               | 51                                                                                | 21                                                                                | 35                                                                                | 408                                                                                 | 896                                                                                 | 25                                                                                  | 17                                                                                  | 842                                                                                 | 188                                                                                 |
| Future Volume (vph)               | 283                                                                               | 13                                                                                | 507                                                                               | 51                                                                                | 21                                                                                | 35                                                                                | 408                                                                                 | 896                                                                                 | 25                                                                                  | 17                                                                                  | 842                                                                                 | 188                                                                                 |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                                 | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Lane Util. Factor                 | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              |                                                                                   | 0.97                                                                                | 0.95                                                                                |                                                                                     | 1.00                                                                                | 0.95                                                                                |                                                                                     |
| Frpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              | 0.99                                                                              | 1.00                                                                              | 0.99                                                                              |                                                                                   | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Flpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Frt                               | 1.00                                                                              | 1.00                                                                              | 0.85                                                                              | 1.00                                                                              | 0.91                                                                              |                                                                                   | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 0.97                                                                                |                                                                                     |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                                | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (prot)                 | 1787                                                                              | 1900                                                                              | 1580                                                                              | 1805                                                                              | 1668                                                                              |                                                                                   | 3467                                                                                | 3523                                                                                |                                                                                     | 1805                                                                                | 3434                                                                                |                                                                                     |
| Flt Permitted                     | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                                | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (perm)                 | 1787                                                                              | 1900                                                                              | 1580                                                                              | 1805                                                                              | 1668                                                                              |                                                                                   | 3467                                                                                | 3523                                                                                |                                                                                     | 1805                                                                                | 3434                                                                                |                                                                                     |
| Peak-hour factor, PHF             | 0.89                                                                              | 0.89                                                                              | 0.89                                                                              | 0.89                                                                              | 0.89                                                                              | 0.89                                                                              | 0.89                                                                                | 0.89                                                                                | 0.89                                                                                | 0.89                                                                                | 0.89                                                                                | 0.89                                                                                |
| Adj. Flow (vph)                   | 318                                                                               | 15                                                                                | 570                                                                               | 57                                                                                | 24                                                                                | 39                                                                                | 458                                                                                 | 1007                                                                                | 28                                                                                  | 19                                                                                  | 946                                                                                 | 211                                                                                 |
| RTOR Reduction (vph)              | 0                                                                                 | 0                                                                                 | 93                                                                                | 0                                                                                 | 35                                                                                | 0                                                                                 | 0                                                                                   | 2                                                                                   | 0                                                                                   | 0                                                                                   | 20                                                                                  | 0                                                                                   |
| Lane Group Flow (vph)             | 318                                                                               | 15                                                                                | 477                                                                               | 57                                                                                | 28                                                                                | 0                                                                                 | 458                                                                                 | 1033                                                                                | 0                                                                                   | 19                                                                                  | 1137                                                                                | 0                                                                                   |
| Confl. Peds. (#/hr)               | 8                                                                                 |                                                                                   | 6                                                                                 | 6                                                                                 |                                                                                   | 8                                                                                 | 9                                                                                   |                                                                                     | 9                                                                                   | 9                                                                                   |                                                                                     | 9                                                                                   |
| Confl. Bikes (#/hr)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 1                                                                                 |                                                                                     |                                                                                     | 3                                                                                   |                                                                                     |                                                                                     | 1                                                                                   |
| Heavy Vehicles (%)                | 1%                                                                                | 0%                                                                                | 1%                                                                                | 0%                                                                                | 0%                                                                                | 3%                                                                                | 1%                                                                                  | 2%                                                                                  | 0%                                                                                  | 0%                                                                                  | 2%                                                                                  | 1%                                                                                  |
| Turn Type                         | Prot                                                                              | NA                                                                                | pm+ov                                                                             | Prot                                                                              | NA                                                                                |                                                                                   | Prot                                                                                | NA                                                                                  |                                                                                     | Prot                                                                                | NA                                                                                  |                                                                                     |
| Protected Phases                  | 5                                                                                 | 2                                                                                 | 7                                                                                 | 1                                                                                 | 6                                                                                 |                                                                                   | 7                                                                                   | 4                                                                                   |                                                                                     | 3                                                                                   | 8                                                                                   |                                                                                     |
| Permitted Phases                  |                                                                                   |                                                                                   | 2                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Green, G (s)             | 28.4                                                                              | 25.5                                                                              | 40.5                                                                              | 12.0                                                                              | 9.1                                                                               |                                                                                   | 15.0                                                                                | 40.3                                                                                |                                                                                     | 2.2                                                                                 | 27.5                                                                                |                                                                                     |
| Effective Green, g (s)            | 28.4                                                                              | 25.5                                                                              | 40.5                                                                              | 12.0                                                                              | 9.1                                                                               |                                                                                   | 15.0                                                                                | 40.3                                                                                |                                                                                     | 2.2                                                                                 | 27.5                                                                                |                                                                                     |
| Actuated g/C Ratio                | 0.28                                                                              | 0.26                                                                              | 0.40                                                                              | 0.12                                                                              | 0.09                                                                              |                                                                                   | 0.15                                                                                | 0.40                                                                                |                                                                                     | 0.02                                                                                | 0.28                                                                                |                                                                                     |
| Clearance Time (s)                | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                                 | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Vehicle Extension (s)             | 1.5                                                                               | 1.5                                                                               | 0.5                                                                               | 2.0                                                                               | 2.0                                                                               |                                                                                   | 0.5                                                                                 | 0.5                                                                                 |                                                                                     | 0.5                                                                                 | 0.5                                                                                 |                                                                                     |
| Lane Grp Cap (vph)                | 507                                                                               | 484                                                                               | 639                                                                               | 216                                                                               | 151                                                                               |                                                                                   | 520                                                                                 | 1419                                                                                |                                                                                     | 39                                                                                  | 944                                                                                 |                                                                                     |
| v/s Ratio Prot                    | c0.18                                                                             | 0.01                                                                              | c0.11                                                                             | c0.03                                                                             | 0.02                                                                              |                                                                                   | c0.13                                                                               | 0.29                                                                                |                                                                                     | 0.01                                                                                | c0.33                                                                               |                                                                                     |
| v/s Ratio Perm                    |                                                                                   |                                                                                   | 0.19                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| v/c Ratio                         | 0.63                                                                              | 0.03                                                                              | 0.75                                                                              | 0.26                                                                              | 0.18                                                                              |                                                                                   | 0.88                                                                                | 0.73                                                                                |                                                                                     | 0.49                                                                                | 1.20                                                                                |                                                                                     |
| Uniform Delay, d1                 | 31.2                                                                              | 28.0                                                                              | 25.4                                                                              | 40.0                                                                              | 42.0                                                                              |                                                                                   | 41.6                                                                                | 25.2                                                                                |                                                                                     | 48.3                                                                                | 36.2                                                                                |                                                                                     |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Incremental Delay, d2             | 1.7                                                                               | 0.0                                                                               | 4.1                                                                               | 0.2                                                                               | 0.2                                                                               |                                                                                   | 15.5                                                                                | 3.3                                                                                 |                                                                                     | 3.5                                                                                 | 102.0                                                                               |                                                                                     |
| Delay (s)                         | 32.9                                                                              | 28.0                                                                              | 29.5                                                                              | 40.2                                                                              | 42.2                                                                              |                                                                                   | 57.2                                                                                | 28.5                                                                                |                                                                                     | 51.8                                                                                | 138.2                                                                               |                                                                                     |
| Level of Service                  | C                                                                                 | C                                                                                 | C                                                                                 | D                                                                                 | D                                                                                 |                                                                                   | E                                                                                   | C                                                                                   |                                                                                     | D                                                                                   | F                                                                                   |                                                                                     |
| Approach Delay (s)                |                                                                                   | 30.7                                                                              |                                                                                   |                                                                                   | 41.3                                                                              |                                                                                   |                                                                                     | 37.3                                                                                |                                                                                     |                                                                                     | 136.8                                                                               |                                                                                     |
| Approach LOS                      |                                                                                   | C                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                     | D                                                                                   |                                                                                     |                                                                                     | F                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                   |                                                                                   | 67.5                                                                              |                                                                                   |                                                                                   | HCM 2000 Level of Service                                                         |                                                                                     |                                                                                     |                                                                                     | E                                                                                   |                                                                                     |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                   |                                                                                   | 0.86                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 100.0                                                                             |                                                                                   |                                                                                   | Sum of lost time (s)                                                              |                                                                                     |                                                                                     | 20.0                                                                                |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 78.1%                                                                             |                                                                                   |                                                                                   | ICU Level of Service                                                              |                                                                                     |                                                                                     | D                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |



Queues  
5: SE 192nd Ave & SE 20th St

Total 2027 Traffic Conditions  
PM Peak Hour Conditions

|                                                                                                             |  |  |  |  |  |  |  |  |
|-------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group                                                                                                  | EBL                                                                               | EBT                                                                               | WBL                                                                               | WBT                                                                               | NBL                                                                               | NBT                                                                               | SBL                                                                                | SBT                                                                                 |
| Lane Group Flow (vph)                                                                                       | 140                                                                               | 265                                                                               | 153                                                                               | 316                                                                               | 118                                                                               | 1332                                                                              | 179                                                                                | 1242                                                                                |
| v/c Ratio                                                                                                   | 0.48                                                                              | 0.78                                                                              | 0.41                                                                              | 0.83                                                                              | 0.66                                                                              | 1.02                                                                              | 0.76                                                                               | 0.87                                                                                |
| Control Delay                                                                                               | 48.9                                                                              | 50.5                                                                              | 44.6                                                                              | 52.3                                                                              | 60.7                                                                              | 62.7                                                                              | 70.6                                                                               | 28.6                                                                                |
| Queue Delay                                                                                                 | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 |
| Total Delay                                                                                                 | 48.9                                                                              | 50.5                                                                              | 44.6                                                                              | 52.3                                                                              | 60.7                                                                              | 62.7                                                                              | 70.6                                                                               | 28.6                                                                                |
| Queue Length 50th (ft)                                                                                      | 44                                                                                | 147                                                                               | 47                                                                                | 176                                                                               | 73                                                                                | ~498                                                                              | 121                                                                                | 243                                                                                 |
| Queue Length 95th (ft)                                                                                      | 73                                                                                | 217                                                                               | 78                                                                                | 259                                                                               | #150                                                                              | #706                                                                              | m#209                                                                              | #582                                                                                |
| Internal Link Dist (ft)                                                                                     |                                                                                   | 1997                                                                              |                                                                                   | 3145                                                                              |                                                                                   | 1320                                                                              |                                                                                    | 1126                                                                                |
| Turn Bay Length (ft)                                                                                        | 100                                                                               |                                                                                   | 150                                                                               |                                                                                   | 335                                                                               |                                                                                   | 410                                                                                |                                                                                     |
| Base Capacity (vph)                                                                                         | 450                                                                               | 462                                                                               | 425                                                                               | 452                                                                               | 195                                                                               | 1307                                                                              | 252                                                                                | 1430                                                                                |
| Starvation Cap Reductn                                                                                      | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |
| Spillback Cap Reductn                                                                                       | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |
| Storage Cap Reductn                                                                                         | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |
| Reduced v/c Ratio                                                                                           | 0.31                                                                              | 0.57                                                                              | 0.36                                                                              | 0.70                                                                              | 0.61                                                                              | 1.02                                                                              | 0.71                                                                               | 0.87                                                                                |
| <b>Intersection Summary</b>                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |
| ~ Volume exceeds capacity, queue is theoretically infinite.<br>Queue shown is maximum after two cycles.     |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |
| # 95th percentile volume exceeds capacity, queue may be longer.<br>Queue shown is maximum after two cycles. |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |
| m Volume for 95th percentile queue is metered by upstream signal.                                           |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |

# HCM Signalized Intersection Capacity Analysis

## 5: SE 192nd Ave & SE 20th St

Total 2027 Traffic Conditions  
PM Peak Hour Conditions

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |                                                                                   |  |  |                                                                                   |  |  |                                                                                     |  |  |  |
| Traffic Volume (vph)              | 134                                                                               | 165                                                                               | 89                                                                                | 147                                                                               | 189                                                                               | 114                                                                               | 113                                                                                | 1087                                                                                | 192                                                                                 | 172                                                                                 | 1011                                                                                | 181                                                                                 |
| Future Volume (vph)               | 134                                                                               | 165                                                                               | 89                                                                                | 147                                                                               | 189                                                                               | 114                                                                               | 113                                                                                | 1087                                                                                | 192                                                                                 | 172                                                                                 | 1011                                                                                | 181                                                                                 |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                                | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Lane Util. Factor                 | 0.97                                                                              | 1.00                                                                              |                                                                                   | 0.97                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                               | 0.95                                                                                |                                                                                     | 1.00                                                                                | 0.95                                                                                |                                                                                     |
| Frpb, ped/bikes                   | 1.00                                                                              | 0.99                                                                              |                                                                                   | 1.00                                                                              | 0.99                                                                              |                                                                                   | 1.00                                                                               | 0.99                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Flpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                               | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Frt                               | 1.00                                                                              | 0.95                                                                              |                                                                                   | 1.00                                                                              | 0.94                                                                              |                                                                                   | 1.00                                                                               | 0.98                                                                                |                                                                                     | 1.00                                                                                | 0.98                                                                                |                                                                                     |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                               | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (prot)                 | 3467                                                                              | 1772                                                                              |                                                                                   | 3502                                                                              | 1761                                                                              |                                                                                   | 1805                                                                               | 3417                                                                                |                                                                                     | 1787                                                                                | 3441                                                                                |                                                                                     |
| Flt Permitted                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                               | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (perm)                 | 3467                                                                              | 1772                                                                              |                                                                                   | 3502                                                                              | 1761                                                                              |                                                                                   | 1805                                                                               | 3417                                                                                |                                                                                     | 1787                                                                                | 3441                                                                                |                                                                                     |
| Peak-hour factor, PHF             | 0.96                                                                              | 0.96                                                                              | 0.96                                                                              | 0.96                                                                              | 0.96                                                                              | 0.96                                                                              | 0.96                                                                               | 0.96                                                                                | 0.96                                                                                | 0.96                                                                                | 0.96                                                                                | 0.96                                                                                |
| Adj. Flow (vph)                   | 140                                                                               | 172                                                                               | 93                                                                                | 153                                                                               | 197                                                                               | 119                                                                               | 118                                                                                | 1132                                                                                | 200                                                                                 | 179                                                                                 | 1053                                                                                | 189                                                                                 |
| RTOR Reduction (vph)              | 0                                                                                 | 21                                                                                | 0                                                                                 | 0                                                                                 | 23                                                                                | 0                                                                                 | 0                                                                                  | 13                                                                                  | 0                                                                                   | 0                                                                                   | 13                                                                                  | 0                                                                                   |
| Lane Group Flow (vph)             | 140                                                                               | 244                                                                               | 0                                                                                 | 153                                                                               | 293                                                                               | 0                                                                                 | 118                                                                                | 1319                                                                                | 0                                                                                   | 179                                                                                 | 1229                                                                                | 0                                                                                   |
| Confl. Peds. (#/hr)               | 3                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                 |                                                                                   | 3                                                                                 | 1                                                                                  |                                                                                     | 5                                                                                   | 5                                                                                   |                                                                                     | 1                                                                                   |
| Confl. Bikes (#/hr)               |                                                                                   |                                                                                   | 1                                                                                 |                                                                                   |                                                                                   | 4                                                                                 |                                                                                    |                                                                                     | 5                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |
| Heavy Vehicles (%)                | 1%                                                                                | 0%                                                                                | 3%                                                                                | 0%                                                                                | 1%                                                                                | 1%                                                                                | 0%                                                                                 | 3%                                                                                  | 1%                                                                                  | 1%                                                                                  | 2%                                                                                  | 3%                                                                                  |
| Turn Type                         | Prot                                                                              | NA                                                                                |                                                                                   | Prot                                                                              | NA                                                                                |                                                                                   | Prot                                                                               | NA                                                                                  |                                                                                     | Prot                                                                                | NA                                                                                  |                                                                                     |
| Protected Phases                  | 5                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 6                                                                                 |                                                                                   | 7                                                                                  | 4                                                                                   |                                                                                     | 3                                                                                   | 8                                                                                   |                                                                                     |
| Permitted Phases                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Green, G (s)             | 8.4                                                                               | 18.0                                                                              |                                                                                   | 10.8                                                                              | 20.4                                                                              |                                                                                   | 10.0                                                                               | 37.9                                                                                |                                                                                     | 13.3                                                                                | 41.2                                                                                |                                                                                     |
| Effective Green, g (s)            | 8.4                                                                               | 18.0                                                                              |                                                                                   | 10.8                                                                              | 20.4                                                                              |                                                                                   | 10.0                                                                               | 37.9                                                                                |                                                                                     | 13.3                                                                                | 41.2                                                                                |                                                                                     |
| Actuated g/C Ratio                | 0.08                                                                              | 0.18                                                                              |                                                                                   | 0.11                                                                              | 0.20                                                                              |                                                                                   | 0.10                                                                               | 0.38                                                                                |                                                                                     | 0.13                                                                                | 0.41                                                                                |                                                                                     |
| Clearance Time (s)                | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                                | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Vehicle Extension (s)             | 2.0                                                                               | 2.0                                                                               |                                                                                   | 2.0                                                                               | 2.0                                                                               |                                                                                   | 2.0                                                                                | 2.0                                                                                 |                                                                                     | 2.0                                                                                 | 2.0                                                                                 |                                                                                     |
| Lane Grp Cap (vph)                | 291                                                                               | 318                                                                               |                                                                                   | 378                                                                               | 359                                                                               |                                                                                   | 180                                                                                | 1295                                                                                |                                                                                     | 237                                                                                 | 1417                                                                                |                                                                                     |
| v/s Ratio Prot                    | 0.04                                                                              | c0.14                                                                             |                                                                                   | 0.04                                                                              | c0.17                                                                             |                                                                                   | 0.07                                                                               | c0.39                                                                               |                                                                                     | c0.10                                                                               | c0.36                                                                               |                                                                                     |
| v/s Ratio Perm                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| v/c Ratio                         | 0.48                                                                              | 0.77                                                                              |                                                                                   | 0.40                                                                              | 0.82                                                                              |                                                                                   | 0.66                                                                               | 1.02                                                                                |                                                                                     | 0.76                                                                                | 0.87                                                                                |                                                                                     |
| Uniform Delay, d1                 | 43.7                                                                              | 39.0                                                                              |                                                                                   | 41.6                                                                              | 38.0                                                                              |                                                                                   | 43.3                                                                               | 31.1                                                                                |                                                                                     | 41.8                                                                                | 26.9                                                                                |                                                                                     |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                               | 1.00                                                                                |                                                                                     | 1.32                                                                                | 0.73                                                                                |                                                                                     |
| Incremental Delay, d2             | 0.5                                                                               | 9.5                                                                               |                                                                                   | 0.3                                                                               | 12.7                                                                              |                                                                                   | 6.4                                                                                | 29.7                                                                                |                                                                                     | 9.1                                                                                 | 4.5                                                                                 |                                                                                     |
| Delay (s)                         | 44.2                                                                              | 48.5                                                                              |                                                                                   | 41.9                                                                              | 50.7                                                                              |                                                                                   | 49.7                                                                               | 60.8                                                                                |                                                                                     | 64.1                                                                                | 24.1                                                                                |                                                                                     |
| Level of Service                  | D                                                                                 | D                                                                                 |                                                                                   | D                                                                                 | D                                                                                 |                                                                                   | D                                                                                  | E                                                                                   |                                                                                     | E                                                                                   | C                                                                                   |                                                                                     |
| Approach Delay (s)                |                                                                                   | 47.0                                                                              |                                                                                   |                                                                                   | 47.8                                                                              |                                                                                   |                                                                                    | 59.9                                                                                |                                                                                     |                                                                                     | 29.2                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                    | E                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                   |                                                                                   | 45.3                                                                              |                                                                                   |                                                                                   | HCM 2000 Level of Service                                                         |                                                                                    |                                                                                     |                                                                                     | D                                                                                   |                                                                                     |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                   |                                                                                   | 0.92                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 100.0                                                                             |                                                                                   |                                                                                   | Sum of lost time (s)                                                              |                                                                                    |                                                                                     | 20.0                                                                                |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 83.8%                                                                             |                                                                                   |                                                                                   | ICU Level of Service                                                              |                                                                                    |                                                                                     | E                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

| Intersection             |        |        |        |      |      |      |
|--------------------------|--------|--------|--------|------|------|------|
| Int Delay, s/veh         | 0      |        |        |      |      |      |
| Movement                 | EBL    | EBR    | NBL    | NBT  | SBT  | SBR  |
| Lane Configurations      |        | ↗      |        | ↑↑   | ↑↑   |      |
| Traffic Vol, veh/h       | 0      | 4      | 0      | 1400 | 1287 | 24   |
| Future Vol, veh/h        | 0      | 4      | 0      | 1400 | 1287 | 24   |
| Conflicting Peds, #/hr   | 0      | 0      | 0      | 0    | 0    | 0    |
| Sign Control             | Stop   | Stop   | Free   | Free | Free | Free |
| RT Channelized           | -      | None   | -      | None | -    | None |
| Storage Length           | -      | 0      | -      | -    | -    | -    |
| Veh in Median Storage, # | 0      | -      | -      | 0    | 0    | -    |
| Grade, %                 | 0      | -      | -      | 0    | 0    | -    |
| Peak Hour Factor         | 91     | 91     | 91     | 91   | 91   | 91   |
| Heavy Vehicles, %        | 0      | 0      | 0      | 2    | 1    | 0    |
| Mvmt Flow                | 0      | 4      | 0      | 1538 | 1414 | 26   |
| Major/Minor              | Minor2 | Major1 | Major2 |      |      |      |
| Conflicting Flow All     | -      | 720    | -      | 0    | -    | 0    |
| Stage 1                  | -      | -      | -      | -    | -    | -    |
| Stage 2                  | -      | -      | -      | -    | -    | -    |
| Critical Hdwy            | -      | 6.9    | -      | -    | -    | -    |
| Critical Hdwy Stg 1      | -      | -      | -      | -    | -    | -    |
| Critical Hdwy Stg 2      | -      | -      | -      | -    | -    | -    |
| Follow-up Hdwy           | -      | 3.3    | -      | -    | -    | -    |
| Pot Cap-1 Maneuver       | 0      | 375    | 0      | -    | -    | -    |
| Stage 1                  | 0      | -      | 0      | -    | -    | -    |
| Stage 2                  | 0      | -      | 0      | -    | -    | -    |
| Platoon blocked, %       | -      | -      | -      | -    | -    | -    |
| Mov Cap-1 Maneuver       | -      | 375    | -      | -    | -    | -    |
| Mov Cap-2 Maneuver       | -      | -      | -      | -    | -    | -    |
| Stage 1                  | -      | -      | -      | -    | -    | -    |
| Stage 2                  | -      | -      | -      | -    | -    | -    |
| Approach                 | EB     | NB     | SB     |      |      |      |
| HCM Control Delay, s     | 14.7   | 0      | 0      |      |      |      |
| HCM LOS                  | B      |        |        |      |      |      |
| Minor Lane/Major Mvmt    | NBT    | EBLn1  | SBT    | SBR  |      |      |
| Capacity (veh/h)         | -      | 375    | -      | -    |      |      |
| HCM Lane V/C Ratio       | -      | 0.012  | -      | -    |      |      |
| HCM Control Delay (s)    | -      | 14.7   | -      | -    |      |      |
| HCM Lane LOS             | -      | B      | -      | -    |      |      |
| HCM 95th %tile Q(veh)    | -      | 0      | -      | -    |      |      |

Intersection

Int Delay, s/veh 1.2

| Movement                 | EBL  | EBT                                                                               | WBT                                                                               | WBR  | SBL                                                                               | SBR  |
|--------------------------|------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|-----------------------------------------------------------------------------------|------|
| Lane Configurations      |      |  |  |      |  |      |
| Traffic Vol, veh/h       | 28   | 268                                                                               | 273                                                                               | 21   | 22                                                                                | 17   |
| Future Vol, veh/h        | 28   | 268                                                                               | 273                                                                               | 21   | 22                                                                                | 17   |
| Conflicting Peds, #/hr   | 0    | 0                                                                                 | 0                                                                                 | 0    | 0                                                                                 | 0    |
| Sign Control             | Free | Free                                                                              | Free                                                                              | Free | Stop                                                                              | Stop |
| RT Channelized           | -    | None                                                                              | -                                                                                 | None | -                                                                                 | None |
| Storage Length           | -    | -                                                                                 | -                                                                                 | -    | 0                                                                                 | -    |
| Veh in Median Storage, # | -    | 0                                                                                 | 0                                                                                 | -    | 0                                                                                 | -    |
| Grade, %                 | -    | 0                                                                                 | 0                                                                                 | -    | 0                                                                                 | -    |
| Peak Hour Factor         | 91   | 91                                                                                | 91                                                                                | 91   | 91                                                                                | 91   |
| Heavy Vehicles, %        | 0    | 1                                                                                 | 1                                                                                 | 0    | 0                                                                                 | 0    |
| Mvmt Flow                | 31   | 295                                                                               | 300                                                                               | 23   | 24                                                                                | 19   |

| Major/Minor          | Major1 | Major2 | Minor2    |
|----------------------|--------|--------|-----------|
| Conflicting Flow All | 323    | 0      | 0 669 312 |
| Stage 1              | -      | -      | - 312 -   |
| Stage 2              | -      | -      | - 357 -   |
| Critical Hdwy        | 4.1    | -      | - 6.4 6.2 |
| Critical Hdwy Stg 1  | -      | -      | - 5.4 -   |
| Critical Hdwy Stg 2  | -      | -      | - 5.4 -   |
| Follow-up Hdwy       | 2.2    | -      | - 3.5 3.3 |
| Pot Cap-1 Maneuver   | 1248   | -      | - 426 733 |
| Stage 1              | -      | -      | - 747 -   |
| Stage 2              | -      | -      | - 713 -   |
| Platoon blocked, %   | -      | -      | -         |
| Mov Cap-1 Maneuver   | 1248   | -      | - 413 733 |
| Mov Cap-2 Maneuver   | -      | -      | - 413 -   |
| Stage 1              | -      | -      | - 725 -   |
| Stage 2              | -      | -      | - 713 -   |

| Approach             | EB  | WB | SB   |
|----------------------|-----|----|------|
| HCM Control Delay, s | 0.8 | 0  | 12.7 |
| HCM LOS              |     |    | B    |

| Minor Lane/Major Mvmt | EBL   | EBT | WBT | WBR | SBLn1 |
|-----------------------|-------|-----|-----|-----|-------|
| Capacity (veh/h)      | 1248  | -   | -   | -   | 510   |
| HCM Lane V/C Ratio    | 0.025 | -   | -   | -   | 0.084 |
| HCM Control Delay (s) | 8     | 0   | -   | -   | 12.7  |
| HCM Lane LOS          | A     | A   | -   | -   | B     |
| HCM 95th %tile Q(veh) | 0.1   | -   | -   | -   | 0.3   |

## Appendix G 2032 Background Operations (Existing Zoning) Worksheets



## Queues

1: SE 164th Ave &amp; SE 15th St

## Background 2032 Traffic Conditions

AM Peak Hour Conditions

|                         |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                               | NBT                                                                                | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Group Flow (vph)   | 17                                                                                | 79                                                                                | 51                                                                                | 55                                                                                | 82                                                                                | 66                                                                                | 1176                                                                               | 79                                                                                  | 77                                                                                  | 1088                                                                                | 19                                                                                  |
| v/c Ratio               | 0.03                                                                              | 0.11                                                                              | 0.08                                                                              | 0.06                                                                              | 0.11                                                                              | 0.46                                                                              | 0.76                                                                               | 0.14                                                                                | 0.50                                                                                | 0.69                                                                                | 0.03                                                                                |
| Control Delay           | 19.8                                                                              | 14.2                                                                              | 19.6                                                                              | 24.7                                                                              | 4.2                                                                               | 61.7                                                                              | 41.0                                                                               | 3.5                                                                                 | 62.5                                                                                | 38.3                                                                                | 0.1                                                                                 |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 19.8                                                                              | 14.2                                                                              | 19.6                                                                              | 24.7                                                                              | 4.2                                                                               | 61.7                                                                              | 41.0                                                                               | 3.5                                                                                 | 62.5                                                                                | 38.3                                                                                | 0.1                                                                                 |
| Queue Length 50th (ft)  | 7                                                                                 | 15                                                                                | 20                                                                                | 22                                                                                | 0                                                                                 | 50                                                                                | 300                                                                                | 0                                                                                   | 58                                                                                  | 268                                                                                 | 0                                                                                   |
| Queue Length 95th (ft)  | 23                                                                                | 57                                                                                | 51                                                                                | 64                                                                                | 27                                                                                | 94                                                                                | 326                                                                                | 22                                                                                  | 105                                                                                 | 291                                                                                 | 0                                                                                   |
| Internal Link Dist (ft) |                                                                                   | 600                                                                               |                                                                                   | 638                                                                               |                                                                                   |                                                                                   | 842                                                                                |                                                                                     |                                                                                     | 586                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 100                                                                               |                                                                                   | 250                                                                               |                                                                                   | 325                                                                               | 150                                                                               |                                                                                    | 150                                                                                 | 230                                                                                 |                                                                                     | 230                                                                                 |
| Base Capacity (vph)     | 714                                                                               | 740                                                                               | 658                                                                               | 884                                                                               | 773                                                                               | 168                                                                               | 2014                                                                               | 706                                                                                 | 171                                                                                 | 2014                                                                                | 687                                                                                 |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.02                                                                              | 0.11                                                                              | 0.08                                                                              | 0.06                                                                              | 0.11                                                                              | 0.39                                                                              | 0.58                                                                               | 0.11                                                                                | 0.45                                                                                | 0.54                                                                                | 0.03                                                                                |
| Intersection Summary    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM Signalized Intersection Capacity Analysis

1: SE 164th Ave & SE 15th St

# Background 2032 Traffic Conditions

AM Peak Hour Conditions

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Traffic Volume (vph)              | 16                                                                                | 29                                                                                | 45                                                                                | 48                                                                                | 52                                                                                | 77                                                                                | 62                                                                                  | 1105                                                                                | 74                                                                                  | 72                                                                                  | 1023                                                                                | 18                                                                                  |
| Future Volume (vph)               | 16                                                                                | 29                                                                                | 45                                                                                | 48                                                                                | 52                                                                                | 77                                                                                | 62                                                                                  | 1105                                                                                | 74                                                                                  | 72                                                                                  | 1023                                                                                | 18                                                                                  |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 4.5                                                                               | 5.0                                                                               |                                                                                   | 4.5                                                                               | 5.0                                                                               | 5.0                                                                               | 4.5                                                                                 | 5.0                                                                                 | 5.0                                                                                 | 4.5                                                                                 | 5.0                                                                                 | 5.0                                                                                 |
| Lane Util. Factor                 | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 0.91                                                                                | 1.00                                                                                | 1.00                                                                                | 0.91                                                                                | 1.00                                                                                |
| Frpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 0.99                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Flpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Frt                               | 1.00                                                                              | 0.91                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 0.85                                                                              | 1.00                                                                                | 1.00                                                                                | 0.85                                                                                | 1.00                                                                                | 1.00                                                                                | 0.85                                                                                |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                |
| Satd. Flow (prot)                 | 1802                                                                              | 1696                                                                              |                                                                                   | 1752                                                                              | 1900                                                                              | 1546                                                                              | 1805                                                                                | 5036                                                                                | 1615                                                                                | 1752                                                                                | 5036                                                                                | 1568                                                                                |
| Flt Permitted                     | 0.72                                                                              | 1.00                                                                              |                                                                                   | 0.66                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                |
| Satd. Flow (perm)                 | 1368                                                                              | 1696                                                                              |                                                                                   | 1212                                                                              | 1900                                                                              | 1546                                                                              | 1805                                                                                | 5036                                                                                | 1615                                                                                | 1752                                                                                | 5036                                                                                | 1568                                                                                |
| Peak-hour factor, PHF             | 0.94                                                                              | 0.94                                                                              | 0.94                                                                              | 0.94                                                                              | 0.94                                                                              | 0.94                                                                              | 0.94                                                                                | 0.94                                                                                | 0.94                                                                                | 0.94                                                                                | 0.94                                                                                | 0.94                                                                                |
| Adj. Flow (vph)                   | 17                                                                                | 31                                                                                | 48                                                                                | 51                                                                                | 55                                                                                | 82                                                                                | 66                                                                                  | 1176                                                                                | 79                                                                                  | 77                                                                                  | 1088                                                                                | 19                                                                                  |
| RTOR Reduction (vph)              | 0                                                                                 | 29                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 46                                                                                | 0                                                                                   | 0                                                                                   | 55                                                                                  | 0                                                                                   | 0                                                                                   | 13                                                                                  |
| Lane Group Flow (vph)             | 17                                                                                | 50                                                                                | 0                                                                                 | 51                                                                                | 55                                                                                | 36                                                                                | 66                                                                                  | 1176                                                                                | 24                                                                                  | 77                                                                                  | 1088                                                                                | 6                                                                                   |
| Confl. Peds. (#/hr)               | 1                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 1                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Heavy Vehicles (%)                | 0%                                                                                | 0%                                                                                | 3%                                                                                | 3%                                                                                | 0%                                                                                | 3%                                                                                | 0%                                                                                  | 3%                                                                                  | 0%                                                                                  | 3%                                                                                  | 3%                                                                                  | 3%                                                                                  |
| Turn Type                         | pm+pt                                                                             | NA                                                                                |                                                                                   | pm+pt                                                                             | NA                                                                                | Perm                                                                              | Prot                                                                                | NA                                                                                  | Perm                                                                                | Prot                                                                                | NA                                                                                  | Perm                                                                                |
| Protected Phases                  | 5                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 6                                                                                 |                                                                                   | 7                                                                                   | 4                                                                                   |                                                                                     | 3                                                                                   | 8                                                                                   |                                                                                     |
| Permitted Phases                  | 2                                                                                 |                                                                                   |                                                                                   | 6                                                                                 |                                                                                   | 6                                                                                 |                                                                                     |                                                                                     | 4                                                                                   |                                                                                     |                                                                                     | 8                                                                                   |
| Actuated Green, G (s)             | 51.4                                                                              | 48.6                                                                              |                                                                                   | 58.6                                                                              | 52.2                                                                              | 52.2                                                                              | 8.5                                                                                 | 36.7                                                                                | 36.7                                                                                | 9.3                                                                                 | 37.5                                                                                | 37.5                                                                                |
| Effective Green, g (s)            | 51.4                                                                              | 48.6                                                                              |                                                                                   | 58.6                                                                              | 52.2                                                                              | 52.2                                                                              | 8.5                                                                                 | 36.7                                                                                | 36.7                                                                                | 9.3                                                                                 | 37.5                                                                                | 37.5                                                                                |
| Actuated g/C Ratio                | 0.43                                                                              | 0.41                                                                              |                                                                                   | 0.49                                                                              | 0.44                                                                              | 0.44                                                                              | 0.07                                                                                | 0.31                                                                                | 0.31                                                                                | 0.08                                                                                | 0.31                                                                                | 0.31                                                                                |
| Clearance Time (s)                | 4.5                                                                               | 5.0                                                                               |                                                                                   | 4.5                                                                               | 5.0                                                                               | 5.0                                                                               | 4.5                                                                                 | 5.0                                                                                 | 5.0                                                                                 | 4.5                                                                                 | 5.0                                                                                 | 5.0                                                                                 |
| Vehicle Extension (s)             | 3.0                                                                               | 2.0                                                                               |                                                                                   | 3.0                                                                               | 2.0                                                                               | 2.0                                                                               | 3.0                                                                                 | 2.0                                                                                 | 2.0                                                                                 | 3.0                                                                                 | 2.0                                                                                 | 2.0                                                                                 |
| Lane Grp Cap (vph)                | 596                                                                               | 686                                                                               |                                                                                   | 620                                                                               | 826                                                                               | 672                                                                               | 127                                                                                 | 1540                                                                                | 493                                                                                 | 135                                                                                 | 1573                                                                                | 490                                                                                 |
| v/s Ratio Prot                    | 0.00                                                                              | 0.03                                                                              |                                                                                   | c0.00                                                                             | 0.03                                                                              |                                                                                   | 0.04                                                                                | c0.23                                                                               |                                                                                     | c0.04                                                                               | 0.22                                                                                |                                                                                     |
| v/s Ratio Perm                    | 0.01                                                                              |                                                                                   |                                                                                   | c0.04                                                                             |                                                                                   | 0.02                                                                              |                                                                                     |                                                                                     | 0.01                                                                                |                                                                                     |                                                                                     | 0.00                                                                                |
| v/c Ratio                         | 0.03                                                                              | 0.07                                                                              |                                                                                   | 0.08                                                                              | 0.07                                                                              | 0.05                                                                              | 0.52                                                                                | 0.76                                                                                | 0.05                                                                                | 0.57                                                                                | 0.69                                                                                | 0.01                                                                                |
| Uniform Delay, d1                 | 19.8                                                                              | 21.9                                                                              |                                                                                   | 16.2                                                                              | 19.7                                                                              | 19.6                                                                              | 53.8                                                                                | 37.7                                                                                | 29.4                                                                                | 53.4                                                                                | 36.2                                                                                | 28.5                                                                                |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Incremental Delay, d2             | 0.0                                                                               | 0.2                                                                               |                                                                                   | 0.1                                                                               | 0.0                                                                               | 0.0                                                                               | 3.6                                                                                 | 2.1                                                                                 | 0.0                                                                                 | 5.7                                                                                 | 1.1                                                                                 | 0.0                                                                                 |
| Delay (s)                         | 19.8                                                                              | 22.1                                                                              |                                                                                   | 16.3                                                                              | 19.7                                                                              | 19.6                                                                              | 57.3                                                                                | 39.8                                                                                | 29.4                                                                                | 59.1                                                                                | 37.3                                                                                | 28.5                                                                                |
| Level of Service                  | B                                                                                 | C                                                                                 |                                                                                   | B                                                                                 | B                                                                                 | B                                                                                 | E                                                                                   | D                                                                                   | C                                                                                   | E                                                                                   | D                                                                                   | C                                                                                   |
| Approach Delay (s)                |                                                                                   | 21.7                                                                              |                                                                                   |                                                                                   | 18.8                                                                              |                                                                                   |                                                                                     | 40.0                                                                                |                                                                                     |                                                                                     | 38.5                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | C                                                                                 |                                                                                   |                                                                                   | B                                                                                 |                                                                                   |                                                                                     | D                                                                                   |                                                                                     |                                                                                     | D                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                   |                                                                                   | 37.3                                                                              |                                                                                   |                                                                                   |                                                                                   | HCM 2000 Level of Service                                                           |                                                                                     |                                                                                     | D                                                                                   |                                                                                     |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                   |                                                                                   | 0.38                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 120.0                                                                             |                                                                                   |                                                                                   |                                                                                   | Sum of lost time (s)                                                                |                                                                                     |                                                                                     | 19.0                                                                                |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 50.2%                                                                             |                                                                                   |                                                                                   |                                                                                   | ICU Level of Service                                                                |                                                                                     |                                                                                     | A                                                                                   |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

| Intersection             |                                                                                   |      |        |                                                                                   |        |                                                                                   |
|--------------------------|-----------------------------------------------------------------------------------|------|--------|-----------------------------------------------------------------------------------|--------|-----------------------------------------------------------------------------------|
| Int Delay, s/veh         | 1.1                                                                               |      |        |                                                                                   |        |                                                                                   |
| Movement                 | EBT                                                                               | EBR  | WBL    | WBT                                                                               | NBL    | NBR                                                                               |
| Lane Configurations      |  |      |        |  |        |  |
| Traffic Vol, veh/h       | 207                                                                               | 10   | 8      | 190                                                                               | 16     | 21                                                                                |
| Future Vol, veh/h        | 207                                                                               | 10   | 8      | 190                                                                               | 16     | 21                                                                                |
| Conflicting Peds, #/hr   | 0                                                                                 | 3    | 3      | 0                                                                                 | 3      | 0                                                                                 |
| Sign Control             | Free                                                                              | Free | Free   | Free                                                                              | Stop   | Stop                                                                              |
| RT Channelized           | -                                                                                 | None | -      | None                                                                              | -      | None                                                                              |
| Storage Length           | -                                                                                 | -    | -      | -                                                                                 | 0      | -                                                                                 |
| Veh in Median Storage, # | 0                                                                                 | -    | -      | 0                                                                                 | 0      | -                                                                                 |
| Grade, %                 | 0                                                                                 | -    | -      | 0                                                                                 | 0      | -                                                                                 |
| Peak Hour Factor         | 77                                                                                | 77   | 77     | 77                                                                                | 77     | 77                                                                                |
| Heavy Vehicles, %        | 3                                                                                 | 3    | 3      | 3                                                                                 | 0      | 0                                                                                 |
| Mvmt Flow                | 269                                                                               | 13   | 10     | 247                                                                               | 21     | 27                                                                                |
|                          |                                                                                   |      |        |                                                                                   |        |                                                                                   |
| Major/Minor              | Major1                                                                            |      | Major2 |                                                                                   | Minor1 |                                                                                   |
| Conflicting Flow All     | 0                                                                                 | 0    | 285    | 0                                                                                 | 549    | 279                                                                               |
| Stage 1                  | -                                                                                 | -    | -      | -                                                                                 | 279    | -                                                                                 |
| Stage 2                  | -                                                                                 | -    | -      | -                                                                                 | 270    | -                                                                                 |
| Critical Hdwy            | -                                                                                 | -    | 4.13   | -                                                                                 | 6.4    | 6.2                                                                               |
| Critical Hdwy Stg 1      | -                                                                                 | -    | -      | -                                                                                 | 5.4    | -                                                                                 |
| Critical Hdwy Stg 2      | -                                                                                 | -    | -      | -                                                                                 | 5.4    | -                                                                                 |
| Follow-up Hdwy           | -                                                                                 | -    | 2.227  | -                                                                                 | 3.5    | 3.3                                                                               |
| Pot Cap-1 Maneuver       | -                                                                                 | -    | 1271   | -                                                                                 | 500    | 765                                                                               |
| Stage 1                  | -                                                                                 | -    | -      | -                                                                                 | 773    | -                                                                                 |
| Stage 2                  | -                                                                                 | -    | -      | -                                                                                 | 780    | -                                                                                 |
| Platoon blocked, %       | -                                                                                 | -    |        | -                                                                                 |        |                                                                                   |
| Mov Cap-1 Maneuver       | -                                                                                 | -    | 1267   | -                                                                                 | 493    | 763                                                                               |
| Mov Cap-2 Maneuver       | -                                                                                 | -    | -      | -                                                                                 | 493    | -                                                                                 |
| Stage 1                  | -                                                                                 | -    | -      | -                                                                                 | 771    | -                                                                                 |
| Stage 2                  | -                                                                                 | -    | -      | -                                                                                 | 771    | -                                                                                 |
|                          |                                                                                   |      |        |                                                                                   |        |                                                                                   |
|                          |                                                                                   |      |        |                                                                                   |        |                                                                                   |
| Approach                 | EB                                                                                |      | WB     |                                                                                   | NB     |                                                                                   |
| HCM Control Delay, s     | 0                                                                                 |      | 0.3    |                                                                                   | 11.3   |                                                                                   |
| HCM LOS                  |                                                                                   |      |        |                                                                                   | B      |                                                                                   |
|                          |                                                                                   |      |        |                                                                                   |        |                                                                                   |
| Minor Lane/Major Mvmt    | NBLn1                                                                             | EBT  | EBR    | WBL                                                                               | WBT    |                                                                                   |
| Capacity (veh/h)         | 617                                                                               | -    | -      | 1267                                                                              | -      |                                                                                   |
| HCM Lane V/C Ratio       | 0.078                                                                             | -    | -      | 0.008                                                                             | -      |                                                                                   |
| HCM Control Delay (s)    | 11.3                                                                              | -    | -      | 7.9                                                                               | 0      |                                                                                   |
| HCM Lane LOS             | B                                                                                 | -    | -      | A                                                                                 | A      |                                                                                   |
| HCM 95th %tile Q(veh)    | 0.3                                                                               | -    | -      | 0                                                                                 | -      |                                                                                   |

Queues  
3: SE 192nd Ave & SE 15th St

Background 2032 Traffic Conditions  
AM Peak Hour Conditions



| Lane Group              | EBL  | EBT  | WBL  | WBT  | WBR  | NBL  | NBT  | SBL  | SBT  |
|-------------------------|------|------|------|------|------|------|------|------|------|
| Lane Group Flow (vph)   | 153  | 121  | 27   | 60   | 55   | 54   | 958  | 28   | 847  |
| v/c Ratio               | 0.72 | 0.35 | 0.27 | 0.41 | 0.18 | 0.39 | 0.47 | 0.28 | 0.44 |
| Control Delay           | 60.5 | 17.5 | 51.6 | 50.6 | 1.2  | 43.8 | 14.5 | 52.2 | 16.6 |
| Queue Delay             | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  |
| Total Delay             | 60.5 | 17.5 | 51.6 | 50.6 | 1.2  | 43.8 | 14.5 | 52.2 | 16.6 |
| Queue Length 50th (ft)  | 95   | 26   | 17   | 38   | 0    | 27   | 172  | 18   | 165  |
| Queue Length 95th (ft)  | 154  | 68   | 44   | 72   | 0    | m42  | 144  | 45   | 294  |
| Internal Link Dist (ft) |      | 318  |      | 1016 |      |      | 1126 |      | 227  |
| Turn Bay Length (ft)    | 115  |      | 110  |      | 110  | 150  |      | 475  |      |
| Base Capacity (vph)     | 350  | 461  | 100  | 172  | 319  | 152  | 2073 | 109  | 1987 |
| Starvation Cap Reductn  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Spillback Cap Reductn   | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Storage Cap Reductn     | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Reduced v/c Ratio       | 0.44 | 0.26 | 0.27 | 0.35 | 0.17 | 0.36 | 0.46 | 0.26 | 0.43 |

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

# HCM Signalized Intersection Capacity Analysis

## 3: SE 192nd Ave & SE 15th St

Background 2032 Traffic Conditions  
AM Peak Hour Conditions

|                                   |  |  |  |  |  |  |   |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Traffic Volume (vph)              | 141                                                                               | 41                                                                                | 70                                                                                | 25                                                                                | 55                                                                                | 51                                                                                | 50                                                                                  | 856                                                                                 | 26                                                                                  | 26                                                                                  | 707                                                                                 | 73                                                                                  |
| Future Volume (vph)               | 141                                                                               | 41                                                                                | 70                                                                                | 25                                                                                | 55                                                                                | 51                                                                                | 50                                                                                  | 856                                                                                 | 26                                                                                  | 26                                                                                  | 707                                                                                 | 73                                                                                  |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                                 | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Lane Util. Factor                 | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 0.95                                                                                |                                                                                     | 1.00                                                                                | 0.95                                                                                |                                                                                     |
| Frpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 0.99                                                                              | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Flpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Frt                               | 1.00                                                                              | 0.91                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 0.85                                                                              | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 0.99                                                                                |                                                                                     |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                                | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (prot)                 | 1752                                                                              | 1721                                                                              |                                                                                   | 1805                                                                              | 1845                                                                              | 1556                                                                              | 1805                                                                                | 3490                                                                                |                                                                                     | 1752                                                                                | 3449                                                                                |                                                                                     |
| Flt Permitted                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                                | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (perm)                 | 1752                                                                              | 1721                                                                              |                                                                                   | 1805                                                                              | 1845                                                                              | 1556                                                                              | 1805                                                                                | 3490                                                                                |                                                                                     | 1752                                                                                | 3449                                                                                |                                                                                     |
| Peak-hour factor, PHF             | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Adj. Flow (vph)                   | 153                                                                               | 45                                                                                | 76                                                                                | 27                                                                                | 60                                                                                | 55                                                                                | 54                                                                                  | 930                                                                                 | 28                                                                                  | 28                                                                                  | 768                                                                                 | 79                                                                                  |
| RTOR Reduction (vph)              | 0                                                                                 | 63                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 49                                                                                | 0                                                                                   | 2                                                                                   | 0                                                                                   | 0                                                                                   | 7                                                                                   | 0                                                                                   |
| Lane Group Flow (vph)             | 153                                                                               | 58                                                                                | 0                                                                                 | 27                                                                                | 60                                                                                | 6                                                                                 | 54                                                                                  | 956                                                                                 | 0                                                                                   | 28                                                                                  | 840                                                                                 | 0                                                                                   |
| Confl. Peds. (#/hr)               | 1                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 1                                                                                 |                                                                                     |                                                                                     | 3                                                                                   | 3                                                                                   |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     | 1                                                                                   |                                                                                     |                                                                                     | 1                                                                                   |
| Heavy Vehicles (%)                | 3%                                                                                | 0%                                                                                | 0%                                                                                | 0%                                                                                | 3%                                                                                | 3%                                                                                | 0%                                                                                  | 3%                                                                                  | 0%                                                                                  | 3%                                                                                  | 3%                                                                                  | 3%                                                                                  |
| Turn Type                         | Prot                                                                              | NA                                                                                |                                                                                   | Prot                                                                              | NA                                                                                | pm+ov                                                                             | Prot                                                                                | NA                                                                                  |                                                                                     | Prot                                                                                | NA                                                                                  |                                                                                     |
| Protected Phases                  | 5                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 6                                                                                 | 3                                                                                 | 7                                                                                   | 4                                                                                   |                                                                                     | 3                                                                                   | 8                                                                                   |                                                                                     |
| Permitted Phases                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 6                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Green, G (s)             | 13.1                                                                              | 16.5                                                                              |                                                                                   | 3.6                                                                               | 7.0                                                                               | 11.7                                                                              | 6.7                                                                                 | 55.2                                                                                |                                                                                     | 4.7                                                                                 | 53.2                                                                                |                                                                                     |
| Effective Green, g (s)            | 13.1                                                                              | 16.5                                                                              |                                                                                   | 3.6                                                                               | 7.0                                                                               | 11.7                                                                              | 6.7                                                                                 | 55.2                                                                                |                                                                                     | 4.7                                                                                 | 53.2                                                                                |                                                                                     |
| Actuated g/C Ratio                | 0.13                                                                              | 0.16                                                                              |                                                                                   | 0.04                                                                              | 0.07                                                                              | 0.12                                                                              | 0.07                                                                                | 0.55                                                                                |                                                                                     | 0.05                                                                                | 0.53                                                                                |                                                                                     |
| Clearance Time (s)                | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                                 | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Vehicle Extension (s)             | 1.0                                                                               | 1.0                                                                               |                                                                                   | 1.0                                                                               | 1.0                                                                               | 1.0                                                                               | 1.0                                                                                 | 1.0                                                                                 |                                                                                     | 1.0                                                                                 | 1.0                                                                                 |                                                                                     |
| Lane Grp Cap (vph)                | 229                                                                               | 283                                                                               |                                                                                   | 64                                                                                | 129                                                                               | 182                                                                               | 120                                                                                 | 1926                                                                                |                                                                                     | 82                                                                                  | 1834                                                                                |                                                                                     |
| v/s Ratio Prot                    | c0.09                                                                             | c0.03                                                                             |                                                                                   | 0.01                                                                              | c0.03                                                                             | 0.00                                                                              | 0.03                                                                                | c0.27                                                                               |                                                                                     | 0.02                                                                                | c0.24                                                                               |                                                                                     |
| v/s Ratio Perm                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 0.00                                                                              |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| v/c Ratio                         | 0.67                                                                              | 0.20                                                                              |                                                                                   | 0.42                                                                              | 0.47                                                                              | 0.04                                                                              | 0.45                                                                                | 0.50                                                                                |                                                                                     | 0.34                                                                                | 0.46                                                                                |                                                                                     |
| Uniform Delay, d1                 | 41.4                                                                              | 36.1                                                                              |                                                                                   | 47.2                                                                              | 44.7                                                                              | 39.1                                                                              | 44.9                                                                                | 13.8                                                                                |                                                                                     | 46.2                                                                                | 14.5                                                                                |                                                                                     |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 0.87                                                                                | 0.92                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Incremental Delay, d2             | 5.6                                                                               | 0.1                                                                               |                                                                                   | 1.6                                                                               | 1.0                                                                               | 0.0                                                                               | 0.7                                                                                 | 0.7                                                                                 |                                                                                     | 0.9                                                                                 | 0.1                                                                                 |                                                                                     |
| Delay (s)                         | 47.0                                                                              | 36.2                                                                              |                                                                                   | 48.8                                                                              | 45.7                                                                              | 39.2                                                                              | 39.6                                                                                | 13.4                                                                                |                                                                                     | 47.1                                                                                | 14.5                                                                                |                                                                                     |
| Level of Service                  | D                                                                                 | D                                                                                 |                                                                                   | D                                                                                 | D                                                                                 | D                                                                                 | D                                                                                   | B                                                                                   |                                                                                     | D                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay (s)                |                                                                                   | 42.2                                                                              |                                                                                   |                                                                                   | 43.8                                                                              |                                                                                   |                                                                                     | 14.8                                                                                |                                                                                     |                                                                                     | 15.6                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                   |                                                                                   | 20.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                   |                                                                                   | 0.53                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 100.0                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 55.6%                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |



Queues  
4: SE 192nd Ave & Mill Plain Blvd

Background 2032 Traffic Conditions  
AM Peak Hour Conditions

|                         |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | NBL                                                                               | NBT                                                                                | SBL                                                                                 | SBT                                                                                 |
| Lane Group Flow (vph)   | 143                                                                               | 118                                                                               | 214                                                                               | 166                                                                               | 234                                                                               | 526                                                                               | 933                                                                                | 103                                                                                 | 823                                                                                 |
| v/c Ratio               | 0.71                                                                              | 0.39                                                                              | 0.36                                                                              | 0.79                                                                              | 0.73                                                                              | 0.92                                                                              | 0.63                                                                               | 0.71                                                                                | 0.68                                                                                |
| Control Delay           | 62.0                                                                              | 38.8                                                                              | 6.9                                                                               | 69.6                                                                              | 44.9                                                                              | 65.7                                                                              | 25.8                                                                               | 69.6                                                                                | 30.8                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 62.0                                                                              | 38.8                                                                              | 6.9                                                                               | 69.6                                                                              | 44.9                                                                              | 65.7                                                                              | 25.8                                                                               | 69.6                                                                                | 30.8                                                                                |
| Queue Length 50th (ft)  | 89                                                                                | 69                                                                                | 24                                                                                | 103                                                                               | 120                                                                               | 172                                                                               | 226                                                                                | 65                                                                                  | 219                                                                                 |
| Queue Length 95th (ft)  | 121                                                                               | 84                                                                                | 32                                                                                | 139                                                                               | 135                                                                               | #240                                                                              | 279                                                                                | 96                                                                                  | 248                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 628                                                                               |                                                                                   |                                                                                   | 391                                                                               |                                                                                   | 457                                                                                |                                                                                     | 709                                                                                 |
| Turn Bay Length (ft)    | 240                                                                               |                                                                                   | 130                                                                               |                                                                                   |                                                                                   | 205                                                                               |                                                                                    | 150                                                                                 |                                                                                     |
| Base Capacity (vph)     | 235                                                                               | 516                                                                               | 600                                                                               | 227                                                                               | 507                                                                               | 573                                                                               | 1478                                                                               | 177                                                                                 | 1205                                                                                |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.61                                                                              | 0.23                                                                              | 0.36                                                                              | 0.73                                                                              | 0.46                                                                              | 0.92                                                                              | 0.63                                                                               | 0.58                                                                                | 0.68                                                                                |

Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.

# HCM Signalized Intersection Capacity Analysis

## 4: SE 192nd Ave & Mill Plain Blvd

Background 2032 Traffic Conditions  
AM Peak Hour Conditions

|                                   |  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                           |                                                                                   |                                                                                   |      |                                                                                     |                                                                                     |      |
|-----------------------------------|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|---------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------|
| Movement                          | EBL                                                                                | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                       | NBL                                                                               | NBT                                                                               | NBR  | SBL                                                                                 | SBT                                                                                 | SBR  |
| Lane Configurations               |   |  |  |  |  |                           |  |  |      |  |  |      |
| Traffic Volume (vph)              | 106                                                                                | 87                                                                                | 158                                                                               | 123                                                                               | 96                                                                                | 77                        | 389                                                                               | 503                                                                               | 187  | 76                                                                                  | 456                                                                                 | 153  |
| Future Volume (vph)               | 106                                                                                | 87                                                                                | 158                                                                               | 123                                                                               | 96                                                                                | 77                        | 389                                                                               | 503                                                                               | 187  | 76                                                                                  | 456                                                                                 | 153  |
| Ideal Flow (vphpl)                | 1900                                                                               | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                      | 1900                                                                              | 1900                                                                              | 1900 | 1900                                                                                | 1900                                                                                | 1900 |
| Total Lost time (s)               | 5.0                                                                                | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               |                           | 5.0                                                                               | 5.0                                                                               |      | 5.0                                                                                 | 5.0                                                                                 |      |
| Lane Util. Factor                 | 1.00                                                                               | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              |                           | 0.97                                                                              | 0.95                                                                              |      | 1.00                                                                                | 0.95                                                                                |      |
| Frpb, ped/bikes                   | 1.00                                                                               | 1.00                                                                              | 0.99                                                                              | 1.00                                                                              | 0.99                                                                              |                           | 1.00                                                                              | 0.99                                                                              |      | 1.00                                                                                | 1.00                                                                                |      |
| Flpb, ped/bikes                   | 1.00                                                                               | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              |                           | 1.00                                                                              | 1.00                                                                              |      | 1.00                                                                                | 1.00                                                                                |      |
| Frt                               | 1.00                                                                               | 1.00                                                                              | 0.85                                                                              | 1.00                                                                              | 0.93                                                                              |                           | 1.00                                                                              | 0.96                                                                              |      | 1.00                                                                                | 0.96                                                                                |      |
| Flt Protected                     | 0.95                                                                               | 1.00                                                                              | 1.00                                                                              | 0.95                                                                              | 1.00                                                                              |                           | 0.95                                                                              | 1.00                                                                              |      | 0.95                                                                                | 1.00                                                                                |      |
| Satd. Flow (prot)                 | 1752                                                                               | 1845                                                                              | 1551                                                                              | 1752                                                                              | 1711                                                                              |                           | 3433                                                                              | 3338                                                                              |      | 1752                                                                                | 3359                                                                                |      |
| Flt Permitted                     | 0.95                                                                               | 1.00                                                                              | 1.00                                                                              | 0.95                                                                              | 1.00                                                                              |                           | 0.95                                                                              | 1.00                                                                              |      | 0.95                                                                                | 1.00                                                                                |      |
| Satd. Flow (perm)                 | 1752                                                                               | 1845                                                                              | 1551                                                                              | 1752                                                                              | 1711                                                                              |                           | 3433                                                                              | 3338                                                                              |      | 1752                                                                                | 3359                                                                                |      |
| Peak-hour factor, PHF             | 0.74                                                                               | 0.74                                                                              | 0.74                                                                              | 0.74                                                                              | 0.74                                                                              | 0.74                      | 0.74                                                                              | 0.74                                                                              | 0.74 | 0.74                                                                                | 0.74                                                                                | 0.74 |
| Adj. Flow (vph)                   | 143                                                                                | 118                                                                               | 214                                                                               | 166                                                                               | 130                                                                               | 104                       | 526                                                                               | 680                                                                               | 253  | 103                                                                                 | 616                                                                                 | 207  |
| RTOR Reduction (vph)              | 0                                                                                  | 0                                                                                 | 88                                                                                | 0                                                                                 | 33                                                                                | 0                         | 0                                                                                 | 31                                                                                | 0    | 0                                                                                   | 29                                                                                  | 0    |
| Lane Group Flow (vph)             | 143                                                                                | 118                                                                               | 126                                                                               | 166                                                                               | 201                                                                               | 0                         | 526                                                                               | 902                                                                               | 0    | 103                                                                                 | 794                                                                                 | 0    |
| Confl. Peds. (#/hr)               | 1                                                                                  |                                                                                   | 8                                                                                 | 8                                                                                 |                                                                                   | 1                         | 3                                                                                 |                                                                                   | 3    | 3                                                                                   |                                                                                     | 3    |
| Confl. Bikes (#/hr)               |                                                                                    |                                                                                   | 1                                                                                 |                                                                                   |                                                                                   | 1                         |                                                                                   |                                                                                   |      |                                                                                     |                                                                                     | 1    |
| Heavy Vehicles (%)                | 3%                                                                                 | 3%                                                                                | 3%                                                                                | 3%                                                                                | 3%                                                                                | 3%                        | 2%                                                                                | 3%                                                                                | 3%   | 3%                                                                                  | 3%                                                                                  | 3%   |
| Turn Type                         | Prot                                                                               | NA                                                                                | pm+ov                                                                             | Prot                                                                              | NA                                                                                |                           | Prot                                                                              | NA                                                                                |      | Prot                                                                                | NA                                                                                  |      |
| Protected Phases                  | 5                                                                                  | 2                                                                                 | 7                                                                                 | 1                                                                                 | 6                                                                                 |                           | 7                                                                                 | 4                                                                                 |      | 3                                                                                   | 8                                                                                   |      |
| Permitted Phases                  |                                                                                    |                                                                                   | 2                                                                                 |                                                                                   |                                                                                   |                           |                                                                                   |                                                                                   |      |                                                                                     |                                                                                     |      |
| Actuated Green, G (s)             | 11.4                                                                               | 16.3                                                                              | 33.0                                                                              | 11.9                                                                              | 16.8                                                                              |                           | 16.7                                                                              | 43.5                                                                              |      | 8.3                                                                                 | 35.1                                                                                |      |
| Effective Green, g (s)            | 11.4                                                                               | 16.3                                                                              | 33.0                                                                              | 11.9                                                                              | 16.8                                                                              |                           | 16.7                                                                              | 43.5                                                                              |      | 8.3                                                                                 | 35.1                                                                                |      |
| Actuated g/C Ratio                | 0.11                                                                               | 0.16                                                                              | 0.33                                                                              | 0.12                                                                              | 0.17                                                                              |                           | 0.17                                                                              | 0.44                                                                              |      | 0.08                                                                                | 0.35                                                                                |      |
| Clearance Time (s)                | 5.0                                                                                | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               |                           | 5.0                                                                               | 5.0                                                                               |      | 5.0                                                                                 | 5.0                                                                                 |      |
| Vehicle Extension (s)             | 1.5                                                                                | 1.5                                                                               | 0.5                                                                               | 2.0                                                                               | 2.0                                                                               |                           | 0.5                                                                               | 0.5                                                                               |      | 0.5                                                                                 | 0.5                                                                                 |      |
| Lane Grp Cap (vph)                | 199                                                                                | 300                                                                               | 511                                                                               | 208                                                                               | 287                                                                               |                           | 573                                                                               | 1452                                                                              |      | 145                                                                                 | 1179                                                                                |      |
| v/s Ratio Prot                    | c0.08                                                                              | c0.06                                                                             | 0.04                                                                              | 0.09                                                                              | c0.12                                                                             |                           | c0.15                                                                             | 0.27                                                                              |      | 0.06                                                                                | c0.24                                                                               |      |
| v/s Ratio Perm                    |                                                                                    |                                                                                   | 0.04                                                                              |                                                                                   |                                                                                   |                           |                                                                                   |                                                                                   |      |                                                                                     |                                                                                     |      |
| v/c Ratio                         | 0.72                                                                               | 0.39                                                                              | 0.25                                                                              | 0.80                                                                              | 0.70                                                                              |                           | 0.92                                                                              | 0.62                                                                              |      | 0.71                                                                                | 0.67                                                                                |      |
| Uniform Delay, d1                 | 42.8                                                                               | 37.4                                                                              | 24.4                                                                              | 42.9                                                                              | 39.2                                                                              |                           | 41.0                                                                              | 21.9                                                                              |      | 44.7                                                                                | 27.6                                                                                |      |
| Progression Factor                | 1.00                                                                               | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              |                           | 1.00                                                                              | 1.00                                                                              |      | 1.00                                                                                | 1.00                                                                                |      |
| Incremental Delay, d2             | 9.9                                                                                | 0.3                                                                               | 0.1                                                                               | 17.7                                                                              | 5.9                                                                               |                           | 19.3                                                                              | 2.0                                                                               |      | 12.8                                                                                | 1.2                                                                                 |      |
| Delay (s)                         | 52.6                                                                               | 37.7                                                                              | 24.5                                                                              | 60.6                                                                              | 45.1                                                                              |                           | 60.3                                                                              | 23.9                                                                              |      | 57.4                                                                                | 28.8                                                                                |      |
| Level of Service                  | D                                                                                  | D                                                                                 | C                                                                                 | E                                                                                 | D                                                                                 |                           | E                                                                                 | C                                                                                 |      | E                                                                                   | C                                                                                   |      |
| Approach Delay (s)                |                                                                                    | 36.3                                                                              |                                                                                   |                                                                                   | 51.6                                                                              |                           |                                                                                   | 37.0                                                                              |      |                                                                                     | 32.0                                                                                |      |
| Approach LOS                      |                                                                                    | D                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                           |                                                                                   | D                                                                                 |      |                                                                                     | C                                                                                   |      |
| <b>Intersection Summary</b>       |                                                                                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                           |                                                                                   |                                                                                   |      |                                                                                     |                                                                                     |      |
| HCM 2000 Control Delay            |                                                                                    |                                                                                   | 37.3                                                                              |                                                                                   |                                                                                   | HCM 2000 Level of Service |                                                                                   |                                                                                   |      | D                                                                                   |                                                                                     |      |
| HCM 2000 Volume to Capacity ratio |                                                                                    |                                                                                   | 0.73                                                                              |                                                                                   |                                                                                   |                           |                                                                                   |                                                                                   |      |                                                                                     |                                                                                     |      |
| Actuated Cycle Length (s)         |                                                                                    |                                                                                   | 100.0                                                                             |                                                                                   |                                                                                   | Sum of lost time (s)      |                                                                                   |                                                                                   | 20.0 |                                                                                     |                                                                                     |      |
| Intersection Capacity Utilization |                                                                                    |                                                                                   | 61.7%                                                                             |                                                                                   |                                                                                   | ICU Level of Service      |                                                                                   |                                                                                   | B    |                                                                                     |                                                                                     |      |
| Analysis Period (min)             |                                                                                    |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                           |                                                                                   |                                                                                   |      |                                                                                     |                                                                                     |      |
| c Critical Lane Group             |                                                                                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                           |                                                                                   |                                                                                   |      |                                                                                     |                                                                                     |      |

Queues  
5: SE 192nd Ave & SE 20th St

Background 2032 Traffic Conditions  
AM Peak Hour Conditions

|                         |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | WBL                                                                               | WBT                                                                               | NBL                                                                               | NBT                                                                               | SBL                                                                                | SBT                                                                                 |
| Lane Group Flow (vph)   | 181                                                                               | 215                                                                               | 139                                                                               | 290                                                                               | 54                                                                                | 1081                                                                              | 96                                                                                 | 986                                                                                 |
| v/c Ratio               | 0.56                                                                              | 0.60                                                                              | 0.48                                                                              | 0.82                                                                              | 0.41                                                                              | 0.69                                                                              | 0.61                                                                               | 0.61                                                                                |
| Control Delay           | 49.6                                                                              | 38.6                                                                              | 49.1                                                                              | 51.4                                                                              | 52.9                                                                              | 27.6                                                                              | 74.2                                                                               | 18.4                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 |
| Total Delay             | 49.6                                                                              | 38.6                                                                              | 49.1                                                                              | 51.4                                                                              | 52.9                                                                              | 27.6                                                                              | 74.2                                                                               | 18.4                                                                                |
| Queue Length 50th (ft)  | 57                                                                                | 111                                                                               | 44                                                                                | 151                                                                               | 33                                                                                | 298                                                                               | 64                                                                                 | 257                                                                                 |
| Queue Length 95th (ft)  | 78                                                                                | 148                                                                               | 63                                                                                | 193                                                                               | 62                                                                                | 355                                                                               | 101                                                                                | 215                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 1997                                                                              |                                                                                   | 3145                                                                              |                                                                                   | 1320                                                                              |                                                                                    | 1126                                                                                |
| Turn Bay Length (ft)    | 100                                                                               |                                                                                   | 150                                                                               |                                                                                   | 335                                                                               |                                                                                   | 410                                                                                |                                                                                     |
| Base Capacity (vph)     | 408                                                                               | 455                                                                               | 374                                                                               | 445                                                                               | 175                                                                               | 1560                                                                              | 180                                                                                | 1606                                                                                |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |
| Reduced v/c Ratio       | 0.44                                                                              | 0.47                                                                              | 0.37                                                                              | 0.65                                                                              | 0.31                                                                              | 0.69                                                                              | 0.53                                                                               | 0.61                                                                                |
| Intersection Summary    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |

# HCM Signalized Intersection Capacity Analysis

## 5: SE 192nd Ave & SE 20th St

Background 2032 Traffic Conditions  
AM Peak Hour Conditions

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |                                                                                   |  |  |                                                                                   |   |  |                                                                                     |  |  |                                                                                     |
| Traffic Volume (vph)              | 143                                                                               | 114                                                                               | 56                                                                                | 110                                                                               | 116                                                                               | 113                                                                               | 43                                                                                  | 762                                                                                 | 92                                                                                  | 76                                                                                  | 688                                                                                 | 91                                                                                  |
| Future Volume (vph)               | 143                                                                               | 114                                                                               | 56                                                                                | 110                                                                               | 116                                                                               | 113                                                                               | 43                                                                                  | 762                                                                                 | 92                                                                                  | 76                                                                                  | 688                                                                                 | 91                                                                                  |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                                 | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Lane Util. Factor                 | 0.97                                                                              | 1.00                                                                              |                                                                                   | 0.97                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                                | 0.95                                                                                |                                                                                     | 1.00                                                                                | 0.95                                                                                |                                                                                     |
| Frpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 0.99                                                                              |                                                                                   | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Flpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Frt                               | 1.00                                                                              | 0.95                                                                              |                                                                                   | 1.00                                                                              | 0.93                                                                              |                                                                                   | 1.00                                                                                | 0.98                                                                                |                                                                                     | 1.00                                                                                | 0.98                                                                                |                                                                                     |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                                | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (prot)                 | 3400                                                                              | 1751                                                                              |                                                                                   | 3400                                                                              | 1711                                                                              |                                                                                   | 1752                                                                                | 3439                                                                                |                                                                                     | 1752                                                                                | 3433                                                                                |                                                                                     |
| Flt Permitted                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                                | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (perm)                 | 3400                                                                              | 1751                                                                              |                                                                                   | 3400                                                                              | 1711                                                                              |                                                                                   | 1752                                                                                | 3439                                                                                |                                                                                     | 1752                                                                                | 3433                                                                                |                                                                                     |
| Peak-hour factor, PHF             | 0.79                                                                              | 0.79                                                                              | 0.79                                                                              | 0.79                                                                              | 0.79                                                                              | 0.79                                                                              | 0.79                                                                                | 0.79                                                                                | 0.79                                                                                | 0.79                                                                                | 0.79                                                                                | 0.79                                                                                |
| Adj. Flow (vph)                   | 181                                                                               | 144                                                                               | 71                                                                                | 139                                                                               | 147                                                                               | 143                                                                               | 54                                                                                  | 965                                                                                 | 116                                                                                 | 96                                                                                  | 871                                                                                 | 115                                                                                 |
| RTOR Reduction (vph)              | 0                                                                                 | 19                                                                                | 0                                                                                 | 0                                                                                 | 38                                                                                | 0                                                                                 | 0                                                                                   | 8                                                                                   | 0                                                                                   | 0                                                                                   | 9                                                                                   | 0                                                                                   |
| Lane Group Flow (vph)             | 181                                                                               | 196                                                                               | 0                                                                                 | 139                                                                               | 252                                                                               | 0                                                                                 | 54                                                                                  | 1073                                                                                | 0                                                                                   | 96                                                                                  | 977                                                                                 | 0                                                                                   |
| Confl. Peds. (#/hr)               | 2                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 2                                                                                   | 2                                                                                   |                                                                                     | 2                                                                                   | 2                                                                                   |                                                                                     |
| Confl. Bikes (#/hr)               |                                                                                   |                                                                                   | 2                                                                                 |                                                                                   |                                                                                   |                                                                                   | 2                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |                                                                                     | 1                                                                                   |
| Heavy Vehicles (%)                | 3%                                                                                | 3%                                                                                | 2%                                                                                | 3%                                                                                | 1%                                                                                | 3%                                                                                | 3%                                                                                  | 3%                                                                                  | 3%                                                                                  | 3%                                                                                  | 3%                                                                                  | 3%                                                                                  |
| Turn Type                         | Prot                                                                              | NA                                                                                |                                                                                   | Prot                                                                              | NA                                                                                |                                                                                   | Prot                                                                                | NA                                                                                  |                                                                                     | Prot                                                                                | NA                                                                                  |                                                                                     |
| Protected Phases                  | 5                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 6                                                                                 |                                                                                   | 7                                                                                   | 4                                                                                   |                                                                                     | 3                                                                                   | 8                                                                                   |                                                                                     |
| Permitted Phases                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Green, G (s)             | 9.6                                                                               | 19.6                                                                              |                                                                                   | 8.4                                                                               | 18.4                                                                              |                                                                                   | 6.5                                                                                 | 44.1                                                                                |                                                                                     | 7.9                                                                                 | 45.5                                                                                |                                                                                     |
| Effective Green, g (s)            | 9.6                                                                               | 19.6                                                                              |                                                                                   | 8.4                                                                               | 18.4                                                                              |                                                                                   | 6.5                                                                                 | 44.1                                                                                |                                                                                     | 7.9                                                                                 | 45.5                                                                                |                                                                                     |
| Actuated g/C Ratio                | 0.10                                                                              | 0.20                                                                              |                                                                                   | 0.08                                                                              | 0.18                                                                              |                                                                                   | 0.06                                                                                | 0.44                                                                                |                                                                                     | 0.08                                                                                | 0.46                                                                                |                                                                                     |
| Clearance Time (s)                | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                                 | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Vehicle Extension (s)             | 2.0                                                                               | 2.0                                                                               |                                                                                   | 2.0                                                                               | 2.0                                                                               |                                                                                   | 2.0                                                                                 | 2.0                                                                                 |                                                                                     | 2.0                                                                                 | 2.0                                                                                 |                                                                                     |
| Lane Grp Cap (vph)                | 326                                                                               | 343                                                                               |                                                                                   | 285                                                                               | 314                                                                               |                                                                                   | 113                                                                                 | 1516                                                                                |                                                                                     | 138                                                                                 | 1562                                                                                |                                                                                     |
| v/s Ratio Prot                    | c0.05                                                                             | 0.11                                                                              |                                                                                   | 0.04                                                                              | c0.15                                                                             |                                                                                   | 0.03                                                                                | c0.31                                                                               |                                                                                     | c0.05                                                                               | 0.28                                                                                |                                                                                     |
| v/s Ratio Perm                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| v/c Ratio                         | 0.56                                                                              | 0.57                                                                              |                                                                                   | 0.49                                                                              | 0.80                                                                              |                                                                                   | 0.48                                                                                | 0.71                                                                                |                                                                                     | 0.70                                                                                | 0.63                                                                                |                                                                                     |
| Uniform Delay, d1                 | 43.2                                                                              | 36.4                                                                              |                                                                                   | 43.7                                                                              | 39.1                                                                              |                                                                                   | 45.1                                                                                | 22.7                                                                                |                                                                                     | 44.9                                                                                | 20.8                                                                                |                                                                                     |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.34                                                                                | 0.72                                                                                |                                                                                     |
| Incremental Delay, d2             | 1.2                                                                               | 1.4                                                                               |                                                                                   | 0.5                                                                               | 13.1                                                                              |                                                                                   | 1.2                                                                                 | 2.8                                                                                 |                                                                                     | 11.2                                                                                | 0.5                                                                                 |                                                                                     |
| Delay (s)                         | 44.3                                                                              | 37.8                                                                              |                                                                                   | 44.2                                                                              | 52.2                                                                              |                                                                                   | 46.3                                                                                | 25.5                                                                                |                                                                                     | 71.2                                                                                | 15.6                                                                                |                                                                                     |
| Level of Service                  | D                                                                                 | D                                                                                 |                                                                                   | D                                                                                 | D                                                                                 |                                                                                   | D                                                                                   | C                                                                                   |                                                                                     | E                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay (s)                |                                                                                   | 40.8                                                                              |                                                                                   |                                                                                   | 49.6                                                                              |                                                                                   |                                                                                     | 26.5                                                                                |                                                                                     |                                                                                     | 20.5                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                     | C                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                   |                                                                                   | 29.5                                                                              |                                                                                   |                                                                                   | HCM 2000 Level of Service                                                         |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                   |                                                                                   | 0.71                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 100.0                                                                             |                                                                                   |                                                                                   | Sum of lost time (s)                                                              |                                                                                     |                                                                                     | 20.0                                                                                |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 62.5%                                                                             |                                                                                   |                                                                                   | ICU Level of Service                                                              |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

| Intersection             |        |        |        |      |      |      |
|--------------------------|--------|--------|--------|------|------|------|
| Int Delay, s/veh         | 0      |        |        |      |      |      |
| Movement                 | EBL    | EBR    | NBL    | NBT  | SBT  | SBR  |
| Lane Configurations      |        | ↗      |        | ↑↑   | ↑↑   |      |
| Traffic Vol, veh/h       | 0      | 3      | 0      | 1048 | 802  | 4    |
| Future Vol, veh/h        | 0      | 3      | 0      | 1048 | 802  | 4    |
| Conflicting Peds, #/hr   | 0      | 0      | 0      | 0    | 0    | 0    |
| Sign Control             | Stop   | Stop   | Free   | Free | Free | Free |
| RT Channelized           | -      | None   | -      | None | -    | None |
| Storage Length           | -      | 0      | -      | -    | -    | -    |
| Veh in Median Storage, # | 0      | -      | -      | 0    | 0    | -    |
| Grade, %                 | 0      | -      | -      | 0    | 0    | -    |
| Peak Hour Factor         | 92     | 92     | 92     | 92   | 92   | 92   |
| Heavy Vehicles, %        | 0      | 0      | 0      | 3    | 3    | 0    |
| Mvmt Flow                | 0      | 3      | 0      | 1139 | 872  | 4    |
| Major/Minor              | Minor2 | Major1 | Major2 |      |      |      |
| Conflicting Flow All     | -      | 438    | -      | 0    | -    | 0    |
| Stage 1                  | -      | -      | -      | -    | -    | -    |
| Stage 2                  | -      | -      | -      | -    | -    | -    |
| Critical Hdwy            | -      | 6.9    | -      | -    | -    | -    |
| Critical Hdwy Stg 1      | -      | -      | -      | -    | -    | -    |
| Critical Hdwy Stg 2      | -      | -      | -      | -    | -    | -    |
| Follow-up Hdwy           | -      | 3.3    | -      | -    | -    | -    |
| Pot Cap-1 Maneuver       | 0      | 572    | 0      | -    | -    | -    |
| Stage 1                  | 0      | -      | 0      | -    | -    | -    |
| Stage 2                  | 0      | -      | 0      | -    | -    | -    |
| Platoon blocked, %       | -      | -      | -      | -    | -    | -    |
| Mov Cap-1 Maneuver       | -      | 572    | -      | -    | -    | -    |
| Mov Cap-2 Maneuver       | -      | -      | -      | -    | -    | -    |
| Stage 1                  | -      | -      | -      | -    | -    | -    |
| Stage 2                  | -      | -      | -      | -    | -    | -    |
| Approach                 | EB     | NB     | SB     |      |      |      |
| HCM Control Delay, s     | 11.3   | 0      | 0      |      |      |      |
| HCM LOS                  | B      |        |        |      |      |      |
| Minor Lane/Major Mvmt    | NBT    | EBLn1  | SBT    | SBR  |      |      |
| Capacity (veh/h)         | -      | 572    | -      | -    |      |      |
| HCM Lane V/C Ratio       | -      | 0.006  | -      | -    |      |      |
| HCM Control Delay (s)    | -      | 11.3   | -      | -    |      |      |
| HCM Lane LOS             | -      | B      | -      | -    |      |      |
| HCM 95th %tile Q(veh)    | -      | 0      | -      | -    |      |      |



Intersection

Int Delay, s/veh 0.9

Movement EBL EBT WBT WBR SBL SBR

Lane Configurations 

Traffic Vol, veh/h 5 234 175 3 18 13

Future Vol, veh/h 5 234 175 3 18 13

Conflicting Peds, #/hr 0 0 0 0 0 0

Sign Control Free Free Free Free Stop Stop

RT Channelized - None - None - None

Storage Length - - - - 0 -

Veh in Median Storage, # - 0 0 - 0 -

Grade, % - 0 0 - 0 -

Peak Hour Factor 92 92 92 92 92 92

Heavy Vehicles, % 0 0 3 0 0 0

Mvmt Flow 5 254 190 3 20 14

Major/Minor Major1 Major2 Minor2

Conflicting Flow All 193 0 - 0 456 192

Stage 1 - - - - 192 -

Stage 2 - - - - 264 -

Critical Hdwy 4.1 - - - 6.4 6.2

Critical Hdwy Stg 1 - - - - 5.4 -

Critical Hdwy Stg 2 - - - - 5.4 -

Follow-up Hdwy 2.2 - - - 3.5 3.3

Pot Cap-1 Maneuver 1392 - - - 566 855

Stage 1 - - - - 845 -

Stage 2 - - - - 785 -

Platoon blocked, % - - - -

Mov Cap-1 Maneuver 1392 - - - 564 855

Mov Cap-2 Maneuver - - - - 564 -

Stage 1 - - - - 842 -

Stage 2 - - - - 785 -

Approach EB WB SB

HCM Control Delay, s 0.2 0 10.8

HCM LOS B

Minor Lane/Major Mvmt EBL EBT WBT WBR SBLn1

Capacity (veh/h) 1392 - - - 658

HCM Lane V/C Ratio 0.004 - - - 0.051

HCM Control Delay (s) 7.6 0 - - 10.8

HCM Lane LOS A A - - B

HCM 95th %tile Q(veh) 0 - - - 0.2

## Queues

1: SE 164th Ave &amp; SE 15th St

## Background 2032 Traffic Conditions

PM Peak Hour Conditions

|                         |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                               | NBT                                                                                | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Group Flow (vph)   | 47                                                                                | 131                                                                               | 131                                                                               | 126                                                                               | 109                                                                               | 136                                                                               | 1782                                                                               | 60                                                                                  | 181                                                                                 | 1706                                                                                | 48                                                                                  |
| v/c Ratio               | 0.14                                                                              | 0.41                                                                              | 0.39                                                                              | 0.32                                                                              | 0.27                                                                              | 0.62                                                                              | 0.84                                                                               | 0.08                                                                                | 0.62                                                                                | 0.72                                                                                | 0.06                                                                                |
| Control Delay           | 34.0                                                                              | 45.3                                                                              | 37.4                                                                              | 46.9                                                                              | 10.3                                                                              | 61.9                                                                              | 35.4                                                                               | 1.2                                                                                 | 55.7                                                                                | 27.8                                                                                | 0.1                                                                                 |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 34.0                                                                              | 45.3                                                                              | 37.4                                                                              | 46.9                                                                              | 10.3                                                                              | 61.9                                                                              | 35.4                                                                               | 1.2                                                                                 | 55.7                                                                                | 27.8                                                                                | 0.1                                                                                 |
| Queue Length 50th (ft)  | 28                                                                                | 85                                                                                | 80                                                                                | 89                                                                                | 0                                                                                 | 101                                                                               | 420                                                                                | 0                                                                                   | 131                                                                                 | 354                                                                                 | 0                                                                                   |
| Queue Length 95th (ft)  | 57                                                                                | 143                                                                               | 131                                                                               | 149                                                                               | 49                                                                                | 158                                                                               | 500                                                                                | 6                                                                                   | 197                                                                                 | 438                                                                                 | 0                                                                                   |
| Internal Link Dist (ft) |                                                                                   | 642                                                                               |                                                                                   | 766                                                                               |                                                                                   |                                                                                   | 1016                                                                               |                                                                                     |                                                                                     | 601                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 100                                                                               |                                                                                   | 250                                                                               |                                                                                   | 325                                                                               | 150                                                                               |                                                                                    | 150                                                                                 | 230                                                                                 |                                                                                     | 230                                                                                 |
| Base Capacity (vph)     | 382                                                                               | 488                                                                               | 344                                                                               | 539                                                                               | 520                                                                               | 229                                                                               | 2126                                                                               | 712                                                                                 | 294                                                                                 | 2385                                                                                | 787                                                                                 |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.12                                                                              | 0.27                                                                              | 0.38                                                                              | 0.23                                                                              | 0.21                                                                              | 0.59                                                                              | 0.84                                                                               | 0.08                                                                                | 0.62                                                                                | 0.72                                                                                | 0.06                                                                                |
| Intersection Summary    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM Signalized Intersection Capacity Analysis

1: SE 164th Ave & SE 15th St

# Background 2032 Traffic Conditions

PM Peak Hour Conditions

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Traffic Volume (vph)              | 41                                                                                | 84                                                                                | 32                                                                                | 115                                                                               | 111                                                                               | 96                                                                                | 120                                                                                 | 1568                                                                                | 53                                                                                  | 159                                                                                 | 1501                                                                                | 42                                                                                  |
| Future Volume (vph)               | 41                                                                                | 84                                                                                | 32                                                                                | 115                                                                               | 111                                                                               | 96                                                                                | 120                                                                                 | 1568                                                                                | 53                                                                                  | 159                                                                                 | 1501                                                                                | 42                                                                                  |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 4.5                                                                               | 5.0                                                                               |                                                                                   | 4.5                                                                               | 5.0                                                                               | 5.0                                                                               | 4.5                                                                                 | 5.0                                                                                 | 5.0                                                                                 | 4.5                                                                                 | 5.0                                                                                 | 5.0                                                                                 |
| Lane Util. Factor                 | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 0.91                                                                                | 1.00                                                                                | 1.00                                                                                | 0.91                                                                                | 1.00                                                                                |
| Frpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 0.98                                                                              | 1.00                                                                                | 1.00                                                                                | 0.98                                                                                | 1.00                                                                                | 1.00                                                                                | 0.98                                                                                |
| Flpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Frt                               | 1.00                                                                              | 0.96                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 0.85                                                                              | 1.00                                                                                | 1.00                                                                                | 0.85                                                                                | 1.00                                                                                | 1.00                                                                                | 0.85                                                                                |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                |
| Satd. Flow (prot)                 | 1805                                                                              | 1786                                                                              |                                                                                   | 1803                                                                              | 1881                                                                              | 1542                                                                              | 1805                                                                                | 5036                                                                                | 1549                                                                                | 1787                                                                                | 5136                                                                                | 1580                                                                                |
| Flt Permitted                     | 0.68                                                                              | 1.00                                                                              |                                                                                   | 0.50                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                |
| Satd. Flow (perm)                 | 1285                                                                              | 1786                                                                              |                                                                                   | 947                                                                               | 1881                                                                              | 1542                                                                              | 1805                                                                                | 5036                                                                                | 1549                                                                                | 1787                                                                                | 5136                                                                                | 1580                                                                                |
| Peak-hour factor, PHF             | 0.88                                                                              | 0.88                                                                              | 0.88                                                                              | 0.88                                                                              | 0.88                                                                              | 0.88                                                                              | 0.88                                                                                | 0.88                                                                                | 0.88                                                                                | 0.88                                                                                | 0.88                                                                                | 0.88                                                                                |
| Adj. Flow (vph)                   | 47                                                                                | 95                                                                                | 36                                                                                | 131                                                                               | 126                                                                               | 109                                                                               | 136                                                                                 | 1782                                                                                | 60                                                                                  | 181                                                                                 | 1706                                                                                | 48                                                                                  |
| RTOR Reduction (vph)              | 0                                                                                 | 13                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 87                                                                                | 0                                                                                   | 0                                                                                   | 35                                                                                  | 0                                                                                   | 0                                                                                   | 26                                                                                  |
| Lane Group Flow (vph)             | 47                                                                                | 118                                                                               | 0                                                                                 | 131                                                                               | 126                                                                               | 22                                                                                | 136                                                                                 | 1782                                                                                | 25                                                                                  | 181                                                                                 | 1706                                                                                | 22                                                                                  |
| Confl. Peds. (#/hr)               |                                                                                   |                                                                                   | 2                                                                                 | 2                                                                                 |                                                                                   |                                                                                   | 1                                                                                   |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 1                                                                                   |
| Confl. Bikes (#/hr)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 4                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Heavy Vehicles (%)                | 0%                                                                                | 1%                                                                                | 3%                                                                                | 0%                                                                                | 1%                                                                                | 3%                                                                                | 0%                                                                                  | 3%                                                                                  | 2%                                                                                  | 1%                                                                                  | 1%                                                                                  | 0%                                                                                  |
| Turn Type                         | pm+pt                                                                             | NA                                                                                |                                                                                   | pm+pt                                                                             | NA                                                                                | Perm                                                                              | Prot                                                                                | NA                                                                                  | Perm                                                                                | Prot                                                                                | NA                                                                                  | Perm                                                                                |
| Protected Phases                  | 5                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 6                                                                                 |                                                                                   | 7                                                                                   | 4                                                                                   |                                                                                     | 3                                                                                   | 8                                                                                   |                                                                                     |
| Permitted Phases                  | 2                                                                                 |                                                                                   |                                                                                   | 6                                                                                 |                                                                                   | 6                                                                                 |                                                                                     |                                                                                     | 4                                                                                   |                                                                                     |                                                                                     | 8                                                                                   |
| Actuated Green, G (s)             | 27.3                                                                              | 20.6                                                                              |                                                                                   | 34.1                                                                              | 24.0                                                                              | 24.0                                                                              | 14.6                                                                                | 50.5                                                                                | 50.5                                                                                | 19.8                                                                                | 55.7                                                                                | 55.7                                                                                |
| Effective Green, g (s)            | 27.3                                                                              | 20.6                                                                              |                                                                                   | 34.1                                                                              | 24.0                                                                              | 24.0                                                                              | 14.6                                                                                | 50.5                                                                                | 50.5                                                                                | 19.8                                                                                | 55.7                                                                                | 55.7                                                                                |
| Actuated g/C Ratio                | 0.23                                                                              | 0.17                                                                              |                                                                                   | 0.28                                                                              | 0.20                                                                              | 0.20                                                                              | 0.12                                                                                | 0.42                                                                                | 0.42                                                                                | 0.17                                                                                | 0.46                                                                                | 0.46                                                                                |
| Clearance Time (s)                | 4.5                                                                               | 5.0                                                                               |                                                                                   | 4.5                                                                               | 5.0                                                                               | 5.0                                                                               | 4.5                                                                                 | 5.0                                                                                 | 5.0                                                                                 | 4.5                                                                                 | 5.0                                                                                 | 5.0                                                                                 |
| Vehicle Extension (s)             | 3.0                                                                               | 2.0                                                                               |                                                                                   | 3.0                                                                               | 2.0                                                                               | 2.0                                                                               | 3.0                                                                                 | 2.0                                                                                 | 2.0                                                                                 | 3.0                                                                                 | 2.0                                                                                 | 2.0                                                                                 |
| Lane Grp Cap (vph)                | 321                                                                               | 306                                                                               |                                                                                   | 341                                                                               | 376                                                                               | 308                                                                               | 219                                                                                 | 2119                                                                                | 651                                                                                 | 294                                                                                 | 2383                                                                                | 733                                                                                 |
| v/s Ratio Prot                    | 0.01                                                                              | 0.07                                                                              |                                                                                   | c0.03                                                                             | 0.07                                                                              |                                                                                   | 0.08                                                                                | c0.35                                                                               |                                                                                     | c0.10                                                                               | 0.33                                                                                |                                                                                     |
| v/s Ratio Perm                    | 0.03                                                                              |                                                                                   |                                                                                   | c0.08                                                                             |                                                                                   | 0.01                                                                              |                                                                                     |                                                                                     | 0.02                                                                                |                                                                                     |                                                                                     | 0.01                                                                                |
| v/c Ratio                         | 0.15                                                                              | 0.38                                                                              |                                                                                   | 0.38                                                                              | 0.34                                                                              | 0.07                                                                              | 0.62                                                                                | 0.84                                                                                | 0.04                                                                                | 0.62                                                                                | 0.72                                                                                | 0.03                                                                                |
| Uniform Delay, d1                 | 36.8                                                                              | 44.1                                                                              |                                                                                   | 33.3                                                                              | 41.2                                                                              | 39.0                                                                              | 50.1                                                                                | 31.2                                                                                | 20.5                                                                                | 46.6                                                                                | 25.8                                                                                | 17.5                                                                                |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Incremental Delay, d2             | 0.2                                                                               | 3.6                                                                               |                                                                                   | 0.7                                                                               | 2.4                                                                               | 0.4                                                                               | 5.4                                                                                 | 3.1                                                                                 | 0.0                                                                                 | 3.8                                                                                 | 0.9                                                                                 | 0.0                                                                                 |
| Delay (s)                         | 37.0                                                                              | 47.7                                                                              |                                                                                   | 34.1                                                                              | 43.6                                                                              | 39.4                                                                              | 55.5                                                                                | 34.2                                                                                | 20.5                                                                                | 50.4                                                                                | 26.7                                                                                | 17.5                                                                                |
| Level of Service                  | D                                                                                 | D                                                                                 |                                                                                   | C                                                                                 | D                                                                                 | D                                                                                 | E                                                                                   | C                                                                                   | C                                                                                   | D                                                                                   | C                                                                                   | B                                                                                   |
| Approach Delay (s)                |                                                                                   | 44.9                                                                              |                                                                                   |                                                                                   | 38.9                                                                              |                                                                                   |                                                                                     | 35.3                                                                                |                                                                                     |                                                                                     | 28.7                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                     | D                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                   |                                                                                   | 33.1                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                   |                                                                                   | 0.67                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 120.0                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 69.5%                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

| Intersection             |                                                                                   |      |        |                                                                                   |        |                                                                                   |
|--------------------------|-----------------------------------------------------------------------------------|------|--------|-----------------------------------------------------------------------------------|--------|-----------------------------------------------------------------------------------|
| Int Delay, s/veh         | 0.8                                                                               |      |        |                                                                                   |        |                                                                                   |
| Movement                 | EBT                                                                               | EBR  | WBL    | WBT                                                                               | NBL    | NBR                                                                               |
| Lane Configurations      |  |      |        |  |        |  |
| Traffic Vol, veh/h       | 283                                                                               | 14   | 23     | 265                                                                               | 12     | 13                                                                                |
| Future Vol, veh/h        | 283                                                                               | 14   | 23     | 265                                                                               | 12     | 13                                                                                |
| Conflicting Peds, #/hr   | 0                                                                                 | 4    | 4      | 0                                                                                 | 6      | 0                                                                                 |
| Sign Control             | Free                                                                              | Free | Free   | Free                                                                              | Stop   | Stop                                                                              |
| RT Channelized           | -                                                                                 | None | -      | None                                                                              | -      | None                                                                              |
| Storage Length           | -                                                                                 | -    | -      | -                                                                                 | 0      | -                                                                                 |
| Veh in Median Storage, # | 0                                                                                 | -    | -      | 0                                                                                 | 0      | -                                                                                 |
| Grade, %                 | 0                                                                                 | -    | -      | 0                                                                                 | 0      | -                                                                                 |
| Peak Hour Factor         | 86                                                                                | 86   | 86     | 86                                                                                | 86     | 86                                                                                |
| Heavy Vehicles, %        | 1                                                                                 | 3    | 3      | 1                                                                                 | 0      | 3                                                                                 |
| Mvmt Flow                | 329                                                                               | 16   | 27     | 308                                                                               | 14     | 15                                                                                |
|                          |                                                                                   |      |        |                                                                                   |        |                                                                                   |
| Major/Minor              | Major1                                                                            |      | Major2 |                                                                                   | Minor1 |                                                                                   |
| Conflicting Flow All     | 0                                                                                 | 0    | 349    | 0                                                                                 | 709    | 341                                                                               |
| Stage 1                  | -                                                                                 | -    | -      | -                                                                                 | 341    | -                                                                                 |
| Stage 2                  | -                                                                                 | -    | -      | -                                                                                 | 368    | -                                                                                 |
| Critical Hdwy            | -                                                                                 | -    | 4.13   | -                                                                                 | 6.4    | 6.23                                                                              |
| Critical Hdwy Stg 1      | -                                                                                 | -    | -      | -                                                                                 | 5.4    | -                                                                                 |
| Critical Hdwy Stg 2      | -                                                                                 | -    | -      | -                                                                                 | 5.4    | -                                                                                 |
| Follow-up Hdwy           | -                                                                                 | -    | 2.227  | -                                                                                 | 3.5    | 3.327                                                                             |
| Pot Cap-1 Maneuver       | -                                                                                 | -    | 1204   | -                                                                                 | 404    | 699                                                                               |
| Stage 1                  | -                                                                                 | -    | -      | -                                                                                 | 725    | -                                                                                 |
| Stage 2                  | -                                                                                 | -    | -      | -                                                                                 | 704    | -                                                                                 |
| Platoon blocked, %       | -                                                                                 | -    |        | -                                                                                 |        |                                                                                   |
| Mov Cap-1 Maneuver       | -                                                                                 | -    | 1199   | -                                                                                 | 389    | 696                                                                               |
| Mov Cap-2 Maneuver       | -                                                                                 | -    | -      | -                                                                                 | 389    | -                                                                                 |
| Stage 1                  | -                                                                                 | -    | -      | -                                                                                 | 722    | -                                                                                 |
| Stage 2                  | -                                                                                 | -    | -      | -                                                                                 | 681    | -                                                                                 |
|                          |                                                                                   |      |        |                                                                                   |        |                                                                                   |
| Approach                 | EB                                                                                |      | WB     |                                                                                   | NB     |                                                                                   |
| HCM Control Delay, s     | 0                                                                                 |      | 0.6    |                                                                                   | 12.6   |                                                                                   |
| HCM LOS                  |                                                                                   |      |        |                                                                                   | B      |                                                                                   |
|                          |                                                                                   |      |        |                                                                                   |        |                                                                                   |
| Minor Lane/Major Mvmt    | NBLn1                                                                             | EBT  | EBR    | WBL                                                                               | WBT    |                                                                                   |
| Capacity (veh/h)         | 505                                                                               | -    | -      | 1199                                                                              | -      |                                                                                   |
| HCM Lane V/C Ratio       | 0.058                                                                             | -    | -      | 0.022                                                                             | -      |                                                                                   |
| HCM Control Delay (s)    | 12.6                                                                              | -    | -      | 8.1                                                                               | 0      |                                                                                   |
| HCM Lane LOS             | B                                                                                 | -    | -      | A                                                                                 | A      |                                                                                   |
| HCM 95th %tile Q(veh)    | 0.2                                                                               | -    | -      | 0.1                                                                               | -      |                                                                                   |

Queues  
3: SE 192nd Ave & SE 15th St

Background 2032 Traffic Conditions  
PM Peak Hour Conditions

|                         |  |      |      |      |      |      |      |      |      |
|-------------------------|------------------------------------------------------------------------------------|------|------|------|------|------|------|------|------|
| Lane Group              | EBL                                                                                | EBT  | WBL  | WBT  | WBR  | NBL  | NBT  | SBL  | SBT  |
| Lane Group Flow (vph)   | 122                                                                                | 193  | 49   | 90   | 231  | 95   | 1243 | 63   | 1381 |
| v/c Ratio               | 0.69                                                                               | 0.77 | 0.49 | 0.62 | 0.60 | 0.66 | 0.62 | 0.50 | 0.67 |
| Control Delay           | 63.2                                                                               | 50.3 | 62.9 | 62.9 | 15.5 | 42.1 | 16.8 | 57.4 | 19.4 |
| Queue Delay             | 0.0                                                                                | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  |
| Total Delay             | 63.2                                                                               | 50.3 | 62.9 | 62.9 | 15.5 | 42.1 | 16.8 | 57.4 | 19.4 |
| Queue Length 50th (ft)  | 76                                                                                 | 89   | 31   | 56   | 24   | 49   | 240  | 40   | 338  |
| Queue Length 95th (ft)  | 132                                                                                | 157  | #81  | 108  | 88   | m49  | m117 | 80   | 473  |
| Internal Link Dist (ft) |                                                                                    | 206  |      | 1016 |      |      | 1126 |      | 238  |
| Turn Bay Length (ft)    | 115                                                                                |      | 110  |      | 110  | 150  |      | 475  |      |
| Base Capacity (vph)     | 232                                                                                | 337  | 100  | 172  | 422  | 177  | 2016 | 177  | 2052 |
| Starvation Cap Reductn  | 0                                                                                  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Spillback Cap Reductn   | 0                                                                                  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Storage Cap Reductn     | 0                                                                                  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    |
| Reduced v/c Ratio       | 0.53                                                                               | 0.57 | 0.49 | 0.52 | 0.55 | 0.54 | 0.62 | 0.36 | 0.67 |

Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.



# HCM Signalized Intersection Capacity Analysis

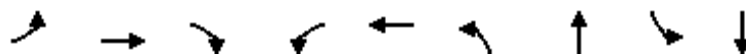
## 3: SE 192nd Ave & SE 15th St

Background 2032 Traffic Conditions  
PM Peak Hour Conditions

|                                   |  |  |  |  |  |  |   |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Traffic Volume (vph)              | 111                                                                               | 82                                                                                | 94                                                                                | 45                                                                                | 82                                                                                | 210                                                                               | 86                                                                                  | 1102                                                                                | 29                                                                                  | 57                                                                                  | 1134                                                                                | 123                                                                                 |
| Future Volume (vph)               | 111                                                                               | 82                                                                                | 94                                                                                | 45                                                                                | 82                                                                                | 210                                                                               | 86                                                                                  | 1102                                                                                | 29                                                                                  | 57                                                                                  | 1134                                                                                | 123                                                                                 |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                                 | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Lane Util. Factor                 | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 0.95                                                                                |                                                                                     | 1.00                                                                                | 0.95                                                                                |                                                                                     |
| Frpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 0.99                                                                              | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Flpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Frt                               | 1.00                                                                              | 0.92                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 0.85                                                                              | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 0.99                                                                                |                                                                                     |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                                | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (prot)                 | 1787                                                                              | 1740                                                                              |                                                                                   | 1805                                                                              | 1881                                                                              | 1604                                                                              | 1752                                                                                | 3522                                                                                |                                                                                     | 1770                                                                                | 3513                                                                                |                                                                                     |
| Flt Permitted                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                                | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (perm)                 | 1787                                                                              | 1740                                                                              |                                                                                   | 1805                                                                              | 1881                                                                              | 1604                                                                              | 1752                                                                                | 3522                                                                                |                                                                                     | 1770                                                                                | 3513                                                                                |                                                                                     |
| Peak-hour factor, PHF             | 0.91                                                                              | 0.91                                                                              | 0.91                                                                              | 0.91                                                                              | 0.91                                                                              | 0.91                                                                              | 0.91                                                                                | 0.91                                                                                | 0.91                                                                                | 0.91                                                                                | 0.91                                                                                | 0.91                                                                                |
| Adj. Flow (vph)                   | 122                                                                               | 90                                                                                | 103                                                                               | 49                                                                                | 90                                                                                | 231                                                                               | 95                                                                                  | 1211                                                                                | 32                                                                                  | 63                                                                                  | 1246                                                                                | 135                                                                                 |
| RTOR Reduction (vph)              | 0                                                                                 | 44                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 159                                                                               | 0                                                                                   | 2                                                                                   | 0                                                                                   | 0                                                                                   | 7                                                                                   | 0                                                                                   |
| Lane Group Flow (vph)             | 122                                                                               | 149                                                                               | 0                                                                                 | 49                                                                                | 90                                                                                | 72                                                                                | 95                                                                                  | 1241                                                                                | 0                                                                                   | 63                                                                                  | 1374                                                                                | 0                                                                                   |
| Confl. Peds. (#/hr)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 3                                                                                   |                                                                                     | 4                                                                                   | 4                                                                                   |                                                                                     | 3                                                                                   |
| Confl. Bikes (#/hr)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 1                                                                                 |                                                                                     |                                                                                     | 1                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Heavy Vehicles (%)                | 1%                                                                                | 1%                                                                                | 0%                                                                                | 0%                                                                                | 1%                                                                                | 0%                                                                                | 3%                                                                                  | 2%                                                                                  | 3%                                                                                  | 2%                                                                                  | 1%                                                                                  | 1%                                                                                  |
| Turn Type                         | Prot                                                                              | NA                                                                                |                                                                                   | Prot                                                                              | NA                                                                                | pm+ov                                                                             | Prot                                                                                | NA                                                                                  |                                                                                     | Prot                                                                                | NA                                                                                  |                                                                                     |
| Protected Phases                  | 5                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 6                                                                                 | 3                                                                                 | 7                                                                                   | 4                                                                                   |                                                                                     | 3                                                                                   | 8                                                                                   |                                                                                     |
| Permitted Phases                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 6                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Green, G (s)             | 9.9                                                                               | 12.0                                                                              |                                                                                   | 4.6                                                                               | 6.7                                                                               | 13.9                                                                              | 7.3                                                                                 | 56.2                                                                                |                                                                                     | 7.2                                                                                 | 56.1                                                                                |                                                                                     |
| Effective Green, g (s)            | 9.9                                                                               | 12.0                                                                              |                                                                                   | 4.6                                                                               | 6.7                                                                               | 13.9                                                                              | 7.3                                                                                 | 56.2                                                                                |                                                                                     | 7.2                                                                                 | 56.1                                                                                |                                                                                     |
| Actuated g/C Ratio                | 0.10                                                                              | 0.12                                                                              |                                                                                   | 0.05                                                                              | 0.07                                                                              | 0.14                                                                              | 0.07                                                                                | 0.56                                                                                |                                                                                     | 0.07                                                                                | 0.56                                                                                |                                                                                     |
| Clearance Time (s)                | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                                 | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Vehicle Extension (s)             | 1.0                                                                               | 1.0                                                                               |                                                                                   | 1.0                                                                               | 1.0                                                                               | 1.0                                                                               | 1.0                                                                                 | 1.0                                                                                 |                                                                                     | 1.0                                                                                 | 1.0                                                                                 |                                                                                     |
| Lane Grp Cap (vph)                | 176                                                                               | 208                                                                               |                                                                                   | 83                                                                                | 126                                                                               | 303                                                                               | 127                                                                                 | 1979                                                                                |                                                                                     | 127                                                                                 | 1970                                                                                |                                                                                     |
| v/s Ratio Prot                    | c0.07                                                                             | c0.09                                                                             |                                                                                   | 0.03                                                                              | 0.05                                                                              | 0.02                                                                              | 0.05                                                                                | c0.35                                                                               |                                                                                     | 0.04                                                                                | c0.39                                                                               |                                                                                     |
| v/s Ratio Perm                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 0.03                                                                              |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| v/c Ratio                         | 0.69                                                                              | 0.72                                                                              |                                                                                   | 0.59                                                                              | 0.71                                                                              | 0.24                                                                              | 0.75                                                                                | 0.63                                                                                |                                                                                     | 0.50                                                                                | 0.70                                                                                |                                                                                     |
| Uniform Delay, d1                 | 43.6                                                                              | 42.4                                                                              |                                                                                   | 46.8                                                                              | 45.7                                                                              | 38.3                                                                              | 45.4                                                                                | 14.8                                                                                |                                                                                     | 44.7                                                                                | 15.8                                                                                |                                                                                     |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 0.79                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Incremental Delay, d2             | 9.1                                                                               | 9.4                                                                               |                                                                                   | 7.3                                                                               | 14.7                                                                              | 0.1                                                                               | 6.8                                                                                 | 0.5                                                                                 |                                                                                     | 1.1                                                                                 | 0.9                                                                                 |                                                                                     |
| Delay (s)                         | 52.7                                                                              | 51.7                                                                              |                                                                                   | 54.1                                                                              | 60.5                                                                              | 38.5                                                                              | 42.5                                                                                | 15.4                                                                                |                                                                                     | 45.8                                                                                | 16.7                                                                                |                                                                                     |
| Level of Service                  | D                                                                                 | D                                                                                 |                                                                                   | D                                                                                 | E                                                                                 | D                                                                                 | D                                                                                   | B                                                                                   |                                                                                     | D                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay (s)                |                                                                                   | 52.1                                                                              |                                                                                   |                                                                                   | 45.9                                                                              |                                                                                   |                                                                                     | 17.3                                                                                |                                                                                     |                                                                                     | 18.0                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                   |                                                                                   | 23.8                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                   |                                                                                   | 0.73                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 100.0                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 71.0%                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

Queues  
4: SE 192nd Ave & Mill Plain Blvd

Background 2032 Traffic Conditions  
PM Peak Hour Conditions



| Lane Group              | EBL  | EBT  | EBR   | WBL  | WBT  | NBL   | NBT  | SBL  | SBT  |
|-------------------------|------|------|-------|------|------|-------|------|------|------|
| Lane Group Flow (vph)   | 334  | 15   | 590   | 57   | 63   | 475   | 1053 | 19   | 1178 |
| v/c Ratio               | 0.65 | 0.06 | 1.22  | 0.22 | 0.31 | 1.14  | 0.68 | 0.20 | 1.09 |
| Control Delay           | 41.6 | 31.0 | 138.4 | 40.3 | 21.8 | 129.6 | 26.3 | 50.5 | 87.6 |
| Queue Delay             | 0.0  | 0.0  | 0.0   | 0.0  | 0.0  | 0.0   | 0.0  | 0.0  | 0.0  |
| Total Delay             | 41.6 | 31.0 | 138.4 | 40.3 | 21.8 | 129.6 | 26.3 | 50.5 | 87.6 |
| Queue Length 50th (ft)  | 179  | 9    | ~479  | 21   | 15   | ~183  | 251  | 12   | ~440 |
| Queue Length 95th (ft)  | #490 | 22   | #313  | 73   | 42   | #279  | 388  | 35   | #564 |
| Internal Link Dist (ft) |      | 628  |       |      | 391  |       | 457  |      | 709  |
| Turn Bay Length (ft)    | 240  |      | 130   |      |      | 205   |      | 150  |      |
| Base Capacity (vph)     | 516  | 517  | 485   | 296  | 479  | 416   | 1545 | 180  | 1083 |
| Starvation Cap Reductn  | 0    | 0    | 0     | 0    | 0    | 0     | 0    | 0    | 0    |
| Spillback Cap Reductn   | 0    | 0    | 0     | 0    | 0    | 0     | 0    | 0    | 0    |
| Storage Cap Reductn     | 0    | 0    | 0     | 0    | 0    | 0     | 0    | 0    | 0    |
| Reduced v/c Ratio       | 0.65 | 0.03 | 1.22  | 0.19 | 0.13 | 1.14  | 0.68 | 0.11 | 1.09 |

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.  
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.

# HCM Signalized Intersection Capacity Analysis

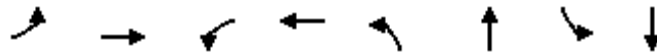
## 4: SE 192nd Ave & Mill Plain Blvd

Background 2032 Traffic Conditions  
PM Peak Hour Conditions

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |  |  |  |                                                                                   |  |  |                                                                                     |  |  |  |
| Traffic Volume (vph)              | 297                                                                               | 13                                                                                | 525                                                                               | 51                                                                                | 21                                                                                | 35                                                                                | 423                                                                                | 912                                                                                 | 25                                                                                  | 17                                                                                  | 851                                                                                 | 198                                                                                 |
| Future Volume (vph)               | 297                                                                               | 13                                                                                | 525                                                                               | 51                                                                                | 21                                                                                | 35                                                                                | 423                                                                                | 912                                                                                 | 25                                                                                  | 17                                                                                  | 851                                                                                 | 198                                                                                 |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                                | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Lane Util. Factor                 | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              |                                                                                   | 0.97                                                                               | 0.95                                                                                |                                                                                     | 1.00                                                                                | 0.95                                                                                |                                                                                     |
| Frpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              | 0.99                                                                              | 1.00                                                                              | 0.99                                                                              |                                                                                   | 1.00                                                                               | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Flpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                               | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Frt                               | 1.00                                                                              | 1.00                                                                              | 0.85                                                                              | 1.00                                                                              | 0.91                                                                              |                                                                                   | 1.00                                                                               | 1.00                                                                                |                                                                                     | 1.00                                                                                | 0.97                                                                                |                                                                                     |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                               | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (prot)                 | 1787                                                                              | 1900                                                                              | 1580                                                                              | 1805                                                                              | 1668                                                                              |                                                                                   | 3467                                                                               | 3523                                                                                |                                                                                     | 1805                                                                                | 3430                                                                                |                                                                                     |
| Flt Permitted                     | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                               | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (perm)                 | 1787                                                                              | 1900                                                                              | 1580                                                                              | 1805                                                                              | 1668                                                                              |                                                                                   | 3467                                                                               | 3523                                                                                |                                                                                     | 1805                                                                                | 3430                                                                                |                                                                                     |
| Peak-hour factor, PHF             | 0.89                                                                              | 0.89                                                                              | 0.89                                                                              | 0.89                                                                              | 0.89                                                                              | 0.89                                                                              | 0.89                                                                               | 0.89                                                                                | 0.89                                                                                | 0.89                                                                                | 0.89                                                                                | 0.89                                                                                |
| Adj. Flow (vph)                   | 334                                                                               | 15                                                                                | 590                                                                               | 57                                                                                | 24                                                                                | 39                                                                                | 475                                                                                | 1025                                                                                | 28                                                                                  | 19                                                                                  | 956                                                                                 | 222                                                                                 |
| RTOR Reduction (vph)              | 0                                                                                 | 0                                                                                 | 92                                                                                | 0                                                                                 | 35                                                                                | 0                                                                                 | 0                                                                                  | 2                                                                                   | 0                                                                                   | 0                                                                                   | 21                                                                                  | 0                                                                                   |
| Lane Group Flow (vph)             | 334                                                                               | 15                                                                                | 498                                                                               | 57                                                                                | 28                                                                                | 0                                                                                 | 475                                                                                | 1051                                                                                | 0                                                                                   | 19                                                                                  | 1157                                                                                | 0                                                                                   |
| Confl. Peds. (#/hr)               | 8                                                                                 |                                                                                   | 6                                                                                 | 6                                                                                 |                                                                                   | 8                                                                                 | 9                                                                                  |                                                                                     | 9                                                                                   | 9                                                                                   |                                                                                     | 9                                                                                   |
| Confl. Bikes (#/hr)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 1                                                                                 |                                                                                    |                                                                                     | 3                                                                                   |                                                                                     |                                                                                     | 1                                                                                   |
| Heavy Vehicles (%)                | 1%                                                                                | 0%                                                                                | 1%                                                                                | 0%                                                                                | 0%                                                                                | 3%                                                                                | 1%                                                                                 | 2%                                                                                  | 0%                                                                                  | 0%                                                                                  | 2%                                                                                  | 1%                                                                                  |
| Turn Type                         | Prot                                                                              | NA                                                                                | pm+ov                                                                             | Prot                                                                              | NA                                                                                |                                                                                   | Prot                                                                               | NA                                                                                  |                                                                                     | Prot                                                                                | NA                                                                                  |                                                                                     |
| Protected Phases                  | 5                                                                                 | 2                                                                                 | 7                                                                                 | 1                                                                                 | 6                                                                                 |                                                                                   | 7                                                                                  | 4                                                                                   |                                                                                     | 3                                                                                   | 8                                                                                   |                                                                                     |
| Permitted Phases                  |                                                                                   |                                                                                   | 2                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Green, G (s)             | 28.9                                                                              | 25.8                                                                              | 40.8                                                                              | 12.2                                                                              | 9.1                                                                               |                                                                                   | 15.0                                                                               | 39.8                                                                                |                                                                                     | 2.2                                                                                 | 27.0                                                                                |                                                                                     |
| Effective Green, g (s)            | 28.9                                                                              | 25.8                                                                              | 40.8                                                                              | 12.2                                                                              | 9.1                                                                               |                                                                                   | 15.0                                                                               | 39.8                                                                                |                                                                                     | 2.2                                                                                 | 27.0                                                                                |                                                                                     |
| Actuated g/C Ratio                | 0.29                                                                              | 0.26                                                                              | 0.41                                                                              | 0.12                                                                              | 0.09                                                                              |                                                                                   | 0.15                                                                               | 0.40                                                                                |                                                                                     | 0.02                                                                                | 0.27                                                                                |                                                                                     |
| Clearance Time (s)                | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                                | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Vehicle Extension (s)             | 1.5                                                                               | 1.5                                                                               | 0.5                                                                               | 2.0                                                                               | 2.0                                                                               |                                                                                   | 0.5                                                                                | 0.5                                                                                 |                                                                                     | 0.5                                                                                 | 0.5                                                                                 |                                                                                     |
| Lane Grp Cap (vph)                | 516                                                                               | 490                                                                               | 644                                                                               | 220                                                                               | 151                                                                               |                                                                                   | 520                                                                                | 1402                                                                                |                                                                                     | 39                                                                                  | 926                                                                                 |                                                                                     |
| v/s Ratio Prot                    | c0.19                                                                             | 0.01                                                                              | c0.12                                                                             | c0.03                                                                             | 0.02                                                                              |                                                                                   | c0.14                                                                              | 0.30                                                                                |                                                                                     | 0.01                                                                                | c0.34                                                                               |                                                                                     |
| v/s Ratio Perm                    |                                                                                   |                                                                                   | 0.20                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| v/c Ratio                         | 0.65                                                                              | 0.03                                                                              | 0.77                                                                              | 0.26                                                                              | 0.18                                                                              |                                                                                   | 0.91                                                                               | 0.75                                                                                |                                                                                     | 0.49                                                                                | 1.25                                                                                |                                                                                     |
| Uniform Delay, d1                 | 31.1                                                                              | 27.7                                                                              | 25.6                                                                              | 39.8                                                                              | 42.0                                                                              |                                                                                   | 41.9                                                                               | 25.8                                                                                |                                                                                     | 48.3                                                                                | 36.5                                                                                |                                                                                     |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                               | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Incremental Delay, d2             | 2.1                                                                               | 0.0                                                                               | 5.2                                                                               | 0.2                                                                               | 0.2                                                                               |                                                                                   | 20.2                                                                               | 3.7                                                                                 |                                                                                     | 3.5                                                                                 | 121.2                                                                               |                                                                                     |
| Delay (s)                         | 33.2                                                                              | 27.8                                                                              | 30.8                                                                              | 40.0                                                                              | 42.2                                                                              |                                                                                   | 62.0                                                                               | 29.6                                                                                |                                                                                     | 51.8                                                                                | 157.7                                                                               |                                                                                     |
| Level of Service                  | C                                                                                 | C                                                                                 | C                                                                                 | D                                                                                 | D                                                                                 |                                                                                   | E                                                                                  | C                                                                                   |                                                                                     | D                                                                                   | F                                                                                   |                                                                                     |
| Approach Delay (s)                |                                                                                   | 31.6                                                                              |                                                                                   |                                                                                   | 41.2                                                                              |                                                                                   |                                                                                    | 39.6                                                                                |                                                                                     |                                                                                     | 156.0                                                                               |                                                                                     |
| Approach LOS                      |                                                                                   | C                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                    | D                                                                                   |                                                                                     |                                                                                     | F                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                   |                                                                                   | 74.5                                                                              |                                                                                   |                                                                                   | HCM 2000 Level of Service                                                         |                                                                                    | E                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                   |                                                                                   | 0.88                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 100.0                                                                             |                                                                                   |                                                                                   | Sum of lost time (s)                                                              |                                                                                    | 20.0                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 79.8%                                                                             |                                                                                   |                                                                                   | ICU Level of Service                                                              |                                                                                    | D                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

Queues  
5: SE 192nd Ave & SE 20th St

Background 2032 Traffic Conditions  
PM Peak Hour Conditions



| Lane Group              | EBL  | EBT  | WBL  | WBT  | NBL  | NBT  | SBL   | SBT  |
|-------------------------|------|------|------|------|------|------|-------|------|
| Lane Group Flow (vph)   | 143  | 271  | 156  | 324  | 121  | 1354 | 182   | 1266 |
| v/c Ratio               | 0.49 | 0.79 | 0.40 | 0.83 | 0.66 | 1.05 | 0.76  | 0.90 |
| Control Delay           | 48.9 | 51.0 | 44.3 | 52.5 | 61.5 | 72.0 | 71.0  | 31.3 |
| Queue Delay             | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0  | 0.0   | 0.0  |
| Total Delay             | 48.9 | 51.0 | 44.3 | 52.5 | 61.5 | 72.0 | 71.0  | 31.3 |
| Queue Length 50th (ft)  | 45   | 151  | 47   | 181  | 74   | ~526 | 122   | 324  |
| Queue Length 95th (ft)  | 74   | 222  | 79   | 268  | #156 | #722 | m#213 | #598 |
| Internal Link Dist (ft) |      | 1997 |      | 3145 |      | 1320 |       | 1126 |
| Turn Bay Length (ft)    | 100  |      | 150  |      | 335  |      | 410   |      |
| Base Capacity (vph)     | 450  | 462  | 426  | 453  | 195  | 1289 | 250   | 1409 |
| Starvation Cap Reductn  | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0    |
| Spillback Cap Reductn   | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0    |
| Storage Cap Reductn     | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0    |
| Reduced v/c Ratio       | 0.32 | 0.59 | 0.37 | 0.72 | 0.62 | 1.05 | 0.73  | 0.90 |

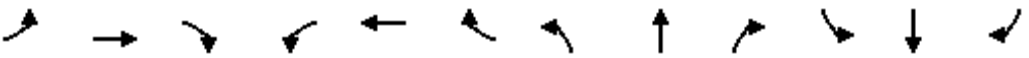
Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.  
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

# HCM Signalized Intersection Capacity Analysis

## 5: SE 192nd Ave & SE 20th St

Background 2032 Traffic Conditions  
PM Peak Hour Conditions

|                                   |  |       |       |      |       |                           |      |       |      |       |       |      |
|-----------------------------------|------------------------------------------------------------------------------------|-------|-------|------|-------|---------------------------|------|-------|------|-------|-------|------|
| Movement                          | EBL                                                                                | EBT   | EBR   | WBL  | WBT   | WBR                       | NBL  | NBT   | NBR  | SBL   | SBT   | SBR  |
| Lane Configurations               | 🚗🚗                                                                                 | 🚗     |       | 🚗🚗   | 🚗     |                           | 🚗    | 🚗🚗    |      | 🚗     | 🚗🚗    |      |
| Traffic Volume (vph)              | 137                                                                                | 169   | 91    | 150  | 193   | 118                       | 116  | 1105  | 195  | 175   | 1030  | 185  |
| Future Volume (vph)               | 137                                                                                | 169   | 91    | 150  | 193   | 118                       | 116  | 1105  | 195  | 175   | 1030  | 185  |
| Ideal Flow (vphpl)                | 1900                                                                               | 1900  | 1900  | 1900 | 1900  | 1900                      | 1900 | 1900  | 1900 | 1900  | 1900  | 1900 |
| Total Lost time (s)               | 5.0                                                                                | 5.0   |       | 5.0  | 5.0   |                           | 5.0  | 5.0   |      | 5.0   | 5.0   |      |
| Lane Util. Factor                 | 0.97                                                                               | 1.00  |       | 0.97 | 1.00  |                           | 1.00 | 0.95  |      | 1.00  | 0.95  |      |
| Frpb, ped/bikes                   | 1.00                                                                               | 0.99  |       | 1.00 | 0.99  |                           | 1.00 | 0.99  |      | 1.00  | 1.00  |      |
| Flpb, ped/bikes                   | 1.00                                                                               | 1.00  |       | 1.00 | 1.00  |                           | 1.00 | 1.00  |      | 1.00  | 1.00  |      |
| Frt                               | 1.00                                                                               | 0.95  |       | 1.00 | 0.94  |                           | 1.00 | 0.98  |      | 1.00  | 0.98  |      |
| Flt Protected                     | 0.95                                                                               | 1.00  |       | 0.95 | 1.00  |                           | 0.95 | 1.00  |      | 0.95  | 1.00  |      |
| Satd. Flow (prot)                 | 3467                                                                               | 1772  |       | 3502 | 1760  |                           | 1805 | 3417  |      | 1787  | 3440  |      |
| Flt Permitted                     | 0.95                                                                               | 1.00  |       | 0.95 | 1.00  |                           | 0.95 | 1.00  |      | 0.95  | 1.00  |      |
| Satd. Flow (perm)                 | 3467                                                                               | 1772  |       | 3502 | 1760  |                           | 1805 | 3417  |      | 1787  | 3440  |      |
| Peak-hour factor, PHF             | 0.96                                                                               | 0.96  | 0.96  | 0.96 | 0.96  | 0.96                      | 0.96 | 0.96  | 0.96 | 0.96  | 0.96  | 0.96 |
| Adj. Flow (vph)                   | 143                                                                                | 176   | 95    | 156  | 201   | 123                       | 121  | 1151  | 203  | 182   | 1073  | 193  |
| RTOR Reduction (vph)              | 0                                                                                  | 21    | 0     | 0    | 23    | 0                         | 0    | 13    | 0    | 0     | 13    | 0    |
| Lane Group Flow (vph)             | 143                                                                                | 250   | 0     | 156  | 301   | 0                         | 121  | 1341  | 0    | 182   | 1253  | 0    |
| Confl. Peds. (#/hr)               | 3                                                                                  |       | 1     | 1    |       | 3                         | 1    |       | 5    | 5     |       | 1    |
| Confl. Bikes (#/hr)               |                                                                                    |       | 1     |      |       | 4                         |      |       | 5    |       |       | 2    |
| Heavy Vehicles (%)                | 1%                                                                                 | 0%    | 3%    | 0%   | 1%    | 1%                        | 0%   | 3%    | 1%   | 1%    | 2%    | 3%   |
| Turn Type                         | Prot                                                                               | NA    |       | Prot | NA    |                           | Prot | NA    |      | Prot  | NA    |      |
| Protected Phases                  | 5                                                                                  | 2     |       | 1    | 6     |                           | 7    | 4     |      | 3     | 8     |      |
| Permitted Phases                  |                                                                                    |       |       |      |       |                           |      |       |      |       |       |      |
| Actuated Green, G (s)             | 8.5                                                                                | 18.2  |       | 11.1 | 20.8  |                           | 10.1 | 37.4  |      | 13.3  | 40.6  |      |
| Effective Green, g (s)            | 8.5                                                                                | 18.2  |       | 11.1 | 20.8  |                           | 10.1 | 37.4  |      | 13.3  | 40.6  |      |
| Actuated g/C Ratio                | 0.08                                                                               | 0.18  |       | 0.11 | 0.21  |                           | 0.10 | 0.37  |      | 0.13  | 0.41  |      |
| Clearance Time (s)                | 5.0                                                                                | 5.0   |       | 5.0  | 5.0   |                           | 5.0  | 5.0   |      | 5.0   | 5.0   |      |
| Vehicle Extension (s)             | 2.0                                                                                | 2.0   |       | 2.0  | 2.0   |                           | 2.0  | 2.0   |      | 2.0   | 2.0   |      |
| Lane Grp Cap (vph)                | 294                                                                                | 322   |       | 388  | 366   |                           | 182  | 1277  |      | 237   | 1396  |      |
| v/s Ratio Prot                    | 0.04                                                                               | c0.14 |       | 0.04 | c0.17 |                           | 0.07 | c0.39 |      | c0.10 | c0.36 |      |
| v/s Ratio Perm                    |                                                                                    |       |       |      |       |                           |      |       |      |       |       |      |
| v/c Ratio                         | 0.49                                                                               | 0.78  |       | 0.40 | 0.82  |                           | 0.66 | 1.05  |      | 0.77  | 0.90  |      |
| Uniform Delay, d1                 | 43.7                                                                               | 39.0  |       | 41.4 | 37.8  |                           | 43.3 | 31.3  |      | 41.9  | 27.8  |      |
| Progression Factor                | 1.00                                                                               | 1.00  |       | 1.00 | 1.00  |                           | 1.00 | 1.00  |      | 1.31  | 0.74  |      |
| Incremental Delay, d2             | 0.5                                                                                | 10.2  |       | 0.2  | 13.2  |                           | 6.9  | 39.6  |      | 9.9   | 6.1   |      |
| Delay (s)                         | 44.1                                                                               | 49.1  |       | 41.6 | 51.1  |                           | 50.2 | 70.9  |      | 64.7  | 26.8  |      |
| Level of Service                  | D                                                                                  | D     |       | D    | D     |                           | D    | E     |      | E     | C     |      |
| Approach Delay (s)                |                                                                                    | 47.4  |       |      | 48.0  |                           |      | 69.2  |      |       | 31.6  |      |
| Approach LOS                      |                                                                                    | D     |       |      | D     |                           |      | E     |      |       | C     |      |
| <b>Intersection Summary</b>       |                                                                                    |       |       |      |       |                           |      |       |      |       |       |      |
| HCM 2000 Control Delay            |                                                                                    |       | 49.9  |      |       | HCM 2000 Level of Service |      |       | D    |       |       |      |
| HCM 2000 Volume to Capacity ratio |                                                                                    |       | 0.94  |      |       |                           |      |       |      |       |       |      |
| Actuated Cycle Length (s)         |                                                                                    |       | 100.0 |      |       | Sum of lost time (s)      |      |       | 20.0 |       |       |      |
| Intersection Capacity Utilization |                                                                                    |       | 84.9% |      |       | ICU Level of Service      |      |       | E    |       |       |      |
| Analysis Period (min)             |                                                                                    |       | 15    |      |       |                           |      |       |      |       |       |      |
| c Critical Lane Group             |                                                                                    |       |       |      |       |                           |      |       |      |       |       |      |



| Intersection             |        |        |        |      |      |      |
|--------------------------|--------|--------|--------|------|------|------|
| Int Delay, s/veh         | 0      |        |        |      |      |      |
| Movement                 | EBL    | EBR    | NBL    | NBT  | SBT  | SBR  |
| Lane Configurations      |        | ↗      |        | ↑↑   | ↑↑   |      |
| Traffic Vol, veh/h       | 0      | 2      | 0      | 1423 | 1312 | 13   |
| Future Vol, veh/h        | 0      | 2      | 0      | 1423 | 1312 | 13   |
| Conflicting Peds, #/hr   | 0      | 0      | 0      | 0    | 0    | 0    |
| Sign Control             | Stop   | Stop   | Free   | Free | Free | Free |
| RT Channelized           | -      | None   | -      | None | -    | None |
| Storage Length           | -      | 0      | -      | -    | -    | -    |
| Veh in Median Storage, # | 0      | -      | -      | 0    | 0    | -    |
| Grade, %                 | 0      | -      | -      | 0    | 0    | -    |
| Peak Hour Factor         | 91     | 91     | 91     | 91   | 91   | 91   |
| Heavy Vehicles, %        | 0      | 0      | 0      | 2    | 1    | 0    |
| Mvmt Flow                | 0      | 2      | 0      | 1564 | 1442 | 14   |
| Major/Minor              | Minor2 | Major1 | Major2 |      |      |      |
| Conflicting Flow All     | -      | 728    | -      | 0    | -    | 0    |
| Stage 1                  | -      | -      | -      | -    | -    | -    |
| Stage 2                  | -      | -      | -      | -    | -    | -    |
| Critical Hdwy            | -      | 6.9    | -      | -    | -    | -    |
| Critical Hdwy Stg 1      | -      | -      | -      | -    | -    | -    |
| Critical Hdwy Stg 2      | -      | -      | -      | -    | -    | -    |
| Follow-up Hdwy           | -      | 3.3    | -      | -    | -    | -    |
| Pot Cap-1 Maneuver       | 0      | 370    | 0      | -    | -    | -    |
| Stage 1                  | 0      | -      | 0      | -    | -    | -    |
| Stage 2                  | 0      | -      | 0      | -    | -    | -    |
| Platoon blocked, %       |        |        |        | -    | -    | -    |
| Mov Cap-1 Maneuver       | -      | 370    | -      | -    | -    | -    |
| Mov Cap-2 Maneuver       | -      | -      | -      | -    | -    | -    |
| Stage 1                  | -      | -      | -      | -    | -    | -    |
| Stage 2                  | -      | -      | -      | -    | -    | -    |
| Approach                 | EB     | NB     | SB     |      |      |      |
| HCM Control Delay, s     | 14.8   | 0      | 0      |      |      |      |
| HCM LOS                  | B      |        |        |      |      |      |
| Minor Lane/Major Mvmt    | NBT    | EBLn1  | SBT    | SBR  |      |      |
| Capacity (veh/h)         | -      | 370    | -      | -    |      |      |
| HCM Lane V/C Ratio       | -      | 0.006  | -      | -    |      |      |
| HCM Control Delay (s)    | -      | 14.8   | -      | -    |      |      |
| HCM Lane LOS             | -      | B      | -      | -    |      |      |
| HCM 95th %tile Q(veh)    | -      | 0      | -      | -    |      |      |

| Intersection             |        |                                                                                   |                                                                                   |        |                                                                                   |      |
|--------------------------|--------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|--------|-----------------------------------------------------------------------------------|------|
| Int Delay, s/veh         | 0.6    |                                                                                   |                                                                                   |        |                                                                                   |      |
| Movement                 | EBL    | EBT                                                                               | WBT                                                                               | WBR    | SBL                                                                               | SBR  |
| Lane Configurations      |        |  |  |        |  |      |
| Traffic Vol, veh/h       | 14     | 274                                                                               | 279                                                                               | 11     | 12                                                                                | 9    |
| Future Vol, veh/h        | 14     | 274                                                                               | 279                                                                               | 11     | 12                                                                                | 9    |
| Conflicting Peds, #/hr   | 0      | 0                                                                                 | 0                                                                                 | 0      | 0                                                                                 | 0    |
| Sign Control             | Free   | Free                                                                              | Free                                                                              | Free   | Stop                                                                              | Stop |
| RT Channelized           | -      | None                                                                              | -                                                                                 | None   | -                                                                                 | None |
| Storage Length           | -      | -                                                                                 | -                                                                                 | -      | 0                                                                                 | -    |
| Veh in Median Storage, # | -      | 0                                                                                 | 0                                                                                 | -      | 0                                                                                 | -    |
| Grade, %                 | -      | 0                                                                                 | 0                                                                                 | -      | 0                                                                                 | -    |
| Peak Hour Factor         | 91     | 91                                                                                | 91                                                                                | 91     | 91                                                                                | 91   |
| Heavy Vehicles, %        | 0      | 1                                                                                 | 1                                                                                 | 0      | 0                                                                                 | 0    |
| Mvmt Flow                | 15     | 301                                                                               | 307                                                                               | 12     | 13                                                                                | 10   |
| Major/Minor              | Major1 | Major2                                                                            |                                                                                   | Minor2 |                                                                                   |      |
| Conflicting Flow All     | 319    | 0                                                                                 | -                                                                                 | 0      | 644                                                                               | 313  |
| Stage 1                  | -      | -                                                                                 | -                                                                                 | -      | 313                                                                               | -    |
| Stage 2                  | -      | -                                                                                 | -                                                                                 | -      | 331                                                                               | -    |
| Critical Hdwy            | 4.1    | -                                                                                 | -                                                                                 | -      | 6.4                                                                               | 6.2  |
| Critical Hdwy Stg 1      | -      | -                                                                                 | -                                                                                 | -      | 5.4                                                                               | -    |
| Critical Hdwy Stg 2      | -      | -                                                                                 | -                                                                                 | -      | 5.4                                                                               | -    |
| Follow-up Hdwy           | 2.2    | -                                                                                 | -                                                                                 | -      | 3.5                                                                               | 3.3  |
| Pot Cap-1 Maneuver       | 1252   | -                                                                                 | -                                                                                 | -      | 440                                                                               | 732  |
| Stage 1                  | -      | -                                                                                 | -                                                                                 | -      | 746                                                                               | -    |
| Stage 2                  | -      | -                                                                                 | -                                                                                 | -      | 732                                                                               | -    |
| Platoon blocked, %       |        | -                                                                                 | -                                                                                 | -      |                                                                                   |      |
| Mov Cap-1 Maneuver       | 1252   | -                                                                                 | -                                                                                 | -      | 434                                                                               | 732  |
| Mov Cap-2 Maneuver       | -      | -                                                                                 | -                                                                                 | -      | 434                                                                               | -    |
| Stage 1                  | -      | -                                                                                 | -                                                                                 | -      | 736                                                                               | -    |
| Stage 2                  | -      | -                                                                                 | -                                                                                 | -      | 732                                                                               | -    |
| Approach                 | EB     | WB                                                                                |                                                                                   | SB     |                                                                                   |      |
| HCM Control Delay, s     | 0.4    | 0                                                                                 |                                                                                   | 12.2   |                                                                                   |      |
| HCM LOS                  |        |                                                                                   |                                                                                   | B      |                                                                                   |      |
| Minor Lane/Major Mvmt    | EBL    | EBT                                                                               | WBT                                                                               | WBR    | SBLn1                                                                             |      |
| Capacity (veh/h)         | 1252   | -                                                                                 | -                                                                                 | -      | 526                                                                               |      |
| HCM Lane V/C Ratio       | 0.012  | -                                                                                 | -                                                                                 | -      | 0.044                                                                             |      |
| HCM Control Delay (s)    | 7.9    | 0                                                                                 | -                                                                                 | -      | 12.2                                                                              |      |
| HCM Lane LOS             | A      | A                                                                                 | -                                                                                 | -      | B                                                                                 |      |
| HCM 95th %tile Q(veh)    | 0      | -                                                                                 | -                                                                                 | -      | 0.1                                                                               |      |

## Appendix H Total Operations (Proposed Zoning) Worksheets

## Queues

1: SE 164th Ave &amp; SE 15th St

## Total 2032 Traffic Conditions

AM Peak Hour Conditions

|                         |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                               | NBT                                                                                | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Group Flow (vph)   | 17                                                                                | 79                                                                                | 60                                                                                | 55                                                                                | 88                                                                                | 66                                                                                | 1176                                                                               | 81                                                                                  | 79                                                                                  | 1088                                                                                | 19                                                                                  |
| v/c Ratio               | 0.03                                                                              | 0.11                                                                              | 0.09                                                                              | 0.06                                                                              | 0.11                                                                              | 0.46                                                                              | 0.76                                                                               | 0.14                                                                                | 0.51                                                                                | 0.69                                                                                | 0.03                                                                                |
| Control Delay           | 20.1                                                                              | 14.5                                                                              | 19.7                                                                              | 25.0                                                                              | 5.0                                                                               | 61.7                                                                              | 40.8                                                                               | 3.7                                                                                 | 62.6                                                                                | 38.0                                                                                | 0.1                                                                                 |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 20.1                                                                              | 14.5                                                                              | 19.7                                                                              | 25.0                                                                              | 5.0                                                                               | 61.7                                                                              | 40.8                                                                               | 3.7                                                                                 | 62.6                                                                                | 38.0                                                                                | 0.1                                                                                 |
| Queue Length 50th (ft)  | 7                                                                                 | 15                                                                                | 24                                                                                | 22                                                                                | 0                                                                                 | 50                                                                                | 300                                                                                | 0                                                                                   | 59                                                                                  | 268                                                                                 | 0                                                                                   |
| Queue Length 95th (ft)  | 23                                                                                | 58                                                                                | 58                                                                                | 64                                                                                | 32                                                                                | 94                                                                                | 323                                                                                | 23                                                                                  | 107                                                                                 | 289                                                                                 | 0                                                                                   |
| Internal Link Dist (ft) |                                                                                   | 600                                                                               |                                                                                   | 638                                                                               |                                                                                   |                                                                                   | 842                                                                                |                                                                                     |                                                                                     | 586                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 100                                                                               |                                                                                   | 250                                                                               |                                                                                   | 325                                                                               | 150                                                                               |                                                                                    | 150                                                                                 | 230                                                                                 |                                                                                     | 230                                                                                 |
| Base Capacity (vph)     | 708                                                                               | 734                                                                               | 653                                                                               | 880                                                                               | 770                                                                               | 168                                                                               | 2014                                                                               | 706                                                                                 | 172                                                                                 | 2014                                                                                | 687                                                                                 |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.02                                                                              | 0.11                                                                              | 0.09                                                                              | 0.06                                                                              | 0.11                                                                              | 0.39                                                                              | 0.58                                                                               | 0.11                                                                                | 0.46                                                                                | 0.54                                                                                | 0.03                                                                                |
| Intersection Summary    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

# HCM Signalized Intersection Capacity Analysis

1: SE 164th Ave & SE 15th St

Total 2032 Traffic Conditions

AM Peak Hour Conditions

|                                   |  |                                                                                   |       |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|-----------------------------------|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                                | EBT                                                                               | EBR   | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |   |  |       |  |  |  |  |  |  |  |  |  |
| Traffic Volume (vph)              | 16                                                                                 | 29                                                                                | 45    | 56                                                                                | 52                                                                                | 83                                                                                | 62                                                                                  | 1105                                                                                | 76                                                                                  | 74                                                                                  | 1023                                                                                | 18                                                                                  |
| Future Volume (vph)               | 16                                                                                 | 29                                                                                | 45    | 56                                                                                | 52                                                                                | 83                                                                                | 62                                                                                  | 1105                                                                                | 76                                                                                  | 74                                                                                  | 1023                                                                                | 18                                                                                  |
| Ideal Flow (vphpl)                | 1900                                                                               | 1900                                                                              | 1900  | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 4.5                                                                                | 5.0                                                                               |       | 4.5                                                                               | 5.0                                                                               | 5.0                                                                               | 4.5                                                                                 | 5.0                                                                                 | 5.0                                                                                 | 4.5                                                                                 | 5.0                                                                                 | 5.0                                                                                 |
| Lane Util. Factor                 | 1.00                                                                               | 1.00                                                                              |       | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 0.91                                                                                | 1.00                                                                                | 1.00                                                                                | 0.91                                                                                | 1.00                                                                                |
| Frpb, ped/bikes                   | 1.00                                                                               | 1.00                                                                              |       | 1.00                                                                              | 1.00                                                                              | 0.99                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Flpb, ped/bikes                   | 1.00                                                                               | 1.00                                                                              |       | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Frt                               | 1.00                                                                               | 0.91                                                                              |       | 1.00                                                                              | 1.00                                                                              | 0.85                                                                              | 1.00                                                                                | 1.00                                                                                | 0.85                                                                                | 1.00                                                                                | 1.00                                                                                | 0.85                                                                                |
| Flt Protected                     | 0.95                                                                               | 1.00                                                                              |       | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                |
| Satd. Flow (prot)                 | 1802                                                                               | 1696                                                                              |       | 1752                                                                              | 1900                                                                              | 1546                                                                              | 1805                                                                                | 5036                                                                                | 1615                                                                                | 1752                                                                                | 5036                                                                                | 1568                                                                                |
| Flt Permitted                     | 0.72                                                                               | 1.00                                                                              |       | 0.65                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                |
| Satd. Flow (perm)                 | 1368                                                                               | 1696                                                                              |       | 1204                                                                              | 1900                                                                              | 1546                                                                              | 1805                                                                                | 5036                                                                                | 1615                                                                                | 1752                                                                                | 5036                                                                                | 1568                                                                                |
| Peak-hour factor, PHF             | 0.94                                                                               | 0.94                                                                              | 0.94  | 0.94                                                                              | 0.94                                                                              | 0.94                                                                              | 0.94                                                                                | 0.94                                                                                | 0.94                                                                                | 0.94                                                                                | 0.94                                                                                | 0.94                                                                                |
| Adj. Flow (vph)                   | 17                                                                                 | 31                                                                                | 48    | 60                                                                                | 55                                                                                | 88                                                                                | 66                                                                                  | 1176                                                                                | 81                                                                                  | 79                                                                                  | 1088                                                                                | 19                                                                                  |
| RTOR Reduction (vph)              | 0                                                                                  | 29                                                                                | 0     | 0                                                                                 | 0                                                                                 | 50                                                                                | 0                                                                                   | 0                                                                                   | 56                                                                                  | 0                                                                                   | 0                                                                                   | 13                                                                                  |
| Lane Group Flow (vph)             | 17                                                                                 | 50                                                                                | 0     | 60                                                                                | 55                                                                                | 38                                                                                | 66                                                                                  | 1176                                                                                | 25                                                                                  | 79                                                                                  | 1088                                                                                | 6                                                                                   |
| Confl. Peds. (#/hr)               | 1                                                                                  |                                                                                   |       |                                                                                   |                                                                                   | 1                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Heavy Vehicles (%)                | 0%                                                                                 | 0%                                                                                | 3%    | 3%                                                                                | 0%                                                                                | 3%                                                                                | 0%                                                                                  | 3%                                                                                  | 0%                                                                                  | 3%                                                                                  | 3%                                                                                  | 3%                                                                                  |
| Turn Type                         | pm+pt                                                                              | NA                                                                                |       | pm+pt                                                                             | NA                                                                                | Perm                                                                              | Prot                                                                                | NA                                                                                  | Perm                                                                                | Prot                                                                                | NA                                                                                  | Perm                                                                                |
| Protected Phases                  | 5                                                                                  | 2                                                                                 |       | 1                                                                                 | 6                                                                                 |                                                                                   | 7                                                                                   | 4                                                                                   |                                                                                     | 3                                                                                   | 8                                                                                   |                                                                                     |
| Permitted Phases                  | 2                                                                                  |                                                                                   |       | 6                                                                                 |                                                                                   | 6                                                                                 |                                                                                     |                                                                                     | 4                                                                                   |                                                                                     |                                                                                     | 8                                                                                   |
| Actuated Green, G (s)             | 50.9                                                                               | 48.1                                                                              |       | 58.7                                                                              | 52.0                                                                              | 52.0                                                                              | 8.5                                                                                 | 36.8                                                                                | 36.8                                                                                | 9.4                                                                                 | 37.7                                                                                | 37.7                                                                                |
| Effective Green, g (s)            | 50.9                                                                               | 48.1                                                                              |       | 58.7                                                                              | 52.0                                                                              | 52.0                                                                              | 8.5                                                                                 | 36.8                                                                                | 36.8                                                                                | 9.4                                                                                 | 37.7                                                                                | 37.7                                                                                |
| Actuated g/C Ratio                | 0.42                                                                               | 0.40                                                                              |       | 0.49                                                                              | 0.43                                                                              | 0.43                                                                              | 0.07                                                                                | 0.31                                                                                | 0.31                                                                                | 0.08                                                                                | 0.31                                                                                | 0.31                                                                                |
| Clearance Time (s)                | 4.5                                                                                | 5.0                                                                               |       | 4.5                                                                               | 5.0                                                                               | 5.0                                                                               | 4.5                                                                                 | 5.0                                                                                 | 5.0                                                                                 | 4.5                                                                                 | 5.0                                                                                 | 5.0                                                                                 |
| Vehicle Extension (s)             | 3.0                                                                                | 2.0                                                                               |       | 3.0                                                                               | 2.0                                                                               | 2.0                                                                               | 3.0                                                                                 | 2.0                                                                                 | 2.0                                                                                 | 3.0                                                                                 | 2.0                                                                                 | 2.0                                                                                 |
| Lane Grp Cap (vph)                | 590                                                                                | 679                                                                               |       | 619                                                                               | 823                                                                               | 669                                                                               | 127                                                                                 | 1544                                                                                | 495                                                                                 | 137                                                                                 | 1582                                                                                | 492                                                                                 |
| v/s Ratio Prot                    | 0.00                                                                               | 0.03                                                                              |       | c0.01                                                                             | 0.03                                                                              |                                                                                   | 0.04                                                                                | c0.23                                                                               |                                                                                     | c0.05                                                                               | 0.22                                                                                |                                                                                     |
| v/s Ratio Perm                    | 0.01                                                                               |                                                                                   |       | c0.04                                                                             |                                                                                   | 0.02                                                                              |                                                                                     |                                                                                     | 0.02                                                                                |                                                                                     |                                                                                     | 0.00                                                                                |
| v/c Ratio                         | 0.03                                                                               | 0.07                                                                              |       | 0.10                                                                              | 0.07                                                                              | 0.06                                                                              | 0.52                                                                                | 0.76                                                                                | 0.05                                                                                | 0.58                                                                                | 0.69                                                                                | 0.01                                                                                |
| Uniform Delay, d1                 | 20.1                                                                               | 22.2                                                                              |       | 16.3                                                                              | 19.8                                                                              | 19.8                                                                              | 53.8                                                                                | 37.6                                                                                | 29.3                                                                                | 53.4                                                                                | 36.0                                                                                | 28.3                                                                                |
| Progression Factor                | 1.00                                                                               | 1.00                                                                              |       | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Incremental Delay, d2             | 0.0                                                                                | 0.2                                                                               |       | 0.1                                                                               | 0.0                                                                               | 0.0                                                                               | 3.6                                                                                 | 2.0                                                                                 | 0.0                                                                                 | 5.8                                                                                 | 1.0                                                                                 | 0.0                                                                                 |
| Delay (s)                         | 20.1                                                                               | 22.4                                                                              |       | 16.3                                                                              | 19.9                                                                              | 19.8                                                                              | 57.3                                                                                | 39.7                                                                                | 29.3                                                                                | 59.1                                                                                | 37.0                                                                                | 28.3                                                                                |
| Level of Service                  | C                                                                                  | C                                                                                 |       | B                                                                                 | B                                                                                 | B                                                                                 | E                                                                                   | D                                                                                   | C                                                                                   | E                                                                                   | D                                                                                   | C                                                                                   |
| Approach Delay (s)                |                                                                                    | 22.0                                                                              |       |                                                                                   | 18.8                                                                              |                                                                                   |                                                                                     | 39.9                                                                                |                                                                                     |                                                                                     | 38.3                                                                                |                                                                                     |
| Approach LOS                      |                                                                                    | C                                                                                 |       |                                                                                   | B                                                                                 |                                                                                   |                                                                                     | D                                                                                   |                                                                                     |                                                                                     | D                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                    |                                                                                   |       |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                    |                                                                                   | 37.1  |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                    |                                                                                   | 0.39  |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                    |                                                                                   | 120.0 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                    |                                                                                   | 50.2% |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                    |                                                                                   | 15    |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                    |                                                                                   |       |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |



HCM 6th TWSC  
2: SE 189th Ave & SE 15th St

Total 2032 Traffic Conditions  
AM Peak Hour Conditions

| Intersection             |                                                                                   |      |        |                                                                                   |                                                                                   |      |
|--------------------------|-----------------------------------------------------------------------------------|------|--------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|
| Int Delay, s/veh         | 1                                                                                 |      |        |                                                                                   |                                                                                   |      |
| Movement                 | EBT                                                                               | EBR  | WBL    | WBT                                                                               | NBL                                                                               | NBR  |
| Lane Configurations      |  |      |        |  |  |      |
| Traffic Vol, veh/h       | 211                                                                               | 10   | 8      | 204                                                                               | 16                                                                                | 21   |
| Future Vol, veh/h        | 211                                                                               | 10   | 8      | 204                                                                               | 16                                                                                | 21   |
| Conflicting Peds, #/hr   | 0                                                                                 | 3    | 3      | 0                                                                                 | 3                                                                                 | 0    |
| Sign Control             | Free                                                                              | Free | Free   | Free                                                                              | Stop                                                                              | Stop |
| RT Channelized           | -                                                                                 | None | -      | None                                                                              | -                                                                                 | None |
| Storage Length           | -                                                                                 | -    | -      | -                                                                                 | 0                                                                                 | -    |
| Veh in Median Storage, # | 0                                                                                 | -    | -      | 0                                                                                 | 0                                                                                 | -    |
| Grade, %                 | 0                                                                                 | -    | -      | 0                                                                                 | 0                                                                                 | -    |
| Peak Hour Factor         | 77                                                                                | 77   | 77     | 77                                                                                | 77                                                                                | 77   |
| Heavy Vehicles, %        | 3                                                                                 | 3    | 3      | 3                                                                                 | 0                                                                                 | 0    |
| Mvmt Flow                | 274                                                                               | 13   | 10     | 265                                                                               | 21                                                                                | 27   |
|                          |                                                                                   |      |        |                                                                                   |                                                                                   |      |
| Major/Minor              | Major1                                                                            |      | Major2 |                                                                                   | Minor1                                                                            |      |
| Conflicting Flow All     | 0                                                                                 | 0    | 290    | 0                                                                                 | 572                                                                               | 284  |
| Stage 1                  | -                                                                                 | -    | -      | -                                                                                 | 284                                                                               | -    |
| Stage 2                  | -                                                                                 | -    | -      | -                                                                                 | 288                                                                               | -    |
| Critical Hdwy            | -                                                                                 | -    | 4.13   | -                                                                                 | 6.4                                                                               | 6.2  |
| Critical Hdwy Stg 1      | -                                                                                 | -    | -      | -                                                                                 | 5.4                                                                               | -    |
| Critical Hdwy Stg 2      | -                                                                                 | -    | -      | -                                                                                 | 5.4                                                                               | -    |
| Follow-up Hdwy           | -                                                                                 | -    | 2.227  | -                                                                                 | 3.5                                                                               | 3.3  |
| Pot Cap-1 Maneuver       | -                                                                                 | -    | 1266   | -                                                                                 | 485                                                                               | 760  |
| Stage 1                  | -                                                                                 | -    | -      | -                                                                                 | 769                                                                               | -    |
| Stage 2                  | -                                                                                 | -    | -      | -                                                                                 | 766                                                                               | -    |
| Platoon blocked, %       | -                                                                                 | -    |        | -                                                                                 |                                                                                   |      |
| Mov Cap-1 Maneuver       | -                                                                                 | -    | 1262   | -                                                                                 | 478                                                                               | 758  |
| Mov Cap-2 Maneuver       | -                                                                                 | -    | -      | -                                                                                 | 478                                                                               | -    |
| Stage 1                  | -                                                                                 | -    | -      | -                                                                                 | 767                                                                               | -    |
| Stage 2                  | -                                                                                 | -    | -      | -                                                                                 | 757                                                                               | -    |
|                          |                                                                                   |      |        |                                                                                   |                                                                                   |      |
| Approach                 | EB                                                                                |      | WB     |                                                                                   | NB                                                                                |      |
| HCM Control Delay, s     | 0                                                                                 |      | 0.3    |                                                                                   | 11.5                                                                              |      |
| HCM LOS                  | B                                                                                 |      |        |                                                                                   |                                                                                   |      |
|                          |                                                                                   |      |        |                                                                                   |                                                                                   |      |
| Minor Lane/Major Mvmt    | NBLn1                                                                             | EBT  | EBR    | WBL                                                                               | WBT                                                                               |      |
| Capacity (veh/h)         | 605                                                                               | -    | -      | 1262                                                                              | -                                                                                 |      |
| HCM Lane V/C Ratio       | 0.079                                                                             | -    | -      | 0.008                                                                             | -                                                                                 |      |
| HCM Control Delay (s)    | 11.5                                                                              | -    | -      | 7.9                                                                               | 0                                                                                 |      |
| HCM Lane LOS             | B                                                                                 | -    | -      | A                                                                                 | A                                                                                 |      |
| HCM 95th %tile Q(veh)    | 0.3                                                                               | -    | -      | 0                                                                                 | -                                                                                 |      |

Queues  
3: SE 192nd Ave & SE 15th St

Total 2032 Traffic Conditions  
AM Peak Hour Conditions

|                         |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                               | NBT                                                                                | SBL                                                                                 | SBT                                                                                 |
| Lane Group Flow (vph)   | 168                                                                               | 125                                                                               | 27                                                                                | 61                                                                                | 55                                                                                | 55                                                                                | 958                                                                                | 28                                                                                  | 853                                                                                 |
| v/c Ratio               | 0.74                                                                              | 0.34                                                                              | 0.27                                                                              | 0.42                                                                              | 0.18                                                                              | 0.40                                                                              | 0.48                                                                               | 0.28                                                                                | 0.44                                                                                |
| Control Delay           | 60.3                                                                              | 16.8                                                                              | 51.6                                                                              | 51.3                                                                              | 1.3                                                                               | 43.8                                                                              | 14.6                                                                               | 52.2                                                                                | 17.2                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 60.3                                                                              | 16.8                                                                              | 51.6                                                                              | 51.3                                                                              | 1.3                                                                               | 43.8                                                                              | 14.6                                                                               | 52.2                                                                                | 17.2                                                                                |
| Queue Length 50th (ft)  | 105                                                                               | 26                                                                                | 17                                                                                | 38                                                                                | 0                                                                                 | 27                                                                                | 172                                                                                | 18                                                                                  | 170                                                                                 |
| Queue Length 95th (ft)  | 164                                                                               | 68                                                                                | 44                                                                                | 74                                                                                | 0                                                                                 | m43                                                                               | 139                                                                                | 45                                                                                  | 298                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 318                                                                               |                                                                                   | 1016                                                                              |                                                                                   |                                                                                   | 1126                                                                               |                                                                                     | 227                                                                                 |
| Turn Bay Length (ft)    | 115                                                                               |                                                                                   | 110                                                                               |                                                                                   | 110                                                                               | 150                                                                               |                                                                                    | 475                                                                                 |                                                                                     |
| Base Capacity (vph)     | 350                                                                               | 466                                                                               | 100                                                                               | 171                                                                               | 318                                                                               | 151                                                                               | 2050                                                                               | 109                                                                                 | 1965                                                                                |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.48                                                                              | 0.27                                                                              | 0.27                                                                              | 0.36                                                                              | 0.17                                                                              | 0.36                                                                              | 0.47                                                                               | 0.26                                                                                | 0.43                                                                                |

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

# HCM Signalized Intersection Capacity Analysis

## 3: SE 192nd Ave & SE 15th St

Total 2032 Traffic Conditions  
AM Peak Hour Conditions

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Traffic Volume (vph)              | 155                                                                               | 42                                                                                | 73                                                                                | 25                                                                                | 56                                                                                | 51                                                                                | 51                                                                                 | 856                                                                                 | 26                                                                                  | 26                                                                                  | 711                                                                                 | 74                                                                                  |
| Future Volume (vph)               | 155                                                                               | 42                                                                                | 73                                                                                | 25                                                                                | 56                                                                                | 51                                                                                | 51                                                                                 | 856                                                                                 | 26                                                                                  | 26                                                                                  | 711                                                                                 | 74                                                                                  |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                                | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Lane Util. Factor                 | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                               | 0.95                                                                                |                                                                                     | 1.00                                                                                | 0.95                                                                                |                                                                                     |
| Frpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 0.99                                                                              | 1.00                                                                               | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Flpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                               | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Frt                               | 1.00                                                                              | 0.91                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 0.85                                                                              | 1.00                                                                               | 1.00                                                                                |                                                                                     | 1.00                                                                                | 0.99                                                                                |                                                                                     |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                               | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (prot)                 | 1752                                                                              | 1720                                                                              |                                                                                   | 1805                                                                              | 1845                                                                              | 1556                                                                              | 1805                                                                               | 3490                                                                                |                                                                                     | 1752                                                                                | 3449                                                                                |                                                                                     |
| Flt Permitted                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                               | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (perm)                 | 1752                                                                              | 1720                                                                              |                                                                                   | 1805                                                                              | 1845                                                                              | 1556                                                                              | 1805                                                                               | 3490                                                                                |                                                                                     | 1752                                                                                | 3449                                                                                |                                                                                     |
| Peak-hour factor, PHF             | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                              | 0.92                                                                               | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                | 0.92                                                                                |
| Adj. Flow (vph)                   | 168                                                                               | 46                                                                                | 79                                                                                | 27                                                                                | 61                                                                                | 55                                                                                | 55                                                                                 | 930                                                                                 | 28                                                                                  | 28                                                                                  | 773                                                                                 | 80                                                                                  |
| RTOR Reduction (vph)              | 0                                                                                 | 65                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 49                                                                                | 0                                                                                  | 2                                                                                   | 0                                                                                   | 0                                                                                   | 7                                                                                   | 0                                                                                   |
| Lane Group Flow (vph)             | 168                                                                               | 60                                                                                | 0                                                                                 | 27                                                                                | 61                                                                                | 6                                                                                 | 55                                                                                 | 956                                                                                 | 0                                                                                   | 28                                                                                  | 846                                                                                 | 0                                                                                   |
| Confl. Peds. (#/hr)               | 1                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 1                                                                                 |                                                                                    |                                                                                     | 3                                                                                   | 3                                                                                   |                                                                                     |                                                                                     |
| Confl. Bikes (#/hr)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     | 1                                                                                   |                                                                                     |                                                                                     | 1                                                                                   |
| Heavy Vehicles (%)                | 3%                                                                                | 0%                                                                                | 0%                                                                                | 0%                                                                                | 3%                                                                                | 3%                                                                                | 0%                                                                                 | 3%                                                                                  | 0%                                                                                  | 3%                                                                                  | 3%                                                                                  | 3%                                                                                  |
| Turn Type                         | Prot                                                                              | NA                                                                                |                                                                                   | Prot                                                                              | NA                                                                                | pm+ov                                                                             | Prot                                                                               | NA                                                                                  |                                                                                     | Prot                                                                                | NA                                                                                  |                                                                                     |
| Protected Phases                  | 5                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 6                                                                                 | 3                                                                                 | 7                                                                                  | 4                                                                                   |                                                                                     | 3                                                                                   | 8                                                                                   |                                                                                     |
| Permitted Phases                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 6                                                                                 |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Green, G (s)             | 14.0                                                                              | 17.3                                                                              |                                                                                   | 3.6                                                                               | 6.9                                                                               | 11.6                                                                              | 6.6                                                                                | 54.4                                                                                |                                                                                     | 4.7                                                                                 | 52.5                                                                                |                                                                                     |
| Effective Green, g (s)            | 14.0                                                                              | 17.3                                                                              |                                                                                   | 3.6                                                                               | 6.9                                                                               | 11.6                                                                              | 6.6                                                                                | 54.4                                                                                |                                                                                     | 4.7                                                                                 | 52.5                                                                                |                                                                                     |
| Actuated g/C Ratio                | 0.14                                                                              | 0.17                                                                              |                                                                                   | 0.04                                                                              | 0.07                                                                              | 0.12                                                                              | 0.07                                                                               | 0.54                                                                                |                                                                                     | 0.05                                                                                | 0.52                                                                                |                                                                                     |
| Clearance Time (s)                | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                                | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Vehicle Extension (s)             | 1.0                                                                               | 1.0                                                                               |                                                                                   | 1.0                                                                               | 1.0                                                                               | 1.0                                                                               | 1.0                                                                                | 1.0                                                                                 |                                                                                     | 1.0                                                                                 | 1.0                                                                                 |                                                                                     |
| Lane Grp Cap (vph)                | 245                                                                               | 297                                                                               |                                                                                   | 64                                                                                | 127                                                                               | 180                                                                               | 119                                                                                | 1898                                                                                |                                                                                     | 82                                                                                  | 1810                                                                                |                                                                                     |
| v/s Ratio Prot                    | c0.10                                                                             | c0.03                                                                             |                                                                                   | 0.01                                                                              | c0.03                                                                             | 0.00                                                                              | 0.03                                                                               | c0.27                                                                               |                                                                                     | 0.02                                                                                | c0.25                                                                               |                                                                                     |
| v/s Ratio Perm                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 0.00                                                                              |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| v/c Ratio                         | 0.69                                                                              | 0.20                                                                              |                                                                                   | 0.42                                                                              | 0.48                                                                              | 0.04                                                                              | 0.46                                                                               | 0.50                                                                                |                                                                                     | 0.34                                                                                | 0.47                                                                                |                                                                                     |
| Uniform Delay, d1                 | 40.9                                                                              | 35.4                                                                              |                                                                                   | 47.2                                                                              | 44.8                                                                              | 39.2                                                                              | 45.0                                                                               | 14.3                                                                                |                                                                                     | 46.2                                                                                | 15.0                                                                                |                                                                                     |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 0.86                                                                               | 0.89                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Incremental Delay, d2             | 6.2                                                                               | 0.1                                                                               |                                                                                   | 1.6                                                                               | 1.0                                                                               | 0.0                                                                               | 0.8                                                                                | 0.7                                                                                 |                                                                                     | 0.9                                                                                 | 0.1                                                                                 |                                                                                     |
| Delay (s)                         | 47.1                                                                              | 35.5                                                                              |                                                                                   | 48.8                                                                              | 45.9                                                                              | 39.3                                                                              | 39.3                                                                               | 13.5                                                                                |                                                                                     | 47.1                                                                                | 15.0                                                                                |                                                                                     |
| Level of Service                  | D                                                                                 | D                                                                                 |                                                                                   | D                                                                                 | D                                                                                 | D                                                                                 | D                                                                                  | B                                                                                   |                                                                                     | D                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay (s)                |                                                                                   | 42.2                                                                              |                                                                                   |                                                                                   | 43.9                                                                              |                                                                                   |                                                                                    | 14.9                                                                                |                                                                                     |                                                                                     | 16.0                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                    | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                   |                                                                                   | 20.5                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                   |                                                                                   | 0.54                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 100.0                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 56.4%                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

Queues  
4: SE 192nd Ave & Mill Plain Blvd

Total 2032 Traffic Conditions  
AM Peak Hour Conditions

|                         |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | NBL                                                                               | NBT                                                                                | SBL                                                                                 | SBT                                                                                 |
| Lane Group Flow (vph)   | 143                                                                               | 118                                                                               | 216                                                                               | 166                                                                               | 234                                                                               | 534                                                                               | 944                                                                                | 103                                                                                 | 826                                                                                 |
| v/c Ratio               | 0.71                                                                              | 0.39                                                                              | 0.36                                                                              | 0.79                                                                              | 0.73                                                                              | 0.94                                                                              | 0.64                                                                               | 0.71                                                                                | 0.68                                                                                |
| Control Delay           | 62.0                                                                              | 38.8                                                                              | 7.0                                                                               | 69.6                                                                              | 44.9                                                                              | 69.0                                                                              | 26.1                                                                               | 69.6                                                                                | 30.8                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 62.0                                                                              | 38.8                                                                              | 7.0                                                                               | 69.6                                                                              | 44.9                                                                              | 69.0                                                                              | 26.1                                                                               | 69.6                                                                                | 30.8                                                                                |
| Queue Length 50th (ft)  | 89                                                                                | 69                                                                                | 25                                                                                | 103                                                                               | 120                                                                               | 176                                                                               | 230                                                                                | 65                                                                                  | 220                                                                                 |
| Queue Length 95th (ft)  | 121                                                                               | 84                                                                                | 32                                                                                | 139                                                                               | 135                                                                               | #246                                                                              | 284                                                                                | 96                                                                                  | 250                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 628                                                                               |                                                                                   |                                                                                   | 391                                                                               |                                                                                   | 457                                                                                |                                                                                     | 709                                                                                 |
| Turn Bay Length (ft)    | 240                                                                               |                                                                                   | 130                                                                               |                                                                                   |                                                                                   | 205                                                                               |                                                                                    | 150                                                                                 |                                                                                     |
| Base Capacity (vph)     | 235                                                                               | 516                                                                               | 599                                                                               | 227                                                                               | 507                                                                               | 569                                                                               | 1478                                                                               | 177                                                                                 | 1208                                                                                |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.61                                                                              | 0.23                                                                              | 0.36                                                                              | 0.73                                                                              | 0.46                                                                              | 0.94                                                                              | 0.64                                                                               | 0.58                                                                                | 0.68                                                                                |

Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.

# HCM Signalized Intersection Capacity Analysis

## 4: SE 192nd Ave & Mill Plain Blvd

Total 2032 Traffic Conditions  
AM Peak Hour Conditions

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |  |  |  |                                                                                   |  |  |                                                                                     |  |  |  |
| Traffic Volume (vph)              | 106                                                                               | 87                                                                                | 160                                                                               | 123                                                                               | 96                                                                                | 77                                                                                | 395                                                                                | 511                                                                                 | 187                                                                                 | 76                                                                                  | 458                                                                                 | 153                                                                                 |
| Future Volume (vph)               | 106                                                                               | 87                                                                                | 160                                                                               | 123                                                                               | 96                                                                                | 77                                                                                | 395                                                                                | 511                                                                                 | 187                                                                                 | 76                                                                                  | 458                                                                                 | 153                                                                                 |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                                | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Lane Util. Factor                 | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              |                                                                                   | 0.97                                                                               | 0.95                                                                                |                                                                                     | 1.00                                                                                | 0.95                                                                                |                                                                                     |
| Frpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              | 0.99                                                                              | 1.00                                                                              | 0.99                                                                              |                                                                                   | 1.00                                                                               | 0.99                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Flpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                               | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Frt                               | 1.00                                                                              | 1.00                                                                              | 0.85                                                                              | 1.00                                                                              | 0.93                                                                              |                                                                                   | 1.00                                                                               | 0.96                                                                                |                                                                                     | 1.00                                                                                | 0.96                                                                                |                                                                                     |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                               | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (prot)                 | 1752                                                                              | 1845                                                                              | 1551                                                                              | 1752                                                                              | 1711                                                                              |                                                                                   | 3433                                                                               | 3340                                                                                |                                                                                     | 1752                                                                                | 3359                                                                                |                                                                                     |
| Flt Permitted                     | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                               | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (perm)                 | 1752                                                                              | 1845                                                                              | 1551                                                                              | 1752                                                                              | 1711                                                                              |                                                                                   | 3433                                                                               | 3340                                                                                |                                                                                     | 1752                                                                                | 3359                                                                                |                                                                                     |
| Peak-hour factor, PHF             | 0.74                                                                              | 0.74                                                                              | 0.74                                                                              | 0.74                                                                              | 0.74                                                                              | 0.74                                                                              | 0.74                                                                               | 0.74                                                                                | 0.74                                                                                | 0.74                                                                                | 0.74                                                                                | 0.74                                                                                |
| Adj. Flow (vph)                   | 143                                                                               | 118                                                                               | 216                                                                               | 166                                                                               | 130                                                                               | 104                                                                               | 534                                                                                | 691                                                                                 | 253                                                                                 | 103                                                                                 | 619                                                                                 | 207                                                                                 |
| RTOR Reduction (vph)              | 0                                                                                 | 0                                                                                 | 88                                                                                | 0                                                                                 | 33                                                                                | 0                                                                                 | 0                                                                                  | 30                                                                                  | 0                                                                                   | 0                                                                                   | 29                                                                                  | 0                                                                                   |
| Lane Group Flow (vph)             | 143                                                                               | 118                                                                               | 128                                                                               | 166                                                                               | 201                                                                               | 0                                                                                 | 534                                                                                | 914                                                                                 | 0                                                                                   | 103                                                                                 | 797                                                                                 | 0                                                                                   |
| Confl. Peds. (#/hr)               | 1                                                                                 |                                                                                   | 8                                                                                 | 8                                                                                 |                                                                                   | 1                                                                                 | 3                                                                                  |                                                                                     | 3                                                                                   | 3                                                                                   |                                                                                     | 3                                                                                   |
| Confl. Bikes (#/hr)               |                                                                                   |                                                                                   | 1                                                                                 |                                                                                   |                                                                                   | 1                                                                                 |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     | 1                                                                                   |
| Heavy Vehicles (%)                | 3%                                                                                | 3%                                                                                | 3%                                                                                | 3%                                                                                | 3%                                                                                | 3%                                                                                | 2%                                                                                 | 3%                                                                                  | 3%                                                                                  | 3%                                                                                  | 3%                                                                                  | 3%                                                                                  |
| Turn Type                         | Prot                                                                              | NA                                                                                | pm+ov                                                                             | Prot                                                                              | NA                                                                                |                                                                                   | Prot                                                                               | NA                                                                                  |                                                                                     | Prot                                                                                | NA                                                                                  |                                                                                     |
| Protected Phases                  | 5                                                                                 | 2                                                                                 | 7                                                                                 | 1                                                                                 | 6                                                                                 |                                                                                   | 7                                                                                  | 4                                                                                   |                                                                                     | 3                                                                                   | 8                                                                                   |                                                                                     |
| Permitted Phases                  |                                                                                   |                                                                                   | 2                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Green, G (s)             | 11.4                                                                              | 16.3                                                                              | 32.9                                                                              | 11.9                                                                              | 16.8                                                                              |                                                                                   | 16.6                                                                               | 43.5                                                                                |                                                                                     | 8.3                                                                                 | 35.2                                                                                |                                                                                     |
| Effective Green, g (s)            | 11.4                                                                              | 16.3                                                                              | 32.9                                                                              | 11.9                                                                              | 16.8                                                                              |                                                                                   | 16.6                                                                               | 43.5                                                                                |                                                                                     | 8.3                                                                                 | 35.2                                                                                |                                                                                     |
| Actuated g/C Ratio                | 0.11                                                                              | 0.16                                                                              | 0.33                                                                              | 0.12                                                                              | 0.17                                                                              |                                                                                   | 0.17                                                                               | 0.44                                                                                |                                                                                     | 0.08                                                                                | 0.35                                                                                |                                                                                     |
| Clearance Time (s)                | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                                | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Vehicle Extension (s)             | 1.5                                                                               | 1.5                                                                               | 0.5                                                                               | 2.0                                                                               | 2.0                                                                               |                                                                                   | 0.5                                                                                | 0.5                                                                                 |                                                                                     | 0.5                                                                                 | 0.5                                                                                 |                                                                                     |
| Lane Grp Cap (vph)                | 199                                                                               | 300                                                                               | 510                                                                               | 208                                                                               | 287                                                                               |                                                                                   | 569                                                                                | 1452                                                                                |                                                                                     | 145                                                                                 | 1182                                                                                |                                                                                     |
| v/s Ratio Prot                    | c0.08                                                                             | c0.06                                                                             | 0.04                                                                              | 0.09                                                                              | c0.12                                                                             |                                                                                   | c0.16                                                                              | 0.27                                                                                |                                                                                     | 0.06                                                                                | c0.24                                                                               |                                                                                     |
| v/s Ratio Perm                    |                                                                                   |                                                                                   | 0.04                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| v/c Ratio                         | 0.72                                                                              | 0.39                                                                              | 0.25                                                                              | 0.80                                                                              | 0.70                                                                              |                                                                                   | 0.94                                                                               | 0.63                                                                                |                                                                                     | 0.71                                                                                | 0.67                                                                                |                                                                                     |
| Uniform Delay, d1                 | 42.8                                                                              | 37.4                                                                              | 24.5                                                                              | 42.9                                                                              | 39.2                                                                              |                                                                                   | 41.2                                                                               | 22.0                                                                                |                                                                                     | 44.7                                                                                | 27.5                                                                                |                                                                                     |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                               | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Incremental Delay, d2             | 9.9                                                                               | 0.3                                                                               | 0.1                                                                               | 17.7                                                                              | 5.9                                                                               |                                                                                   | 23.0                                                                               | 2.1                                                                                 |                                                                                     | 12.8                                                                                | 1.2                                                                                 |                                                                                     |
| Delay (s)                         | 52.6                                                                              | 37.7                                                                              | 24.6                                                                              | 60.6                                                                              | 45.1                                                                              |                                                                                   | 64.2                                                                               | 24.1                                                                                |                                                                                     | 57.4                                                                                | 28.7                                                                                |                                                                                     |
| Level of Service                  | D                                                                                 | D                                                                                 | C                                                                                 | E                                                                                 | D                                                                                 |                                                                                   | E                                                                                  | C                                                                                   |                                                                                     | E                                                                                   | C                                                                                   |                                                                                     |
| Approach Delay (s)                |                                                                                   | 36.3                                                                              |                                                                                   |                                                                                   | 51.6                                                                              |                                                                                   |                                                                                    | 38.6                                                                                |                                                                                     |                                                                                     | 31.9                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                    | D                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                   |                                                                                   | 37.9                                                                              |                                                                                   |                                                                                   | HCM 2000 Level of Service                                                         |                                                                                    |                                                                                     |                                                                                     | D                                                                                   |                                                                                     |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                   |                                                                                   | 0.73                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 100.0                                                                             |                                                                                   |                                                                                   | Sum of lost time (s)                                                              |                                                                                    |                                                                                     |                                                                                     | 20.0                                                                                |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 61.9%                                                                             |                                                                                   |                                                                                   | ICU Level of Service                                                              |                                                                                    |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |



Queues  
5: SE 192nd Ave & SE 20th St

Total 2032 Traffic Conditions  
AM Peak Hour Conditions

|                         |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | WBL                                                                               | WBT                                                                               | NBL                                                                               | NBT                                                                               | SBL                                                                                | SBT                                                                                 |
| Lane Group Flow (vph)   | 181                                                                               | 215                                                                               | 139                                                                               | 289                                                                               | 54                                                                                | 1083                                                                              | 97                                                                                 | 993                                                                                 |
| v/c Ratio               | 0.56                                                                              | 0.60                                                                              | 0.48                                                                              | 0.82                                                                              | 0.41                                                                              | 0.69                                                                              | 0.61                                                                               | 0.62                                                                                |
| Control Delay           | 49.6                                                                              | 38.7                                                                              | 49.1                                                                              | 51.5                                                                              | 52.9                                                                              | 27.6                                                                              | 73.6                                                                               | 18.7                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 |
| Total Delay             | 49.6                                                                              | 38.7                                                                              | 49.1                                                                              | 51.5                                                                              | 52.9                                                                              | 27.6                                                                              | 73.6                                                                               | 18.7                                                                                |
| Queue Length 50th (ft)  | 57                                                                                | 111                                                                               | 44                                                                                | 150                                                                               | 33                                                                                | 299                                                                               | 65                                                                                 | 259                                                                                 |
| Queue Length 95th (ft)  | 78                                                                                | 148                                                                               | 63                                                                                | 192                                                                               | 62                                                                                | 355                                                                               | 101                                                                                | 228                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 1997                                                                              |                                                                                   | 3145                                                                              |                                                                                   | 1320                                                                              |                                                                                    | 1126                                                                                |
| Turn Bay Length (ft)    | 100                                                                               |                                                                                   | 150                                                                               |                                                                                   | 335                                                                               |                                                                                   | 410                                                                                |                                                                                     |
| Base Capacity (vph)     | 408                                                                               | 455                                                                               | 374                                                                               | 445                                                                               | 175                                                                               | 1561                                                                              | 181                                                                                | 1608                                                                                |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |
| Reduced v/c Ratio       | 0.44                                                                              | 0.47                                                                              | 0.37                                                                              | 0.65                                                                              | 0.31                                                                              | 0.69                                                                              | 0.54                                                                               | 0.62                                                                                |
| Intersection Summary    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |

# HCM Signalized Intersection Capacity Analysis

## 5: SE 192nd Ave & SE 20th St

Total 2032 Traffic Conditions  
AM Peak Hour Conditions

|                                   |                                                                                    |  |  |                                                                                    |  |  |   |                                                                                      |  |  |                                                                                      |  |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                                                                                                                 | EBT                                                                               | EBR                                                                               | WBL                                                                                                                                                                 | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                                                                                                     | NBR                                                                                 | SBL                                                                                 | SBT                                                                                                                                                                     | SBR                                                                                 |
| Lane Configurations               |   |  |                                                                                   |   |  |                                                                                   |  |   |                                                                                     |  |   |                                                                                     |
| Traffic Volume (vph)              | 143                                                                                                                                                                 | 114                                                                               | 56                                                                                | 110                                                                                                                                                                 | 116                                                                               | 112                                                                               | 43                                                                                  | 764                                                                                                                                                                     | 92                                                                                  | 77                                                                                  | 694                                                                                                                                                                     | 91                                                                                  |
| Future Volume (vph)               | 143                                                                                                                                                                 | 114                                                                               | 56                                                                                | 110                                                                                                                                                                 | 116                                                                               | 112                                                                               | 43                                                                                  | 764                                                                                                                                                                     | 92                                                                                  | 77                                                                                  | 694                                                                                                                                                                     | 91                                                                                  |
| Ideal Flow (vphpl)                | 1900                                                                                                                                                                | 1900                                                                              | 1900                                                                              | 1900                                                                                                                                                                | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                                                                                                    | 1900                                                                                | 1900                                                                                | 1900                                                                                                                                                                    | 1900                                                                                |
| Total Lost time (s)               | 5.0                                                                                                                                                                 | 5.0                                                                               |                                                                                   | 5.0                                                                                                                                                                 | 5.0                                                                               |                                                                                   | 5.0                                                                                 | 5.0                                                                                                                                                                     |                                                                                     | 5.0                                                                                 | 5.0                                                                                                                                                                     |                                                                                     |
| Lane Util. Factor                 | 0.97                                                                                                                                                                | 1.00                                                                              |                                                                                   | 0.97                                                                                                                                                                | 1.00                                                                              |                                                                                   | 1.00                                                                                | 0.95                                                                                                                                                                    |                                                                                     | 1.00                                                                                | 0.95                                                                                                                                                                    |                                                                                     |
| Frpb, ped/bikes                   | 1.00                                                                                                                                                                | 1.00                                                                              |                                                                                   | 1.00                                                                                                                                                                | 0.99                                                                              |                                                                                   | 1.00                                                                                | 1.00                                                                                                                                                                    |                                                                                     | 1.00                                                                                | 1.00                                                                                                                                                                    |                                                                                     |
| Flpb, ped/bikes                   | 1.00                                                                                                                                                                | 1.00                                                                              |                                                                                   | 1.00                                                                                                                                                                | 1.00                                                                              |                                                                                   | 1.00                                                                                | 1.00                                                                                                                                                                    |                                                                                     | 1.00                                                                                | 1.00                                                                                                                                                                    |                                                                                     |
| Frt                               | 1.00                                                                                                                                                                | 0.95                                                                              |                                                                                   | 1.00                                                                                                                                                                | 0.93                                                                              |                                                                                   | 1.00                                                                                | 0.98                                                                                                                                                                    |                                                                                     | 1.00                                                                                | 0.98                                                                                                                                                                    |                                                                                     |
| Flt Protected                     | 0.95                                                                                                                                                                | 1.00                                                                              |                                                                                   | 0.95                                                                                                                                                                | 1.00                                                                              |                                                                                   | 0.95                                                                                | 1.00                                                                                                                                                                    |                                                                                     | 0.95                                                                                | 1.00                                                                                                                                                                    |                                                                                     |
| Satd. Flow (prot)                 | 3400                                                                                                                                                                | 1751                                                                              |                                                                                   | 3400                                                                                                                                                                | 1711                                                                              |                                                                                   | 1752                                                                                | 3439                                                                                                                                                                    |                                                                                     | 1752                                                                                | 3434                                                                                                                                                                    |                                                                                     |
| Flt Permitted                     | 0.95                                                                                                                                                                | 1.00                                                                              |                                                                                   | 0.95                                                                                                                                                                | 1.00                                                                              |                                                                                   | 0.95                                                                                | 1.00                                                                                                                                                                    |                                                                                     | 0.95                                                                                | 1.00                                                                                                                                                                    |                                                                                     |
| Satd. Flow (perm)                 | 3400                                                                                                                                                                | 1751                                                                              |                                                                                   | 3400                                                                                                                                                                | 1711                                                                              |                                                                                   | 1752                                                                                | 3439                                                                                                                                                                    |                                                                                     | 1752                                                                                | 3434                                                                                                                                                                    |                                                                                     |
| Peak-hour factor, PHF             | 0.79                                                                                                                                                                | 0.79                                                                              | 0.79                                                                              | 0.79                                                                                                                                                                | 0.79                                                                              | 0.79                                                                              | 0.79                                                                                | 0.79                                                                                                                                                                    | 0.79                                                                                | 0.79                                                                                | 0.79                                                                                                                                                                    | 0.79                                                                                |
| Adj. Flow (vph)                   | 181                                                                                                                                                                 | 144                                                                               | 71                                                                                | 139                                                                                                                                                                 | 147                                                                               | 142                                                                               | 54                                                                                  | 967                                                                                                                                                                     | 116                                                                                 | 97                                                                                  | 878                                                                                                                                                                     | 115                                                                                 |
| RTOR Reduction (vph)              | 0                                                                                                                                                                   | 19                                                                                | 0                                                                                 | 0                                                                                                                                                                   | 38                                                                                | 0                                                                                 | 0                                                                                   | 8                                                                                                                                                                       | 0                                                                                   | 0                                                                                   | 8                                                                                                                                                                       | 0                                                                                   |
| Lane Group Flow (vph)             | 181                                                                                                                                                                 | 196                                                                               | 0                                                                                 | 139                                                                                                                                                                 | 251                                                                               | 0                                                                                 | 54                                                                                  | 1075                                                                                                                                                                    | 0                                                                                   | 97                                                                                  | 985                                                                                                                                                                     | 0                                                                                   |
| Confl. Peds. (#/hr)               | 2                                                                                                                                                                   |                                                                                   |                                                                                   |                                                                                                                                                                     |                                                                                   |                                                                                   | 2                                                                                   | 2                                                                                                                                                                       |                                                                                     | 2                                                                                   | 2                                                                                                                                                                       |                                                                                     |
| Confl. Bikes (#/hr)               |                                                                                                                                                                     |                                                                                   | 2                                                                                 |                                                                                                                                                                     |                                                                                   |                                                                                   | 2                                                                                   |                                                                                                                                                                         |                                                                                     | 2                                                                                   |                                                                                                                                                                         | 1                                                                                   |
| Heavy Vehicles (%)                | 3%                                                                                                                                                                  | 3%                                                                                | 2%                                                                                | 3%                                                                                                                                                                  | 1%                                                                                | 3%                                                                                | 3%                                                                                  | 3%                                                                                                                                                                      | 3%                                                                                  | 3%                                                                                  | 3%                                                                                                                                                                      | 3%                                                                                  |
| Turn Type                         | Prot                                                                                                                                                                | NA                                                                                |                                                                                   | Prot                                                                                                                                                                | NA                                                                                |                                                                                   | Prot                                                                                | NA                                                                                                                                                                      |                                                                                     | Prot                                                                                | NA                                                                                                                                                                      |                                                                                     |
| Protected Phases                  | 5                                                                                                                                                                   | 2                                                                                 |                                                                                   | 1                                                                                                                                                                   | 6                                                                                 |                                                                                   | 7                                                                                   | 4                                                                                                                                                                       |                                                                                     | 3                                                                                   | 8                                                                                                                                                                       |                                                                                     |
| Permitted Phases                  |                                                                                                                                                                     |                                                                                   |                                                                                   |                                                                                                                                                                     |                                                                                   |                                                                                   |                                                                                     |                                                                                                                                                                         |                                                                                     |                                                                                     |                                                                                                                                                                         |                                                                                     |
| Actuated Green, G (s)             | 9.6                                                                                                                                                                 | 19.5                                                                              |                                                                                   | 8.4                                                                                                                                                                 | 18.3                                                                              |                                                                                   | 6.5                                                                                 | 44.2                                                                                                                                                                    |                                                                                     | 7.9                                                                                 | 45.6                                                                                                                                                                    |                                                                                     |
| Effective Green, g (s)            | 9.6                                                                                                                                                                 | 19.5                                                                              |                                                                                   | 8.4                                                                                                                                                                 | 18.3                                                                              |                                                                                   | 6.5                                                                                 | 44.2                                                                                                                                                                    |                                                                                     | 7.9                                                                                 | 45.6                                                                                                                                                                    |                                                                                     |
| Actuated g/C Ratio                | 0.10                                                                                                                                                                | 0.20                                                                              |                                                                                   | 0.08                                                                                                                                                                | 0.18                                                                              |                                                                                   | 0.06                                                                                | 0.44                                                                                                                                                                    |                                                                                     | 0.08                                                                                | 0.46                                                                                                                                                                    |                                                                                     |
| Clearance Time (s)                | 5.0                                                                                                                                                                 | 5.0                                                                               |                                                                                   | 5.0                                                                                                                                                                 | 5.0                                                                               |                                                                                   | 5.0                                                                                 | 5.0                                                                                                                                                                     |                                                                                     | 5.0                                                                                 | 5.0                                                                                                                                                                     |                                                                                     |
| Vehicle Extension (s)             | 2.0                                                                                                                                                                 | 2.0                                                                               |                                                                                   | 2.0                                                                                                                                                                 | 2.0                                                                               |                                                                                   | 2.0                                                                                 | 2.0                                                                                                                                                                     |                                                                                     | 2.0                                                                                 | 2.0                                                                                                                                                                     |                                                                                     |
| Lane Grp Cap (vph)                | 326                                                                                                                                                                 | 341                                                                               |                                                                                   | 285                                                                                                                                                                 | 313                                                                               |                                                                                   | 113                                                                                 | 1520                                                                                                                                                                    |                                                                                     | 138                                                                                 | 1565                                                                                                                                                                    |                                                                                     |
| v/s Ratio Prot                    | c0.05                                                                                                                                                               | 0.11                                                                              |                                                                                   | 0.04                                                                                                                                                                | c0.15                                                                             |                                                                                   | 0.03                                                                                | c0.31                                                                                                                                                                   |                                                                                     | c0.06                                                                               | 0.29                                                                                                                                                                    |                                                                                     |
| v/s Ratio Perm                    |                                                                                                                                                                     |                                                                                   |                                                                                   |                                                                                                                                                                     |                                                                                   |                                                                                   |                                                                                     |                                                                                                                                                                         |                                                                                     |                                                                                     |                                                                                                                                                                         |                                                                                     |
| v/c Ratio                         | 0.56                                                                                                                                                                | 0.57                                                                              |                                                                                   | 0.49                                                                                                                                                                | 0.80                                                                              |                                                                                   | 0.48                                                                                | 0.71                                                                                                                                                                    |                                                                                     | 0.70                                                                                | 0.63                                                                                                                                                                    |                                                                                     |
| Uniform Delay, d1                 | 43.2                                                                                                                                                                | 36.5                                                                              |                                                                                   | 43.7                                                                                                                                                                | 39.1                                                                              |                                                                                   | 45.1                                                                                | 22.6                                                                                                                                                                    |                                                                                     | 44.9                                                                                | 20.8                                                                                                                                                                    |                                                                                     |
| Progression Factor                | 1.00                                                                                                                                                                | 1.00                                                                              |                                                                                   | 1.00                                                                                                                                                                | 1.00                                                                              |                                                                                   | 1.00                                                                                | 1.00                                                                                                                                                                    |                                                                                     | 1.32                                                                                | 0.73                                                                                                                                                                    |                                                                                     |
| Incremental Delay, d2             | 1.2                                                                                                                                                                 | 1.5                                                                               |                                                                                   | 0.5                                                                                                                                                                 | 13.1                                                                              |                                                                                   | 1.2                                                                                 | 2.8                                                                                                                                                                     |                                                                                     | 12.0                                                                                | 0.6                                                                                                                                                                     |                                                                                     |
| Delay (s)                         | 44.3                                                                                                                                                                | 37.9                                                                              |                                                                                   | 44.2                                                                                                                                                                | 52.2                                                                              |                                                                                   | 46.3                                                                                | 25.5                                                                                                                                                                    |                                                                                     | 71.3                                                                                | 15.8                                                                                                                                                                    |                                                                                     |
| Level of Service                  | D                                                                                                                                                                   | D                                                                                 |                                                                                   | D                                                                                                                                                                   | D                                                                                 |                                                                                   | D                                                                                   | C                                                                                                                                                                       |                                                                                     | E                                                                                   | B                                                                                                                                                                       |                                                                                     |
| Approach Delay (s)                |                                                                                                                                                                     | 40.9                                                                              |                                                                                   |                                                                                                                                                                     | 49.6                                                                              |                                                                                   |                                                                                     | 26.4                                                                                                                                                                    |                                                                                     |                                                                                     | 20.7                                                                                                                                                                    |                                                                                     |
| Approach LOS                      |                                                                                                                                                                     | D                                                                                 |                                                                                   |                                                                                                                                                                     | D                                                                                 |                                                                                   |                                                                                     | C                                                                                                                                                                       |                                                                                     |                                                                                     | C                                                                                                                                                                       |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                                                                                                     |                                                                                   |                                                                                   |                                                                                                                                                                     |                                                                                   |                                                                                   |                                                                                     |                                                                                                                                                                         |                                                                                     |                                                                                     |                                                                                                                                                                         |                                                                                     |
| HCM 2000 Control Delay            |                                                                                                                                                                     |                                                                                   | 29.5                                                                              |                                                                                                                                                                     |                                                                                   | HCM 2000 Level of Service                                                         |                                                                                     |                                                                                                                                                                         | C                                                                                   |                                                                                     |                                                                                                                                                                         |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                                                                                                     |                                                                                   | 0.71                                                                              |                                                                                                                                                                     |                                                                                   |                                                                                   |                                                                                     |                                                                                                                                                                         |                                                                                     |                                                                                     |                                                                                                                                                                         |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                                                                                                     |                                                                                   | 100.0                                                                             |                                                                                                                                                                     |                                                                                   | Sum of lost time (s)                                                              |                                                                                     |                                                                                                                                                                         | 20.0                                                                                |                                                                                     |                                                                                                                                                                         |                                                                                     |
| Intersection Capacity Utilization |                                                                                                                                                                     |                                                                                   | 62.6%                                                                             |                                                                                                                                                                     |                                                                                   | ICU Level of Service                                                              |                                                                                     |                                                                                                                                                                         | B                                                                                   |                                                                                     |                                                                                                                                                                         |                                                                                     |
| Analysis Period (min)             |                                                                                                                                                                     |                                                                                   | 15                                                                                |                                                                                                                                                                     |                                                                                   |                                                                                   |                                                                                     |                                                                                                                                                                         |                                                                                     |                                                                                     |                                                                                                                                                                         |                                                                                     |
| c Critical Lane Group             |                                                                                                                                                                     |                                                                                   |                                                                                   |                                                                                                                                                                     |                                                                                   |                                                                                   |                                                                                     |                                                                                                                                                                         |                                                                                     |                                                                                     |                                                                                                                                                                         |                                                                                     |

| Intersection             |        |        |        |      |      |      |
|--------------------------|--------|--------|--------|------|------|------|
| Int Delay, s/veh         | 0      |        |        |      |      |      |
| Movement                 | EBL    | EBR    | NBL    | NBT  | SBT  | SBR  |
| Lane Configurations      |        | ↗      |        | ↑↑   | ↑↑   |      |
| Traffic Vol, veh/h       | 0      | 7      | 0      | 1062 | 803  | 7    |
| Future Vol, veh/h        | 0      | 7      | 0      | 1062 | 803  | 7    |
| Conflicting Peds, #/hr   | 0      | 0      | 0      | 0    | 0    | 0    |
| Sign Control             | Stop   | Stop   | Free   | Free | Free | Free |
| RT Channelized           | -      | None   | -      | None | -    | None |
| Storage Length           | -      | 0      | -      | -    | -    | -    |
| Veh in Median Storage, # | 0      | -      | -      | 0    | 0    | -    |
| Grade, %                 | 0      | -      | -      | 0    | 0    | -    |
| Peak Hour Factor         | 92     | 92     | 92     | 92   | 92   | 92   |
| Heavy Vehicles, %        | 0      | 0      | 0      | 3    | 3    | 0    |
| Mvmt Flow                | 0      | 8      | 0      | 1154 | 873  | 8    |
| Major/Minor              | Minor2 | Major1 | Major2 |      |      |      |
| Conflicting Flow All     | -      | 441    | -      | 0    | -    | 0    |
| Stage 1                  | -      | -      | -      | -    | -    | -    |
| Stage 2                  | -      | -      | -      | -    | -    | -    |
| Critical Hdwy            | -      | 6.9    | -      | -    | -    | -    |
| Critical Hdwy Stg 1      | -      | -      | -      | -    | -    | -    |
| Critical Hdwy Stg 2      | -      | -      | -      | -    | -    | -    |
| Follow-up Hdwy           | -      | 3.3    | -      | -    | -    | -    |
| Pot Cap-1 Maneuver       | 0      | 570    | 0      | -    | -    | -    |
| Stage 1                  | 0      | -      | 0      | -    | -    | -    |
| Stage 2                  | 0      | -      | 0      | -    | -    | -    |
| Platoon blocked, %       |        |        |        | -    | -    | -    |
| Mov Cap-1 Maneuver       | -      | 570    | -      | -    | -    | -    |
| Mov Cap-2 Maneuver       | -      | -      | -      | -    | -    | -    |
| Stage 1                  | -      | -      | -      | -    | -    | -    |
| Stage 2                  | -      | -      | -      | -    | -    | -    |
| Approach                 | EB     | NB     | SB     |      |      |      |
| HCM Control Delay, s     | 11.4   | 0      | 0      |      |      |      |
| HCM LOS                  | B      |        |        |      |      |      |
| Minor Lane/Major Mvmt    | NBT    | EBLn1  | SBT    | SBR  |      |      |
| Capacity (veh/h)         | -      | 570    | -      | -    |      |      |
| HCM Lane V/C Ratio       | -      | 0.013  | -      | -    |      |      |
| HCM Control Delay (s)    | -      | 11.4   | -      | -    |      |      |
| HCM Lane LOS             | -      | B      | -      | -    |      |      |
| HCM 95th %tile Q(veh)    | -      | 0      | -      | -    |      |      |

Intersection

Int Delay, s/veh 1.6

Movement EBL EBT WBT WBR SBL SBR

Lane Configurations 

Traffic Vol, veh/h 9 234 175 6 36 27

Future Vol, veh/h 9 234 175 6 36 27

Conflicting Peds, #/hr 0 0 0 0 0 0

Sign Control Free Free Free Free Stop Stop

RT Channelized - None - None - None

Storage Length - - - - 0 -

Veh in Median Storage, # - 0 0 - 0 -

Grade, % - 0 0 - 0 -

Peak Hour Factor 92 92 92 92 92 92

Heavy Vehicles, % 0 0 3 0 0 0

Mvmt Flow 10 254 190 7 39 29

Major/Minor Major1 Major2 Minor2

Conflicting Flow All 197 0 - 0 468 194

Stage 1 - - - - 194 -

Stage 2 - - - - 274 -

Critical Hdwy 4.1 - - - 6.4 6.2

Critical Hdwy Stg 1 - - - - 5.4 -

Critical Hdwy Stg 2 - - - - 5.4 -

Follow-up Hdwy 2.2 - - - 3.5 3.3

Pot Cap-1 Maneuver 1388 - - - 557 853

Stage 1 - - - - 844 -

Stage 2 - - - - 777 -

Platoon blocked, % - - - -

Mov Cap-1 Maneuver 1388 - - - 553 853

Mov Cap-2 Maneuver - - - - 553 -

Stage 1 - - - - 837 -

Stage 2 - - - - 777 -

Approach EB WB SB

HCM Control Delay, s 0.3 0 11.2

HCM LOS B

Minor Lane/Major Mvmt EBL EBT WBT WBR SBLn1

Capacity (veh/h) 1388 - - - 651

HCM Lane V/C Ratio 0.007 - - - 0.105

HCM Control Delay (s) 7.6 0 - - 11.2

HCM Lane LOS A A - - B

HCM 95th %tile Q(veh) 0 - - - 0.4

## Queues

1: SE 164th Ave &amp; SE 15th St

## Total 2032 Traffic Conditions

PM Peak Hour Conditions

|                         |  |  |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                               | NBT                                                                                | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Group Flow (vph)   | 47                                                                                | 131                                                                               | 135                                                                               | 126                                                                               | 114                                                                               | 136                                                                               | 1782                                                                               | 69                                                                                  | 188                                                                                 | 1706                                                                                | 48                                                                                  |
| v/c Ratio               | 0.14                                                                              | 0.43                                                                              | 0.41                                                                              | 0.34                                                                              | 0.29                                                                              | 0.62                                                                              | 0.84                                                                               | 0.10                                                                                | 0.60                                                                                | 0.70                                                                                | 0.06                                                                                |
| Control Delay           | 34.4                                                                              | 46.0                                                                              | 38.5                                                                              | 47.7                                                                              | 10.3                                                                              | 61.9                                                                              | 35.6                                                                               | 1.9                                                                                 | 54.3                                                                                | 27.0                                                                                | 0.1                                                                                 |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 34.4                                                                              | 46.0                                                                              | 38.5                                                                              | 47.7                                                                              | 10.3                                                                              | 61.9                                                                              | 35.6                                                                               | 1.9                                                                                 | 54.3                                                                                | 27.0                                                                                | 0.1                                                                                 |
| Queue Length 50th (ft)  | 28                                                                                | 85                                                                                | 85                                                                                | 90                                                                                | 0                                                                                 | 101                                                                               | 415                                                                                | 0                                                                                   | 136                                                                                 | 345                                                                                 | 0                                                                                   |
| Queue Length 95th (ft)  | 57                                                                                | 143                                                                               | 134                                                                               | 149                                                                               | 50                                                                                | 158                                                                               | 504                                                                                | 12                                                                                  | 204                                                                                 | 438                                                                                 | 0                                                                                   |
| Internal Link Dist (ft) |                                                                                   | 642                                                                               |                                                                                   | 766                                                                               |                                                                                   |                                                                                   | 1016                                                                               |                                                                                     |                                                                                     | 601                                                                                 |                                                                                     |
| Turn Bay Length (ft)    | 100                                                                               |                                                                                   | 250                                                                               |                                                                                   | 325                                                                               | 150                                                                               |                                                                                    | 150                                                                                 | 230                                                                                 |                                                                                     | 230                                                                                 |
| Base Capacity (vph)     | 374                                                                               | 488                                                                               | 332                                                                               | 532                                                                               | 518                                                                               | 229                                                                               | 2122                                                                               | 710                                                                                 | 311                                                                                 | 2427                                                                                | 799                                                                                 |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.13                                                                              | 0.27                                                                              | 0.41                                                                              | 0.24                                                                              | 0.22                                                                              | 0.59                                                                              | 0.84                                                                               | 0.10                                                                                | 0.60                                                                                | 0.70                                                                                | 0.06                                                                                |
| Intersection Summary    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |



# HCM Signalized Intersection Capacity Analysis

1: SE 164th Ave & SE 15th St

Total 2032 Traffic Conditions

PM Peak Hour Conditions

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Traffic Volume (vph)              | 41                                                                                | 84                                                                                | 32                                                                                | 119                                                                               | 111                                                                               | 100                                                                               | 120                                                                                 | 1568                                                                                | 61                                                                                  | 165                                                                                 | 1501                                                                                | 42                                                                                  |
| Future Volume (vph)               | 41                                                                                | 84                                                                                | 32                                                                                | 119                                                                               | 111                                                                               | 100                                                                               | 120                                                                                 | 1568                                                                                | 61                                                                                  | 165                                                                                 | 1501                                                                                | 42                                                                                  |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 4.5                                                                               | 5.0                                                                               |                                                                                   | 4.5                                                                               | 5.0                                                                               | 5.0                                                                               | 4.5                                                                                 | 5.0                                                                                 | 5.0                                                                                 | 4.5                                                                                 | 5.0                                                                                 | 5.0                                                                                 |
| Lane Util. Factor                 | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 0.91                                                                                | 1.00                                                                                | 1.00                                                                                | 0.91                                                                                | 1.00                                                                                |
| Frpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 0.98                                                                              | 1.00                                                                                | 1.00                                                                                | 0.98                                                                                | 1.00                                                                                | 1.00                                                                                | 0.98                                                                                |
| Flpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Frt                               | 1.00                                                                              | 0.96                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 0.85                                                                              | 1.00                                                                                | 1.00                                                                                | 0.85                                                                                | 1.00                                                                                | 1.00                                                                                | 0.85                                                                                |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                |
| Satd. Flow (prot)                 | 1805                                                                              | 1786                                                                              |                                                                                   | 1803                                                                              | 1881                                                                              | 1542                                                                              | 1805                                                                                | 5036                                                                                | 1549                                                                                | 1787                                                                                | 5136                                                                                | 1580                                                                                |
| Flt Permitted                     | 0.68                                                                              | 1.00                                                                              |                                                                                   | 0.50                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                | 0.95                                                                                | 1.00                                                                                | 1.00                                                                                |
| Satd. Flow (perm)                 | 1285                                                                              | 1786                                                                              |                                                                                   | 941                                                                               | 1881                                                                              | 1542                                                                              | 1805                                                                                | 5036                                                                                | 1549                                                                                | 1787                                                                                | 5136                                                                                | 1580                                                                                |
| Peak-hour factor, PHF             | 0.88                                                                              | 0.88                                                                              | 0.88                                                                              | 0.88                                                                              | 0.88                                                                              | 0.88                                                                              | 0.88                                                                                | 0.88                                                                                | 0.88                                                                                | 0.88                                                                                | 0.88                                                                                | 0.88                                                                                |
| Adj. Flow (vph)                   | 47                                                                                | 95                                                                                | 36                                                                                | 135                                                                               | 126                                                                               | 114                                                                               | 136                                                                                 | 1782                                                                                | 69                                                                                  | 188                                                                                 | 1706                                                                                | 48                                                                                  |
| RTOR Reduction (vph)              | 0                                                                                 | 13                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 92                                                                                | 0                                                                                   | 0                                                                                   | 40                                                                                  | 0                                                                                   | 0                                                                                   | 25                                                                                  |
| Lane Group Flow (vph)             | 47                                                                                | 118                                                                               | 0                                                                                 | 135                                                                               | 126                                                                               | 22                                                                                | 136                                                                                 | 1782                                                                                | 29                                                                                  | 188                                                                                 | 1706                                                                                | 23                                                                                  |
| Confl. Peds. (#/hr)               |                                                                                   |                                                                                   | 2                                                                                 | 2                                                                                 |                                                                                   |                                                                                   | 1                                                                                   |                                                                                     | 1                                                                                   | 1                                                                                   |                                                                                     | 1                                                                                   |
| Confl. Bikes (#/hr)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 4                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Heavy Vehicles (%)                | 0%                                                                                | 1%                                                                                | 3%                                                                                | 0%                                                                                | 1%                                                                                | 3%                                                                                | 0%                                                                                  | 3%                                                                                  | 2%                                                                                  | 1%                                                                                  | 1%                                                                                  | 0%                                                                                  |
| Turn Type                         | pm+pt                                                                             | NA                                                                                |                                                                                   | pm+pt                                                                             | NA                                                                                | Perm                                                                              | Prot                                                                                | NA                                                                                  | Perm                                                                                | Prot                                                                                | NA                                                                                  | Perm                                                                                |
| Protected Phases                  | 5                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 6                                                                                 |                                                                                   | 7                                                                                   | 4                                                                                   |                                                                                     | 3                                                                                   | 8                                                                                   |                                                                                     |
| Permitted Phases                  | 2                                                                                 |                                                                                   |                                                                                   | 6                                                                                 |                                                                                   | 6                                                                                 |                                                                                     |                                                                                     | 4                                                                                   |                                                                                     |                                                                                     | 8                                                                                   |
| Actuated Green, G (s)             | 26.5                                                                              | 19.8                                                                              |                                                                                   | 32.9                                                                              | 23.0                                                                              | 23.0                                                                              | 14.6                                                                                | 50.4                                                                                | 50.4                                                                                | 20.9                                                                                | 56.7                                                                                | 56.7                                                                                |
| Effective Green, g (s)            | 26.5                                                                              | 19.8                                                                              |                                                                                   | 32.9                                                                              | 23.0                                                                              | 23.0                                                                              | 14.6                                                                                | 50.4                                                                                | 50.4                                                                                | 20.9                                                                                | 56.7                                                                                | 56.7                                                                                |
| Actuated g/C Ratio                | 0.22                                                                              | 0.17                                                                              |                                                                                   | 0.27                                                                              | 0.19                                                                              | 0.19                                                                              | 0.12                                                                                | 0.42                                                                                | 0.42                                                                                | 0.17                                                                                | 0.47                                                                                | 0.47                                                                                |
| Clearance Time (s)                | 4.5                                                                               | 5.0                                                                               |                                                                                   | 4.5                                                                               | 5.0                                                                               | 5.0                                                                               | 4.5                                                                                 | 5.0                                                                                 | 5.0                                                                                 | 4.5                                                                                 | 5.0                                                                                 | 5.0                                                                                 |
| Vehicle Extension (s)             | 3.0                                                                               | 2.0                                                                               |                                                                                   | 3.0                                                                               | 2.0                                                                               | 2.0                                                                               | 3.0                                                                                 | 2.0                                                                                 | 2.0                                                                                 | 3.0                                                                                 | 2.0                                                                                 | 2.0                                                                                 |
| Lane Grp Cap (vph)                | 312                                                                               | 294                                                                               |                                                                                   | 329                                                                               | 360                                                                               | 295                                                                               | 219                                                                                 | 2115                                                                                | 650                                                                                 | 311                                                                                 | 2426                                                                                | 746                                                                                 |
| v/s Ratio Prot                    | 0.01                                                                              | 0.07                                                                              |                                                                                   | c0.03                                                                             | 0.07                                                                              |                                                                                   | 0.08                                                                                | c0.35                                                                               |                                                                                     | c0.11                                                                               | c0.33                                                                               |                                                                                     |
| v/s Ratio Perm                    | 0.02                                                                              |                                                                                   |                                                                                   | c0.08                                                                             |                                                                                   | 0.01                                                                              |                                                                                     |                                                                                     | 0.02                                                                                |                                                                                     |                                                                                     | 0.01                                                                                |
| v/c Ratio                         | 0.15                                                                              | 0.40                                                                              |                                                                                   | 0.41                                                                              | 0.35                                                                              | 0.07                                                                              | 0.62                                                                                | 0.84                                                                                | 0.04                                                                                | 0.60                                                                                | 0.70                                                                                | 0.03                                                                                |
| Uniform Delay, d1                 | 37.4                                                                              | 44.8                                                                              |                                                                                   | 34.3                                                                              | 42.0                                                                              | 39.8                                                                              | 50.1                                                                                | 31.2                                                                                | 20.6                                                                                | 45.7                                                                                | 25.0                                                                                | 16.9                                                                                |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                | 1.00                                                                                |
| Incremental Delay, d2             | 0.2                                                                               | 4.0                                                                               |                                                                                   | 0.8                                                                               | 2.7                                                                               | 0.5                                                                               | 5.4                                                                                 | 3.1                                                                                 | 0.0                                                                                 | 3.3                                                                                 | 0.8                                                                                 | 0.0                                                                                 |
| Delay (s)                         | 37.6                                                                              | 48.8                                                                              |                                                                                   | 35.2                                                                              | 44.7                                                                              | 40.3                                                                              | 55.5                                                                                | 34.3                                                                                | 20.6                                                                                | 49.0                                                                                | 25.8                                                                                | 16.9                                                                                |
| Level of Service                  | D                                                                                 | D                                                                                 |                                                                                   | D                                                                                 | D                                                                                 | D                                                                                 | E                                                                                   | C                                                                                   | C                                                                                   | D                                                                                   | C                                                                                   | B                                                                                   |
| Approach Delay (s)                |                                                                                   | 45.9                                                                              |                                                                                   |                                                                                   | 39.9                                                                              |                                                                                   |                                                                                     | 35.3                                                                                |                                                                                     |                                                                                     | 27.8                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                     | D                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                   |                                                                                   | 32.9                                                                              |                                                                                   |                                                                                   |                                                                                   | HCM 2000 Level of Service                                                           |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                   |                                                                                   | 0.68                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 120.0                                                                             |                                                                                   |                                                                                   |                                                                                   | Sum of lost time (s)                                                                |                                                                                     |                                                                                     | 19.0                                                                                |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 69.9%                                                                             |                                                                                   |                                                                                   |                                                                                   | ICU Level of Service                                                                |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

HCM 6th TWSC  
2: SE 189th Ave & SE 15th St

Total 2032 Traffic Conditions  
PM Peak Hour Conditions

| Intersection             |                                                                                   |      |        |                                                                                   |        |                                                                                   |
|--------------------------|-----------------------------------------------------------------------------------|------|--------|-----------------------------------------------------------------------------------|--------|-----------------------------------------------------------------------------------|
| Int Delay, s/veh         | 0.8                                                                               |      |        |                                                                                   |        |                                                                                   |
| Movement                 | EBT                                                                               | EBR  | WBL    | WBT                                                                               | NBL    | NBR                                                                               |
| Lane Configurations      |  |      |        |  |        |  |
| Traffic Vol, veh/h       | 297                                                                               | 14   | 23     | 273                                                                               | 12     | 13                                                                                |
| Future Vol, veh/h        | 297                                                                               | 14   | 23     | 273                                                                               | 12     | 13                                                                                |
| Conflicting Peds, #/hr   | 0                                                                                 | 4    | 4      | 0                                                                                 | 6      | 0                                                                                 |
| Sign Control             | Free                                                                              | Free | Free   | Free                                                                              | Stop   | Stop                                                                              |
| RT Channelized           | -                                                                                 | None | -      | None                                                                              | -      | None                                                                              |
| Storage Length           | -                                                                                 | -    | -      | -                                                                                 | 0      | -                                                                                 |
| Veh in Median Storage, # | 0                                                                                 | -    | -      | 0                                                                                 | 0      | -                                                                                 |
| Grade, %                 | 0                                                                                 | -    | -      | 0                                                                                 | 0      | -                                                                                 |
| Peak Hour Factor         | 86                                                                                | 86   | 86     | 86                                                                                | 86     | 86                                                                                |
| Heavy Vehicles, %        | 1                                                                                 | 3    | 3      | 1                                                                                 | 0      | 3                                                                                 |
| Mvmt Flow                | 345                                                                               | 16   | 27     | 317                                                                               | 14     | 15                                                                                |
|                          |                                                                                   |      |        |                                                                                   |        |                                                                                   |
| Major/Minor              | Major1                                                                            |      | Major2 |                                                                                   | Minor1 |                                                                                   |
| Conflicting Flow All     | 0                                                                                 | 0    | 365    | 0                                                                                 | 734    | 357                                                                               |
| Stage 1                  | -                                                                                 | -    | -      | -                                                                                 | 357    | -                                                                                 |
| Stage 2                  | -                                                                                 | -    | -      | -                                                                                 | 377    | -                                                                                 |
| Critical Hdwy            | -                                                                                 | -    | 4.13   | -                                                                                 | 6.4    | 6.23                                                                              |
| Critical Hdwy Stg 1      | -                                                                                 | -    | -      | -                                                                                 | 5.4    | -                                                                                 |
| Critical Hdwy Stg 2      | -                                                                                 | -    | -      | -                                                                                 | 5.4    | -                                                                                 |
| Follow-up Hdwy           | -                                                                                 | -    | 2.227  | -                                                                                 | 3.5    | 3.327                                                                             |
| Pot Cap-1 Maneuver       | -                                                                                 | -    | 1188   | -                                                                                 | 390    | 685                                                                               |
| Stage 1                  | -                                                                                 | -    | -      | -                                                                                 | 713    | -                                                                                 |
| Stage 2                  | -                                                                                 | -    | -      | -                                                                                 | 698    | -                                                                                 |
| Platoon blocked, %       | -                                                                                 | -    |        | -                                                                                 |        |                                                                                   |
| Mov Cap-1 Maneuver       | -                                                                                 | -    | 1183   | -                                                                                 | 375    | 682                                                                               |
| Mov Cap-2 Maneuver       | -                                                                                 | -    | -      | -                                                                                 | 375    | -                                                                                 |
| Stage 1                  | -                                                                                 | -    | -      | -                                                                                 | 710    | -                                                                                 |
| Stage 2                  | -                                                                                 | -    | -      | -                                                                                 | 674    | -                                                                                 |
|                          |                                                                                   |      |        |                                                                                   |        |                                                                                   |
| Approach                 | EB                                                                                |      | WB     |                                                                                   | NB     |                                                                                   |
| HCM Control Delay, s     | 0                                                                                 |      | 0.6    |                                                                                   | 12.8   |                                                                                   |
| HCM LOS                  |                                                                                   |      |        |                                                                                   | B      |                                                                                   |
|                          |                                                                                   |      |        |                                                                                   |        |                                                                                   |
| Minor Lane/Major Mvmt    | NBLn1                                                                             | EBT  | EBR    | WBL                                                                               | WBT    |                                                                                   |
| Capacity (veh/h)         | 490                                                                               | -    | -      | 1183                                                                              | -      |                                                                                   |
| HCM Lane V/C Ratio       | 0.059                                                                             | -    | -      | 0.023                                                                             | -      |                                                                                   |
| HCM Control Delay (s)    | 12.8                                                                              | -    | -      | 8.1                                                                               | 0      |                                                                                   |
| HCM Lane LOS             | B                                                                                 | -    | -      | A                                                                                 | A      |                                                                                   |
| HCM 95th %tile Q(veh)    | 0.2                                                                               | -    | -      | 0.1                                                                               | -      |                                                                                   |

Queues  
3: SE 192nd Ave & SE 15th St

Total 2032 Traffic Conditions  
PM Peak Hour Conditions

|                         |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                               | NBT                                                                                | SBL                                                                                 | SBT                                                                                 |
| Lane Group Flow (vph)   | 131                                                                               | 195                                                                               | 49                                                                                | 91                                                                                | 231                                                                               | 101                                                                               | 1243                                                                               | 63                                                                                  | 1386                                                                                |
| v/c Ratio               | 0.72                                                                              | 0.74                                                                              | 0.52                                                                              | 0.64                                                                              | 0.61                                                                              | 0.68                                                                              | 0.62                                                                               | 0.50                                                                                | 0.68                                                                                |
| Control Delay           | 65.0                                                                              | 47.6                                                                              | 65.9                                                                              | 64.2                                                                              | 15.6                                                                              | 41.7                                                                              | 16.2                                                                               | 57.4                                                                                | 19.9                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 65.0                                                                              | 47.6                                                                              | 65.9                                                                              | 64.2                                                                              | 15.6                                                                              | 41.7                                                                              | 16.2                                                                               | 57.4                                                                                | 19.9                                                                                |
| Queue Length 50th (ft)  | 82                                                                                | 89                                                                                | 31                                                                                | 57                                                                                | 24                                                                                | 52                                                                                | 228                                                                                | 40                                                                                  | 347                                                                                 |
| Queue Length 95th (ft)  | 141                                                                               | 158                                                                               | #81                                                                               | 108                                                                               | 88                                                                                | m52                                                                               | m117                                                                               | 80                                                                                  | 476                                                                                 |
| Internal Link Dist (ft) |                                                                                   | 206                                                                               |                                                                                   | 1016                                                                              |                                                                                   |                                                                                   | 1126                                                                               |                                                                                     | 238                                                                                 |
| Turn Bay Length (ft)    | 115                                                                               |                                                                                   | 110                                                                               |                                                                                   | 110                                                                               | 150                                                                               |                                                                                    | 475                                                                                 |                                                                                     |
| Base Capacity (vph)     | 232                                                                               | 337                                                                               | 95                                                                                | 170                                                                               | 421                                                                               | 178                                                                               | 2008                                                                               | 177                                                                                 | 2038                                                                                |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.56                                                                              | 0.58                                                                              | 0.52                                                                              | 0.54                                                                              | 0.55                                                                              | 0.57                                                                              | 0.62                                                                               | 0.36                                                                                | 0.68                                                                                |

Intersection Summary

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

# HCM Signalized Intersection Capacity Analysis

## 3: SE 192nd Ave & SE 15th St

Total 2032 Traffic Conditions  
PM Peak Hour Conditions

|                                   |  |  |  |  |  |  |   |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |                                                                                   |  |  |  |  |  |  |  |  |  |
| Traffic Volume (vph)              | 119                                                                               | 82                                                                                | 96                                                                                | 45                                                                                | 83                                                                                | 210                                                                               | 92                                                                                  | 1102                                                                                | 29                                                                                  | 57                                                                                  | 1136                                                                                | 126                                                                                 |
| Future Volume (vph)               | 119                                                                               | 82                                                                                | 96                                                                                | 45                                                                                | 83                                                                                | 210                                                                               | 92                                                                                  | 1102                                                                                | 29                                                                                  | 57                                                                                  | 1136                                                                                | 126                                                                                 |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                                 | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Lane Util. Factor                 | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 0.95                                                                                |                                                                                     | 1.00                                                                                | 0.95                                                                                |                                                                                     |
| Frpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 0.99                                                                              | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Flpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Frt                               | 1.00                                                                              | 0.92                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 0.85                                                                              | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 0.99                                                                                |                                                                                     |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                                | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (prot)                 | 1787                                                                              | 1739                                                                              |                                                                                   | 1805                                                                              | 1881                                                                              | 1604                                                                              | 1752                                                                                | 3522                                                                                |                                                                                     | 1770                                                                                | 3512                                                                                |                                                                                     |
| Flt Permitted                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                                | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (perm)                 | 1787                                                                              | 1739                                                                              |                                                                                   | 1805                                                                              | 1881                                                                              | 1604                                                                              | 1752                                                                                | 3522                                                                                |                                                                                     | 1770                                                                                | 3512                                                                                |                                                                                     |
| Peak-hour factor, PHF             | 0.91                                                                              | 0.91                                                                              | 0.91                                                                              | 0.91                                                                              | 0.91                                                                              | 0.91                                                                              | 0.91                                                                                | 0.91                                                                                | 0.91                                                                                | 0.91                                                                                | 0.91                                                                                | 0.91                                                                                |
| Adj. Flow (vph)                   | 131                                                                               | 90                                                                                | 105                                                                               | 49                                                                                | 91                                                                                | 231                                                                               | 101                                                                                 | 1211                                                                                | 32                                                                                  | 63                                                                                  | 1248                                                                                | 138                                                                                 |
| RTOR Reduction (vph)              | 0                                                                                 | 45                                                                                | 0                                                                                 | 0                                                                                 | 0                                                                                 | 159                                                                               | 0                                                                                   | 2                                                                                   | 0                                                                                   | 0                                                                                   | 7                                                                                   | 0                                                                                   |
| Lane Group Flow (vph)             | 131                                                                               | 150                                                                               | 0                                                                                 | 49                                                                                | 91                                                                                | 72                                                                                | 101                                                                                 | 1241                                                                                | 0                                                                                   | 63                                                                                  | 1379                                                                                | 0                                                                                   |
| Confl. Peds. (#/hr)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 3                                                                                   |                                                                                     | 4                                                                                   | 4                                                                                   |                                                                                     | 3                                                                                   |
| Confl. Bikes (#/hr)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 1                                                                                 |                                                                                     |                                                                                     | 1                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Heavy Vehicles (%)                | 1%                                                                                | 1%                                                                                | 0%                                                                                | 0%                                                                                | 1%                                                                                | 0%                                                                                | 3%                                                                                  | 2%                                                                                  | 3%                                                                                  | 2%                                                                                  | 1%                                                                                  | 1%                                                                                  |
| Turn Type                         | Prot                                                                              | NA                                                                                |                                                                                   | Prot                                                                              | NA                                                                                | pm+ov                                                                             | Prot                                                                                | NA                                                                                  |                                                                                     | Prot                                                                                | NA                                                                                  |                                                                                     |
| Protected Phases                  | 5                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 6                                                                                 | 3                                                                                 | 7                                                                                   | 4                                                                                   |                                                                                     | 3                                                                                   | 8                                                                                   |                                                                                     |
| Permitted Phases                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 6                                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Green, G (s)             | 10.2                                                                              | 12.5                                                                              |                                                                                   | 4.3                                                                               | 6.6                                                                               | 13.8                                                                              | 7.5                                                                                 | 56.0                                                                                |                                                                                     | 7.2                                                                                 | 55.7                                                                                |                                                                                     |
| Effective Green, g (s)            | 10.2                                                                              | 12.5                                                                              |                                                                                   | 4.3                                                                               | 6.6                                                                               | 13.8                                                                              | 7.5                                                                                 | 56.0                                                                                |                                                                                     | 7.2                                                                                 | 55.7                                                                                |                                                                                     |
| Actuated g/C Ratio                | 0.10                                                                              | 0.12                                                                              |                                                                                   | 0.04                                                                              | 0.07                                                                              | 0.14                                                                              | 0.08                                                                                | 0.56                                                                                |                                                                                     | 0.07                                                                                | 0.56                                                                                |                                                                                     |
| Clearance Time (s)                | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                                 | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Vehicle Extension (s)             | 1.0                                                                               | 1.0                                                                               |                                                                                   | 1.0                                                                               | 1.0                                                                               | 1.0                                                                               | 1.0                                                                                 | 1.0                                                                                 |                                                                                     | 1.0                                                                                 | 1.0                                                                                 |                                                                                     |
| Lane Grp Cap (vph)                | 182                                                                               | 217                                                                               |                                                                                   | 77                                                                                | 124                                                                               | 301                                                                               | 131                                                                                 | 1972                                                                                |                                                                                     | 127                                                                                 | 1956                                                                                |                                                                                     |
| v/s Ratio Prot                    | c0.07                                                                             | c0.09                                                                             |                                                                                   | 0.03                                                                              | 0.05                                                                              | 0.02                                                                              | 0.06                                                                                | c0.35                                                                               |                                                                                     | 0.04                                                                                | c0.39                                                                               |                                                                                     |
| v/s Ratio Perm                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 0.03                                                                              |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| v/c Ratio                         | 0.72                                                                              | 0.69                                                                              |                                                                                   | 0.64                                                                              | 0.73                                                                              | 0.24                                                                              | 0.77                                                                                | 0.63                                                                                |                                                                                     | 0.50                                                                                | 0.70                                                                                |                                                                                     |
| Uniform Delay, d1                 | 43.5                                                                              | 41.9                                                                              |                                                                                   | 47.1                                                                              | 45.8                                                                              | 38.4                                                                              | 45.4                                                                                | 14.9                                                                                |                                                                                     | 44.7                                                                                | 16.2                                                                                |                                                                                     |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 0.77                                                                                | 0.96                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Incremental Delay, d2             | 10.8                                                                              | 7.5                                                                               |                                                                                   | 12.0                                                                              | 17.5                                                                              | 0.1                                                                               | 7.9                                                                                 | 0.5                                                                                 |                                                                                     | 1.1                                                                                 | 1.0                                                                                 |                                                                                     |
| Delay (s)                         | 54.3                                                                              | 49.4                                                                              |                                                                                   | 59.1                                                                              | 63.3                                                                              | 38.6                                                                              | 42.7                                                                                | 14.8                                                                                |                                                                                     | 45.8                                                                                | 17.1                                                                                |                                                                                     |
| Level of Service                  | D                                                                                 | D                                                                                 |                                                                                   | E                                                                                 | E                                                                                 | D                                                                                 | D                                                                                   | B                                                                                   |                                                                                     | D                                                                                   | B                                                                                   |                                                                                     |
| Approach Delay (s)                |                                                                                   | 51.4                                                                              |                                                                                   |                                                                                   | 47.3                                                                              |                                                                                   |                                                                                     | 16.9                                                                                |                                                                                     |                                                                                     | 18.4                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                     | B                                                                                   |                                                                                     |                                                                                     | B                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                   |                                                                                   | 24.0                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                   |                                                                                   | 0.74                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 100.0                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 71.6%                                                                             |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

Queues  
4: SE 192nd Ave & Mill Plain Blvd

Total 2032 Traffic Conditions  
PM Peak Hour Conditions

|                         |  |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | NBL                                                                               | NBT                                                                                | SBL                                                                                 | SBT                                                                                 |
| Lane Group Flow (vph)   | 334                                                                               | 15                                                                                | 596                                                                               | 57                                                                                | 63                                                                                | 480                                                                               | 1057                                                                               | 19                                                                                  | 1188                                                                                |
| v/c Ratio               | 0.65                                                                              | 0.06                                                                              | 1.23                                                                              | 0.22                                                                              | 0.31                                                                              | 1.15                                                                              | 0.68                                                                               | 0.20                                                                                | 1.10                                                                                |
| Control Delay           | 41.6                                                                              | 31.0                                                                              | 143.4                                                                             | 40.3                                                                              | 21.8                                                                              | 133.7                                                                             | 26.3                                                                               | 50.5                                                                                | 90.9                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 | 0.0                                                                                 |
| Total Delay             | 41.6                                                                              | 31.0                                                                              | 143.4                                                                             | 40.3                                                                              | 21.8                                                                              | 133.7                                                                             | 26.3                                                                               | 50.5                                                                                | 90.9                                                                                |
| Queue Length 50th (ft)  | 179                                                                               | 9                                                                                 | ~488                                                                              | 21                                                                                | 15                                                                                | ~187                                                                              | 253                                                                                | 12                                                                                  | ~447                                                                                |
| Queue Length 95th (ft)  | #490                                                                              | 22                                                                                | #301                                                                              | 73                                                                                | 42                                                                                | #282                                                                              | 390                                                                                | 35                                                                                  | #571                                                                                |
| Internal Link Dist (ft) |                                                                                   | 628                                                                               |                                                                                   |                                                                                   | 391                                                                               |                                                                                   | 457                                                                                |                                                                                     | 709                                                                                 |
| Turn Bay Length (ft)    | 240                                                                               |                                                                                   | 130                                                                               |                                                                                   |                                                                                   | 205                                                                               |                                                                                    | 150                                                                                 |                                                                                     |
| Base Capacity (vph)     | 516                                                                               | 517                                                                               | 485                                                                               | 296                                                                               | 479                                                                               | 416                                                                               | 1545                                                                               | 180                                                                                 | 1083                                                                                |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   | 0                                                                                   |
| Reduced v/c Ratio       | 0.65                                                                              | 0.03                                                                              | 1.23                                                                              | 0.19                                                                              | 0.13                                                                              | 1.15                                                                              | 0.68                                                                               | 0.11                                                                                | 1.10                                                                                |

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.  
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.



# HCM Signalized Intersection Capacity Analysis

## 4: SE 192nd Ave & Mill Plain Blvd

Total 2032 Traffic Conditions  
PM Peak Hour Conditions

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                 | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |  |  |  |                                                                                   |   |  |                                                                                     |  |  |                                                                                     |
| Traffic Volume (vph)              | 297                                                                               | 13                                                                                | 530                                                                               | 51                                                                                | 21                                                                                | 35                                                                                | 427                                                                                 | 916                                                                                 | 25                                                                                  | 17                                                                                  | 860                                                                                 | 198                                                                                 |
| Future Volume (vph)               | 297                                                                               | 13                                                                                | 530                                                                               | 51                                                                                | 21                                                                                | 35                                                                                | 427                                                                                 | 916                                                                                 | 25                                                                                  | 17                                                                                  | 860                                                                                 | 198                                                                                 |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                                 | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Lane Util. Factor                 | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              |                                                                                   | 0.97                                                                                | 0.95                                                                                |                                                                                     | 1.00                                                                                | 0.95                                                                                |                                                                                     |
| Frpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              | 0.99                                                                              | 1.00                                                                              | 0.99                                                                              |                                                                                   | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Flpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Frt                               | 1.00                                                                              | 1.00                                                                              | 0.85                                                                              | 1.00                                                                              | 0.91                                                                              |                                                                                   | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 0.97                                                                                |                                                                                     |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                                | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (prot)                 | 1787                                                                              | 1900                                                                              | 1580                                                                              | 1805                                                                              | 1668                                                                              |                                                                                   | 3467                                                                                | 3523                                                                                |                                                                                     | 1805                                                                                | 3431                                                                                |                                                                                     |
| Flt Permitted                     | 0.95                                                                              | 1.00                                                                              | 1.00                                                                              | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                                | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (perm)                 | 1787                                                                              | 1900                                                                              | 1580                                                                              | 1805                                                                              | 1668                                                                              |                                                                                   | 3467                                                                                | 3523                                                                                |                                                                                     | 1805                                                                                | 3431                                                                                |                                                                                     |
| Peak-hour factor, PHF             | 0.89                                                                              | 0.89                                                                              | 0.89                                                                              | 0.89                                                                              | 0.89                                                                              | 0.89                                                                              | 0.89                                                                                | 0.89                                                                                | 0.89                                                                                | 0.89                                                                                | 0.89                                                                                | 0.89                                                                                |
| Adj. Flow (vph)                   | 334                                                                               | 15                                                                                | 596                                                                               | 57                                                                                | 24                                                                                | 39                                                                                | 480                                                                                 | 1029                                                                                | 28                                                                                  | 19                                                                                  | 966                                                                                 | 222                                                                                 |
| RTOR Reduction (vph)              | 0                                                                                 | 0                                                                                 | 92                                                                                | 0                                                                                 | 35                                                                                | 0                                                                                 | 0                                                                                   | 2                                                                                   | 0                                                                                   | 0                                                                                   | 21                                                                                  | 0                                                                                   |
| Lane Group Flow (vph)             | 334                                                                               | 15                                                                                | 504                                                                               | 57                                                                                | 28                                                                                | 0                                                                                 | 480                                                                                 | 1055                                                                                | 0                                                                                   | 19                                                                                  | 1167                                                                                | 0                                                                                   |
| Confl. Peds. (#/hr)               | 8                                                                                 |                                                                                   | 6                                                                                 | 6                                                                                 |                                                                                   | 8                                                                                 | 9                                                                                   |                                                                                     | 9                                                                                   | 9                                                                                   |                                                                                     | 9                                                                                   |
| Confl. Bikes (#/hr)               |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   | 1                                                                                 |                                                                                     |                                                                                     | 3                                                                                   |                                                                                     |                                                                                     | 1                                                                                   |
| Heavy Vehicles (%)                | 1%                                                                                | 0%                                                                                | 1%                                                                                | 0%                                                                                | 0%                                                                                | 3%                                                                                | 1%                                                                                  | 2%                                                                                  | 0%                                                                                  | 0%                                                                                  | 2%                                                                                  | 1%                                                                                  |
| Turn Type                         | Prot                                                                              | NA                                                                                | pm+ov                                                                             | Prot                                                                              | NA                                                                                |                                                                                   | Prot                                                                                | NA                                                                                  |                                                                                     | Prot                                                                                | NA                                                                                  |                                                                                     |
| Protected Phases                  | 5                                                                                 | 2                                                                                 | 7                                                                                 | 1                                                                                 | 6                                                                                 |                                                                                   | 7                                                                                   | 4                                                                                   |                                                                                     | 3                                                                                   | 8                                                                                   |                                                                                     |
| Permitted Phases                  |                                                                                   |                                                                                   | 2                                                                                 |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Green, G (s)             | 28.9                                                                              | 25.8                                                                              | 40.8                                                                              | 12.2                                                                              | 9.1                                                                               |                                                                                   | 15.0                                                                                | 39.8                                                                                |                                                                                     | 2.2                                                                                 | 27.0                                                                                |                                                                                     |
| Effective Green, g (s)            | 28.9                                                                              | 25.8                                                                              | 40.8                                                                              | 12.2                                                                              | 9.1                                                                               |                                                                                   | 15.0                                                                                | 39.8                                                                                |                                                                                     | 2.2                                                                                 | 27.0                                                                                |                                                                                     |
| Actuated g/C Ratio                | 0.29                                                                              | 0.26                                                                              | 0.41                                                                              | 0.12                                                                              | 0.09                                                                              |                                                                                   | 0.15                                                                                | 0.40                                                                                |                                                                                     | 0.02                                                                                | 0.27                                                                                |                                                                                     |
| Clearance Time (s)                | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                                 | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Vehicle Extension (s)             | 1.5                                                                               | 1.5                                                                               | 0.5                                                                               | 2.0                                                                               | 2.0                                                                               |                                                                                   | 0.5                                                                                 | 0.5                                                                                 |                                                                                     | 0.5                                                                                 | 0.5                                                                                 |                                                                                     |
| Lane Grp Cap (vph)                | 516                                                                               | 490                                                                               | 644                                                                               | 220                                                                               | 151                                                                               |                                                                                   | 520                                                                                 | 1402                                                                                |                                                                                     | 39                                                                                  | 926                                                                                 |                                                                                     |
| v/s Ratio Prot                    | c0.19                                                                             | 0.01                                                                              | c0.12                                                                             | c0.03                                                                             | 0.02                                                                              |                                                                                   | c0.14                                                                               | 0.30                                                                                |                                                                                     | 0.01                                                                                | c0.34                                                                               |                                                                                     |
| v/s Ratio Perm                    |                                                                                   |                                                                                   | 0.20                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| v/c Ratio                         | 0.65                                                                              | 0.03                                                                              | 0.78                                                                              | 0.26                                                                              | 0.18                                                                              |                                                                                   | 0.92                                                                                | 0.75                                                                                |                                                                                     | 0.49                                                                                | 1.26                                                                                |                                                                                     |
| Uniform Delay, d1                 | 31.1                                                                              | 27.7                                                                              | 25.7                                                                              | 39.8                                                                              | 42.0                                                                              |                                                                                   | 41.9                                                                                | 25.9                                                                                |                                                                                     | 48.3                                                                                | 36.5                                                                                |                                                                                     |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                                | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Incremental Delay, d2             | 2.1                                                                               | 0.0                                                                               | 5.7                                                                               | 0.2                                                                               | 0.2                                                                               |                                                                                   | 21.8                                                                                | 3.8                                                                                 |                                                                                     | 3.5                                                                                 | 125.8                                                                               |                                                                                     |
| Delay (s)                         | 33.2                                                                              | 27.8                                                                              | 31.4                                                                              | 40.0                                                                              | 42.2                                                                              |                                                                                   | 63.7                                                                                | 29.6                                                                                |                                                                                     | 51.8                                                                                | 162.3                                                                               |                                                                                     |
| Level of Service                  | C                                                                                 | C                                                                                 | C                                                                                 | D                                                                                 | D                                                                                 |                                                                                   | E                                                                                   | C                                                                                   |                                                                                     | D                                                                                   | F                                                                                   |                                                                                     |
| Approach Delay (s)                |                                                                                   | 32.0                                                                              |                                                                                   |                                                                                   | 41.2                                                                              |                                                                                   |                                                                                     | 40.3                                                                                |                                                                                     |                                                                                     | 160.6                                                                               |                                                                                     |
| Approach LOS                      |                                                                                   | C                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                     | D                                                                                   |                                                                                     |                                                                                     | F                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                   |                                                                                   | 76.4                                                                              |                                                                                   |                                                                                   | HCM 2000 Level of Service                                                         |                                                                                     | E                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                   |                                                                                   | 0.89                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 100.0                                                                             |                                                                                   |                                                                                   | Sum of lost time (s)                                                              |                                                                                     | 20.0                                                                                |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 80.4%                                                                             |                                                                                   |                                                                                   | ICU Level of Service                                                              |                                                                                     | D                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

Queues  
5: SE 192nd Ave & SE 20th St

Total 2032 Traffic Conditions  
PM Peak Hour Conditions

|                         |  |  |  |  |  |  |  |  |
|-------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Lane Group              | EBL                                                                               | EBT                                                                               | WBL                                                                               | WBT                                                                               | NBL                                                                               | NBT                                                                               | SBL                                                                                | SBT                                                                                 |
| Lane Group Flow (vph)   | 143                                                                               | 271                                                                               | 156                                                                               | 325                                                                               | 121                                                                               | 1359                                                                              | 183                                                                                | 1269                                                                                |
| v/c Ratio               | 0.49                                                                              | 0.79                                                                              | 0.40                                                                              | 0.83                                                                              | 0.67                                                                              | 1.06                                                                              | 0.77                                                                               | 0.90                                                                                |
| Control Delay           | 48.9                                                                              | 51.0                                                                              | 44.2                                                                              | 52.5                                                                              | 61.6                                                                              | 73.9                                                                              | 70.9                                                                               | 31.6                                                                                |
| Queue Delay             | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                               | 0.0                                                                                | 0.0                                                                                 |
| Total Delay             | 48.9                                                                              | 51.0                                                                              | 44.2                                                                              | 52.5                                                                              | 61.6                                                                              | 73.9                                                                              | 70.9                                                                               | 31.6                                                                                |
| Queue Length 50th (ft)  | 45                                                                                | 151                                                                               | 47                                                                                | 181                                                                               | 74                                                                                | ~533                                                                              | 123                                                                                | 254                                                                                 |
| Queue Length 95th (ft)  | 74                                                                                | 222                                                                               | 79                                                                                | 269                                                                               | #156                                                                              | #726                                                                              | m#212                                                                              | #601                                                                                |
| Internal Link Dist (ft) |                                                                                   | 1997                                                                              |                                                                                   | 3145                                                                              |                                                                                   | 1320                                                                              |                                                                                    | 1126                                                                                |
| Turn Bay Length (ft)    | 100                                                                               |                                                                                   | 150                                                                               |                                                                                   | 335                                                                               |                                                                                   | 410                                                                                |                                                                                     |
| Base Capacity (vph)     | 450                                                                               | 462                                                                               | 427                                                                               | 453                                                                               | 195                                                                               | 1287                                                                              | 250                                                                                | 1408                                                                                |
| Starvation Cap Reductn  | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |
| Spillback Cap Reductn   | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |
| Storage Cap Reductn     | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                 | 0                                                                                  | 0                                                                                   |
| Reduced v/c Ratio       | 0.32                                                                              | 0.59                                                                              | 0.37                                                                              | 0.72                                                                              | 0.62                                                                              | 1.06                                                                              | 0.73                                                                               | 0.90                                                                                |

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.  
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

# HCM Signalized Intersection Capacity Analysis

## 5: SE 192nd Ave & SE 20th St

Total 2032 Traffic Conditions  
PM Peak Hour Conditions

|                                   |  |  |  |  |  |  |  |  |  |  |  |  |
|-----------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Movement                          | EBL                                                                               | EBT                                                                               | EBR                                                                               | WBL                                                                               | WBT                                                                               | WBR                                                                               | NBL                                                                                | NBT                                                                                 | NBR                                                                                 | SBL                                                                                 | SBT                                                                                 | SBR                                                                                 |
| Lane Configurations               |  |  |                                                                                   |  |  |                                                                                   |  |  |                                                                                     |  |  |  |
| Traffic Volume (vph)              | 137                                                                               | 169                                                                               | 91                                                                                | 150                                                                               | 193                                                                               | 119                                                                               | 116                                                                                | 1110                                                                                | 195                                                                                 | 176                                                                                 | 1033                                                                                | 185                                                                                 |
| Future Volume (vph)               | 137                                                                               | 169                                                                               | 91                                                                                | 150                                                                               | 193                                                                               | 119                                                                               | 116                                                                                | 1110                                                                                | 195                                                                                 | 176                                                                                 | 1033                                                                                | 185                                                                                 |
| Ideal Flow (vphpl)                | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                              | 1900                                                                               | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                | 1900                                                                                |
| Total Lost time (s)               | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                                | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Lane Util. Factor                 | 0.97                                                                              | 1.00                                                                              |                                                                                   | 0.97                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                               | 0.95                                                                                |                                                                                     | 1.00                                                                                | 0.95                                                                                |                                                                                     |
| Frpb, ped/bikes                   | 1.00                                                                              | 0.99                                                                              |                                                                                   | 1.00                                                                              | 0.99                                                                              |                                                                                   | 1.00                                                                               | 0.99                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Flpb, ped/bikes                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                               | 1.00                                                                                |                                                                                     | 1.00                                                                                | 1.00                                                                                |                                                                                     |
| Frt                               | 1.00                                                                              | 0.95                                                                              |                                                                                   | 1.00                                                                              | 0.94                                                                              |                                                                                   | 1.00                                                                               | 0.98                                                                                |                                                                                     | 1.00                                                                                | 0.98                                                                                |                                                                                     |
| Flt Protected                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                               | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (prot)                 | 3467                                                                              | 1772                                                                              |                                                                                   | 3502                                                                              | 1760                                                                              |                                                                                   | 1805                                                                               | 3418                                                                                |                                                                                     | 1787                                                                                | 3441                                                                                |                                                                                     |
| Flt Permitted                     | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                              | 1.00                                                                              |                                                                                   | 0.95                                                                               | 1.00                                                                                |                                                                                     | 0.95                                                                                | 1.00                                                                                |                                                                                     |
| Satd. Flow (perm)                 | 3467                                                                              | 1772                                                                              |                                                                                   | 3502                                                                              | 1760                                                                              |                                                                                   | 1805                                                                               | 3418                                                                                |                                                                                     | 1787                                                                                | 3441                                                                                |                                                                                     |
| Peak-hour factor, PHF             | 0.96                                                                              | 0.96                                                                              | 0.96                                                                              | 0.96                                                                              | 0.96                                                                              | 0.96                                                                              | 0.96                                                                               | 0.96                                                                                | 0.96                                                                                | 0.96                                                                                | 0.96                                                                                | 0.96                                                                                |
| Adj. Flow (vph)                   | 143                                                                               | 176                                                                               | 95                                                                                | 156                                                                               | 201                                                                               | 124                                                                               | 121                                                                                | 1156                                                                                | 203                                                                                 | 183                                                                                 | 1076                                                                                | 193                                                                                 |
| RTOR Reduction (vph)              | 0                                                                                 | 21                                                                                | 0                                                                                 | 0                                                                                 | 23                                                                                | 0                                                                                 | 0                                                                                  | 13                                                                                  | 0                                                                                   | 0                                                                                   | 13                                                                                  | 0                                                                                   |
| Lane Group Flow (vph)             | 143                                                                               | 250                                                                               | 0                                                                                 | 156                                                                               | 302                                                                               | 0                                                                                 | 121                                                                                | 1346                                                                                | 0                                                                                   | 183                                                                                 | 1256                                                                                | 0                                                                                   |
| Confl. Peds. (#/hr)               | 3                                                                                 |                                                                                   | 1                                                                                 | 1                                                                                 |                                                                                   | 3                                                                                 | 1                                                                                  |                                                                                     | 5                                                                                   | 5                                                                                   |                                                                                     | 1                                                                                   |
| Confl. Bikes (#/hr)               |                                                                                   |                                                                                   | 1                                                                                 |                                                                                   |                                                                                   | 4                                                                                 |                                                                                    |                                                                                     | 5                                                                                   |                                                                                     |                                                                                     | 2                                                                                   |
| Heavy Vehicles (%)                | 1%                                                                                | 0%                                                                                | 3%                                                                                | 0%                                                                                | 1%                                                                                | 1%                                                                                | 0%                                                                                 | 3%                                                                                  | 1%                                                                                  | 1%                                                                                  | 2%                                                                                  | 3%                                                                                  |
| Turn Type                         | Prot                                                                              | NA                                                                                |                                                                                   | Prot                                                                              | NA                                                                                |                                                                                   | Prot                                                                               | NA                                                                                  |                                                                                     | Prot                                                                                | NA                                                                                  |                                                                                     |
| Protected Phases                  | 5                                                                                 | 2                                                                                 |                                                                                   | 1                                                                                 | 6                                                                                 |                                                                                   | 7                                                                                  | 4                                                                                   |                                                                                     | 3                                                                                   | 8                                                                                   |                                                                                     |
| Permitted Phases                  |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Green, G (s)             | 8.5                                                                               | 18.2                                                                              |                                                                                   | 11.2                                                                              | 20.9                                                                              |                                                                                   | 10.1                                                                               | 37.2                                                                                |                                                                                     | 13.4                                                                                | 40.5                                                                                |                                                                                     |
| Effective Green, g (s)            | 8.5                                                                               | 18.2                                                                              |                                                                                   | 11.2                                                                              | 20.9                                                                              |                                                                                   | 10.1                                                                               | 37.2                                                                                |                                                                                     | 13.4                                                                                | 40.5                                                                                |                                                                                     |
| Actuated g/C Ratio                | 0.08                                                                              | 0.18                                                                              |                                                                                   | 0.11                                                                              | 0.21                                                                              |                                                                                   | 0.10                                                                               | 0.37                                                                                |                                                                                     | 0.13                                                                                | 0.40                                                                                |                                                                                     |
| Clearance Time (s)                | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                               | 5.0                                                                               |                                                                                   | 5.0                                                                                | 5.0                                                                                 |                                                                                     | 5.0                                                                                 | 5.0                                                                                 |                                                                                     |
| Vehicle Extension (s)             | 2.0                                                                               | 2.0                                                                               |                                                                                   | 2.0                                                                               | 2.0                                                                               |                                                                                   | 2.0                                                                                | 2.0                                                                                 |                                                                                     | 2.0                                                                                 | 2.0                                                                                 |                                                                                     |
| Lane Grp Cap (vph)                | 294                                                                               | 322                                                                               |                                                                                   | 392                                                                               | 367                                                                               |                                                                                   | 182                                                                                | 1271                                                                                |                                                                                     | 239                                                                                 | 1393                                                                                |                                                                                     |
| v/s Ratio Prot                    | 0.04                                                                              | c0.14                                                                             |                                                                                   | 0.04                                                                              | c0.17                                                                             |                                                                                   | 0.07                                                                               | c0.39                                                                               |                                                                                     | c0.10                                                                               | c0.37                                                                               |                                                                                     |
| v/s Ratio Perm                    |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| v/c Ratio                         | 0.49                                                                              | 0.78                                                                              |                                                                                   | 0.40                                                                              | 0.82                                                                              |                                                                                   | 0.66                                                                               | 1.06                                                                                |                                                                                     | 0.77                                                                                | 0.90                                                                                |                                                                                     |
| Uniform Delay, d1                 | 43.7                                                                              | 39.0                                                                              |                                                                                   | 41.3                                                                              | 37.8                                                                              |                                                                                   | 43.3                                                                               | 31.4                                                                                |                                                                                     | 41.8                                                                                | 27.9                                                                                |                                                                                     |
| Progression Factor                | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                              | 1.00                                                                              |                                                                                   | 1.00                                                                               | 1.00                                                                                |                                                                                     | 1.31                                                                                | 0.75                                                                                |                                                                                     |
| Incremental Delay, d2             | 0.5                                                                               | 10.2                                                                              |                                                                                   | 0.2                                                                               | 13.2                                                                              |                                                                                   | 6.9                                                                                | 42.6                                                                                |                                                                                     | 9.6                                                                                 | 6.5                                                                                 |                                                                                     |
| Delay (s)                         | 44.1                                                                              | 49.1                                                                              |                                                                                   | 41.5                                                                              | 51.0                                                                              |                                                                                   | 50.2                                                                               | 74.0                                                                                |                                                                                     | 64.2                                                                                | 27.3                                                                                |                                                                                     |
| Level of Service                  | D                                                                                 | D                                                                                 |                                                                                   | D                                                                                 | D                                                                                 |                                                                                   | D                                                                                  | E                                                                                   |                                                                                     | E                                                                                   | C                                                                                   |                                                                                     |
| Approach Delay (s)                |                                                                                   | 47.4                                                                              |                                                                                   |                                                                                   | 47.9                                                                              |                                                                                   |                                                                                    | 72.0                                                                                |                                                                                     |                                                                                     | 32.0                                                                                |                                                                                     |
| Approach LOS                      |                                                                                   | D                                                                                 |                                                                                   |                                                                                   | D                                                                                 |                                                                                   |                                                                                    | E                                                                                   |                                                                                     |                                                                                     | C                                                                                   |                                                                                     |
| <b>Intersection Summary</b>       |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Control Delay            |                                                                                   |                                                                                   | 51.1                                                                              |                                                                                   |                                                                                   | HCM 2000 Level of Service                                                         |                                                                                    |                                                                                     | D                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| HCM 2000 Volume to Capacity ratio |                                                                                   |                                                                                   | 0.94                                                                              |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Actuated Cycle Length (s)         |                                                                                   |                                                                                   | 100.0                                                                             |                                                                                   |                                                                                   | Sum of lost time (s)                                                              |                                                                                    |                                                                                     | 20.0                                                                                |                                                                                     |                                                                                     |                                                                                     |
| Intersection Capacity Utilization |                                                                                   |                                                                                   | 85.2%                                                                             |                                                                                   |                                                                                   | ICU Level of Service                                                              |                                                                                    |                                                                                     | E                                                                                   |                                                                                     |                                                                                     |                                                                                     |
| Analysis Period (min)             |                                                                                   |                                                                                   | 15                                                                                |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| c Critical Lane Group             |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

| Intersection             |      |      |      |      |      |      |
|--------------------------|------|------|------|------|------|------|
| Int Delay, s/veh         | 0    |      |      |      |      |      |
| Movement                 | EBL  | EBR  | NBL  | NBT  | SBT  | SBR  |
| Lane Configurations      |      | ↗    |      | ↑↑   | ↑↑   |      |
| Traffic Vol, veh/h       | 0    | 4    | 0    | 1431 | 1315 | 24   |
| Future Vol, veh/h        | 0    | 4    | 0    | 1431 | 1315 | 24   |
| Conflicting Peds, #/hr   | 0    | 0    | 0    | 0    | 0    | 0    |
| Sign Control             | Stop | Stop | Free | Free | Free | Free |
| RT Channelized           | -    | None | -    | None | -    | None |
| Storage Length           | -    | 0    | -    | -    | -    | -    |
| Veh in Median Storage, # | 0    | -    | -    | 0    | 0    | -    |
| Grade, %                 | 0    | -    | -    | 0    | 0    | -    |
| Peak Hour Factor         | 91   | 91   | 91   | 91   | 91   | 91   |
| Heavy Vehicles, %        | 0    | 0    | 0    | 2    | 1    | 0    |
| Mvmt Flow                | 0    | 4    | 0    | 1573 | 1445 | 26   |

| Major/Minor          | Minor2 | Major1 | Major2 |   |   |   |
|----------------------|--------|--------|--------|---|---|---|
| Conflicting Flow All | -      | 736    | -      | 0 | - | 0 |
| Stage 1              | -      | -      | -      | - | - | - |
| Stage 2              | -      | -      | -      | - | - | - |
| Critical Hdwy        | -      | 6.9    | -      | - | - | - |
| Critical Hdwy Stg 1  | -      | -      | -      | - | - | - |
| Critical Hdwy Stg 2  | -      | -      | -      | - | - | - |
| Follow-up Hdwy       | -      | 3.3    | -      | - | - | - |
| Pot Cap-1 Maneuver   | 0      | 366    | 0      | - | - | - |
| Stage 1              | 0      | -      | 0      | - | - | - |
| Stage 2              | 0      | -      | 0      | - | - | - |
| Platoon blocked, %   |        |        |        | - | - | - |
| Mov Cap-1 Maneuver   | -      | 366    | -      | - | - | - |
| Mov Cap-2 Maneuver   | -      | -      | -      | - | - | - |
| Stage 1              | -      | -      | -      | - | - | - |
| Stage 2              | -      | -      | -      | - | - | - |

| Approach             | EB | NB | SB |
|----------------------|----|----|----|
| HCM Control Delay, s | 15 | 0  | 0  |
| HCM LOS              | C  |    |    |

| Minor Lane/Major Mvmt | NBT EBLn1 | SBT | SBR |
|-----------------------|-----------|-----|-----|
| Capacity (veh/h)      | - 366     | -   | -   |
| HCM Lane V/C Ratio    | - 0.012   | -   | -   |
| HCM Control Delay (s) | - 15      | -   | -   |
| HCM Lane LOS          | - C       | -   | -   |
| HCM 95th %tile Q(veh) | - 0       | -   | -   |

Intersection

Int Delay, s/veh 1.1

Movement EBL EBT WBT WBR SBL SBR

Lane Configurations 

Traffic Vol, veh/h 28 274 279 21 22 17

Future Vol, veh/h 28 274 279 21 22 17

Conflicting Peds, #/hr 0 0 0 0 0 0

Sign Control Free Free Free Free Stop Stop

RT Channelized - None - None - None

Storage Length - - - - 0 -

Veh in Median Storage, # - 0 0 - 0 -

Grade, % - 0 0 - 0 -

Peak Hour Factor 91 91 91 91 91 91

Heavy Vehicles, % 0 1 1 0 0 0

Mvmt Flow 31 301 307 23 24 19

Major/Minor Major1 Major2 Minor2

Conflicting Flow All 330 0 - 0 682 319

Stage 1 - - - - 319 -

Stage 2 - - - - 363 -

Critical Hdwy 4.1 - - - 6.4 6.2

Critical Hdwy Stg 1 - - - - 5.4 -

Critical Hdwy Stg 2 - - - - 5.4 -

Follow-up Hdwy 2.2 - - - 3.5 3.3

Pot Cap-1 Maneuver 1241 - - - 419 726

Stage 1 - - - - 741 -

Stage 2 - - - - 708 -

Platoon blocked, % - - - -

Mov Cap-1 Maneuver 1241 - - - 406 726

Mov Cap-2 Maneuver - - - - 406 -

Stage 1 - - - - 719 -

Stage 2 - - - - 708 -

Approach EB WB SB

HCM Control Delay, s 0.7 0 12.8

HCM LOS B

Minor Lane/Major Mvmt EBL EBT WBT WBR SBLn1

Capacity (veh/h) 1241 - - - 503

HCM Lane V/C Ratio 0.025 - - - 0.085

HCM Control Delay (s) 8 0 - - 12.8

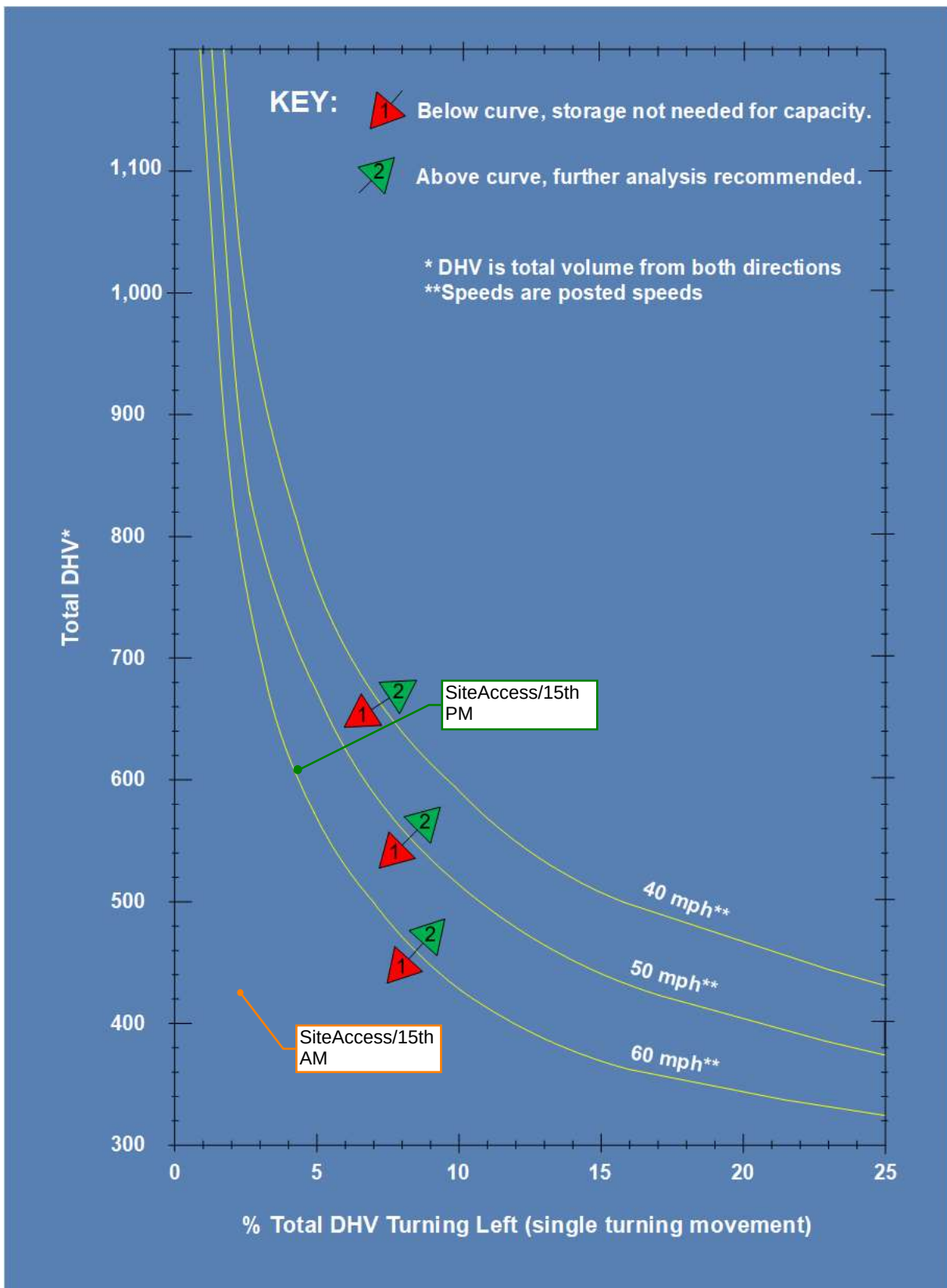
HCM Lane LOS A A - - B

HCM 95th %tile Q(veh) 0.1 - - - 0.3

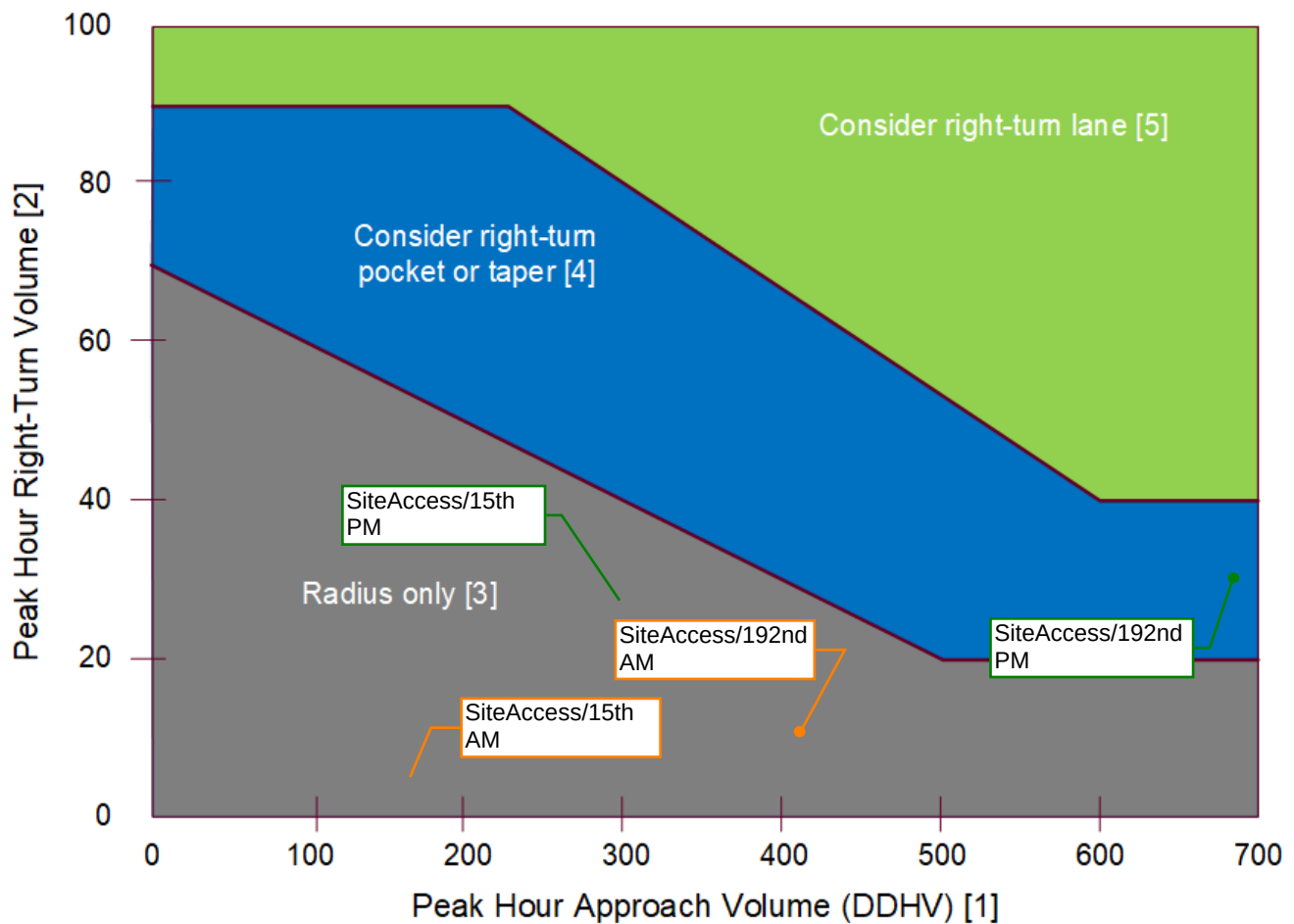


## Appendix I WSDOT Turn Lane Criteria

Exhibit 1310-7 Left-Turn Storage Guidelines: Two-Lane, Unsignalized



## Exhibit 1310-19 Right-Turn Lane Guidelines



Notes:

- [1] For two-lane highways, use the peak hour DDHV (through + right-turn).  
For multilane, highways (posted speed 45 mph or above), use the right-lane peak hour approach volume (through + right-turn).
- [2] When all three of the following conditions are met, reduce the right-turn DDHV by 20:
  - The posted speed is 45 mph or below
  - The right-turn volume is greater than 40 VPH
  - The peak hour approach volume (DDHV) is less than 300 VPH
- [3] For right-turn corner design, see [Exhibit 1310-6](#).
- [4] For right-turn pocket or taper design, see [Exhibit 1310-20](#).
- [5] For right-turn lane design, see [Exhibit 1310-21](#).

# SE 192<sup>nd</sup> Avenue Comprehensive Plan Amendment and Zone Change

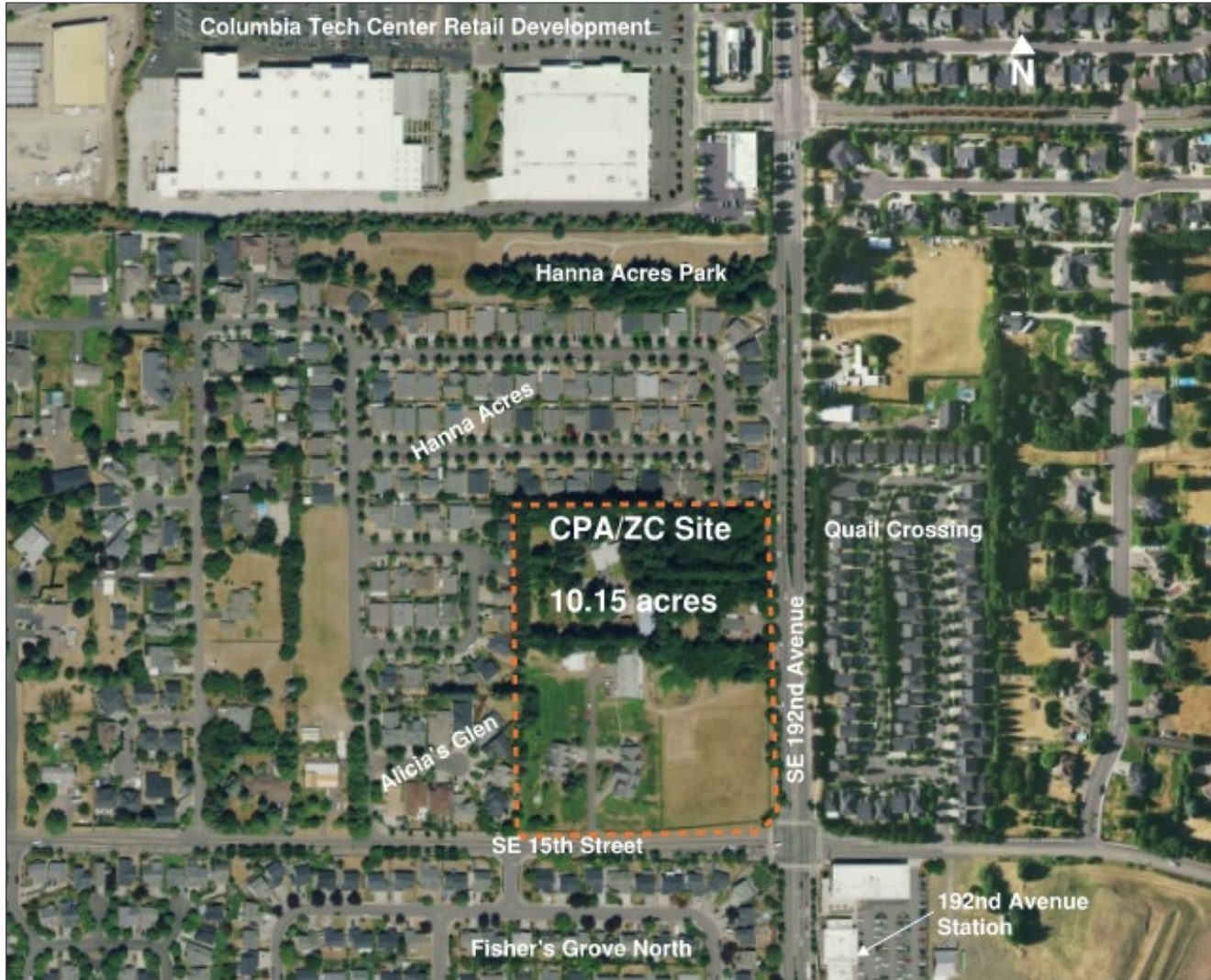
PRJ-168777 / LUP-83484

City of Vancouver Planning Commission

October 24, 2023



# INTRODUCTION



*Applicant*

Vance Development

*Consultant Team*





# CONSISTENCY WITH REVISED CODE OF WASHINGTON

| Planning Goals (RCW 36.70A.020)    | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Urban Growth                    | <ul style="list-style-type: none"><li>• Promotes development in an area with urban services, adjacent to transit, employment, education and recreation</li><li>• Promotes infill development near urban centers reducing pressure on rural lands</li><li>• Development utilizes and supports adjacent multi-modal transportation network through improvements and use.</li><li>• Increases quantity and variety of housing types</li><li>• Provides market rate and affordable housing units</li><li>• Location has adequate facilities and services to accommodate additional housing.</li></ul> |
| 2. Reduce Sprawl                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 3. Transportation                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 4. Housing                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 12. Public Facilities and Services |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

# CONSISTENCY WITH WASHINGTON ADMINISTRATIVE CODE

| Urban Growth Areas and<br>Countywide Planning Policies | Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Urban Density (WAC 365-196-300)                        | <ul style="list-style-type: none"><li>• Expand variety of and capacity for housing</li><li>• Rezone will result in approximately 153-166 additional housing units</li><li>• Housing for a broader range of income levels</li><li>• Affordable housing commitments</li><li>• Locates higher intensity residential adjacent to urban services, transit and other multi-modal facilities</li><li>• Existing transportation system can support the proposed zone change</li><li>• Site design commitments will complement development</li></ul> |
| Land Use Element (WAC 365-196-405)                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Housing Element (WAC 365-196-410)                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Transportation Element (WAC 360-196-430)               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

# NEW LEGISLATION OR POLICIES SHAPING GROWTH

| New Legislation / Policy | General Policy Goal                                                                                     |
|--------------------------|---------------------------------------------------------------------------------------------------------|
| House Bill 1220          | Increase middle-housing production with parameters based upon city size and location.                   |
| House Bill 1181          | Adds a climate goal to GMA, requiring local plans to include climate element in update.                 |
| House Bill 1110          | Amends GMA to require fully planning cities to “plan for and accommodate” housing to all income levels. |
| Housing Action Plan      | Sets targets for housing to address deficit and projected need.                                         |
| Climate Action Framework | Reduce GHG over time and achieve carbon neutrality                                                      |
| Affordable Housing Fund  | Levy renewed by voters in 2023 for preservation, development of affordable housing and rent assistance. |

# KEY APPROVAL CRITERIA

## VMC 20.285.050 Approval Criteria

How the proposal is more consistent than the existing designation with applicable policies of the **Vancouver Strategic Plan** and **Comprehensive Plan**?

# CONSISTENCY WITH THE COMPREHENSIVE PLAN

| Elements and Associated Policies                                                                                                                                                                                                                                                                                             | Response                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Community Development (Chapter 1)</p> <ul style="list-style-type: none"> <li>• CD-1 Citywide land supplies</li> <li>• CD-2 Efficient development patterns</li> <li>• CD-3 Infill and redevelopment</li> <li>• CD-6 Neighborhood Livability</li> <li>• CD-9 Compatible uses</li> <li>• CD-10 Complementary Uses</li> </ul> | <ul style="list-style-type: none"> <li>• Rezone responds directly to City's strategy to increase housing development</li> <li>• Increases variety of housing options at a broader range of affordability levels</li> <li>• Proximity to urban services supports efficient infill development</li> <li>• Site design commitments will provide transition between site and existing neighborhoods</li> </ul> |
| <p>Housing (Chapter 3)</p> <ul style="list-style-type: none"> <li>• H-1 Housing options</li> <li>• H-4 Innovative zoning</li> <li>• H-5 Housing placement near services and centers</li> </ul>                                                                                                                               | <ul style="list-style-type: none"> <li>• Wider variety of housing types and price points</li> <li>• Affordable housing commitment</li> <li>• Adjacency/walkability to services</li> </ul>                                                                                                                                                                                                                  |
| <p>Public Facilities and Services (Chapter 5)</p> <ul style="list-style-type: none"> <li>• PFS-1 Service availability</li> <li>• PFS-2 Service standards</li> <li>• PFS-4 Transportation system</li> </ul>                                                                                                                   | <ul style="list-style-type: none"> <li>• TIA demonstrated level of service standards are met,</li> <li>• Increased eastbound left turn lane storage at 192<sup>nd</sup>/15<sup>th</sup></li> <li>• No safety-based mitigation identified.</li> </ul>                                                                                                                                                       |



# CONSISTENCY WITH THE STRATEGIC PLAN

| Goals                                                                                                                                               | Response                                                                                                                                                                                                                                        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Goal 1, Objective 1.1<br>Develop and maintain a safe, balanced and innovative transportation system that will meet the needs of future generations. | The existing, multi-modal transportation system can support the requested change. Future site development will yield additional roadway improvements along SE 15 <sup>th</sup> Street.                                                          |
| Goal 6, Objective 6.1<br>Support a strong, active neighborhood program that enhances livability and community connections.                          | Proposal will increase housing supply, create diversity in housing options and will provide affordable housing units in an urban area equipped with services including transportation, utilities, employment, retail, education and recreation. |

# KEY APPROVAL CRITERIA

| Approval Criteria<br>(VMC 20.285.050)                                                                                                                                                                                                                                            | Response                                                                                                                                                                                                                                      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>How the proposal is more consistent than the existing designation with each of the following objectives, as applicable:</b>                                                                                                                                                   |                                                                                                                                                                                                                                               |
| <ul style="list-style-type: none"><li>• Encourage more intensive development to locate in major urban centers and corridors...Encourage development of distinct neighborhoods served by commercial nodes and discourage urban sprawl and strip commercial development.</li></ul> | SE 192nd Avenue is a major corridor with a variety of urban services which support high-density residential. Increased housing capacity in the area supports housing and climate goals adopted by the City in response to current conditions. |
| <ul style="list-style-type: none"><li>• Provide development of uses which are functionally integrated with surrounding areas and neighborhoods in terms of local shopping, employment, recreational or other opportunities.</li></ul>                                            | The site is adjacent to SE 192 <sup>nd</sup> Avenue, a high-intensity transit corridor with a variety of services. Multi-modal transportation network and public transit will provide means to connect with services.                         |
| <ul style="list-style-type: none"><li>• Provide adequate provision of transportation, water, sewer and other public services.</li></ul>                                                                                                                                          | Facilities and services can support the requested zone change. Impact fees and SDCs will be paid.                                                                                                                                             |

# KEY APPROVAL CRITERIA

| Approval Criteria<br>(VMC 20.285.050)                                                                                                                                                                   | Response                                                                                                                                                                                                                                                                                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"><li>• Provide development which is compatible and integrated with surrounding uses in terms of scale, orientation, pedestrian enhancements and landscaping.</li></ul> | <ul style="list-style-type: none"><li>• High-density residential is consistent with urban setting adjacent to SE 192<sup>nd</sup> Avenue corridor.</li><li>• Site development commitments in support of existing single family detached residential.</li></ul>                             |
| <ul style="list-style-type: none"><li>• Provide for the formation and enhancement of neighborhoods and communities.</li></ul>                                                                           | <ul style="list-style-type: none"><li>• Increased housing will support existing and future businesses in the vicinity,</li><li>• Frontage improvements (including sidewalks and bike lanes) will benefit all</li><li>• Add diversity of both housing variety and cost of housing</li></ul> |
| <ul style="list-style-type: none"><li>• Provide affordable or below-market rate housing opportunities.</li></ul>                                                                                        | <ul style="list-style-type: none"><li>• Housing diversity will support broader range of income levels</li><li>• 5% of housing units to be rented at 80% AMI</li></ul>                                                                                                                      |

# Questions?

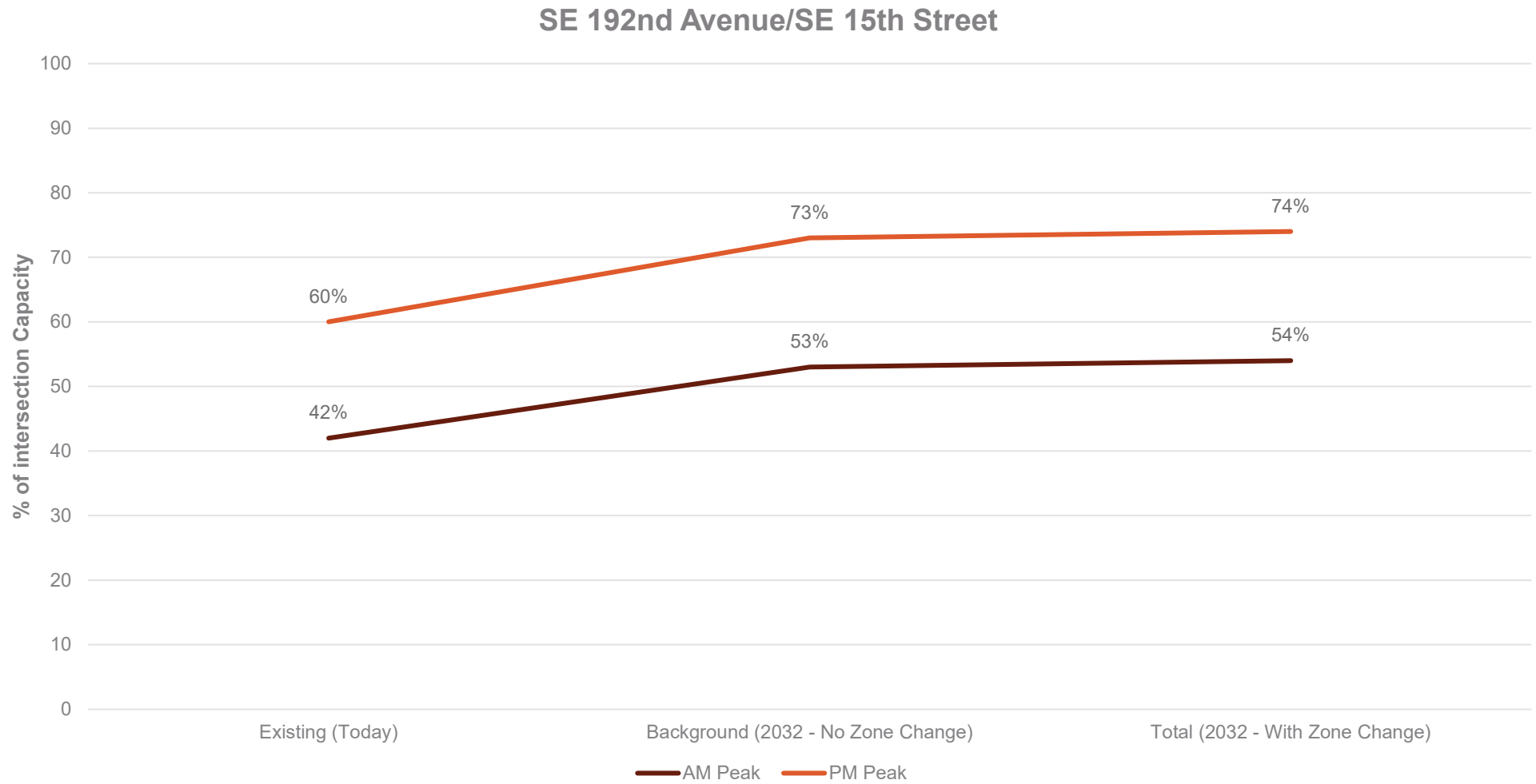


# TRAFFIC STUDY

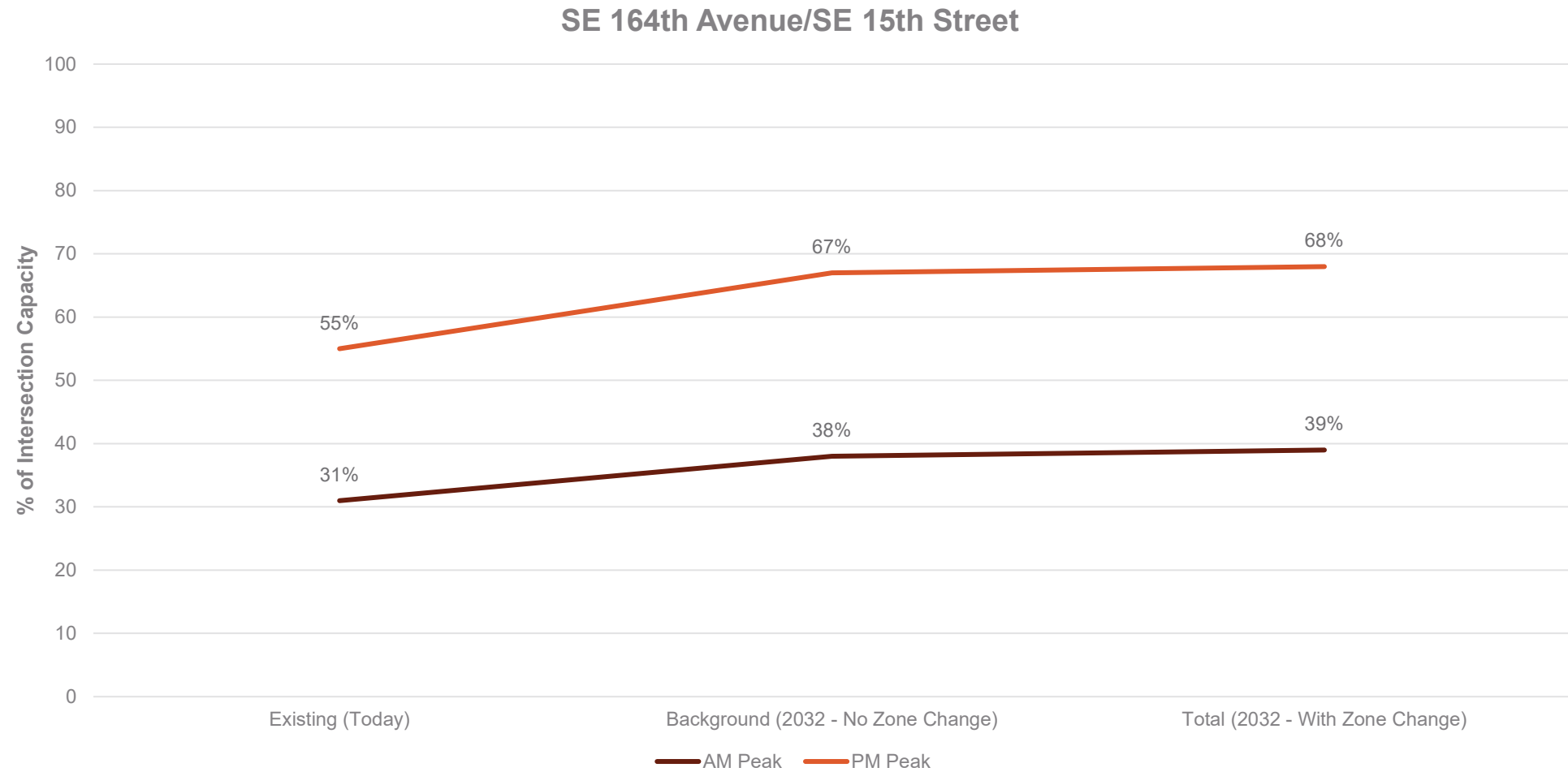
- Traffic study was prepared for previous R-30 zone change proposal in August 2023, and updated to current R-22 zone change proposal in October 2023
- Increase in trips compared to existing R-6 zoning (less than 1 trip per minute):
  - 947 daily trips
  - 46 trips during the weekday AM peak hour
  - 55 trips during the weekday PM peak hour
- Surrounding intersections continue to meet City operational standards with the addition of these trips:
  - Project increases volume-to-capacity (V/C) ratio by approx. 1%
  - Eastbound left-turn queue on 15<sup>th</sup> Street approaching 192<sup>nd</sup> Avenue exceeds available storage. Traffic study recommends extending the turn lane to 175 feet.



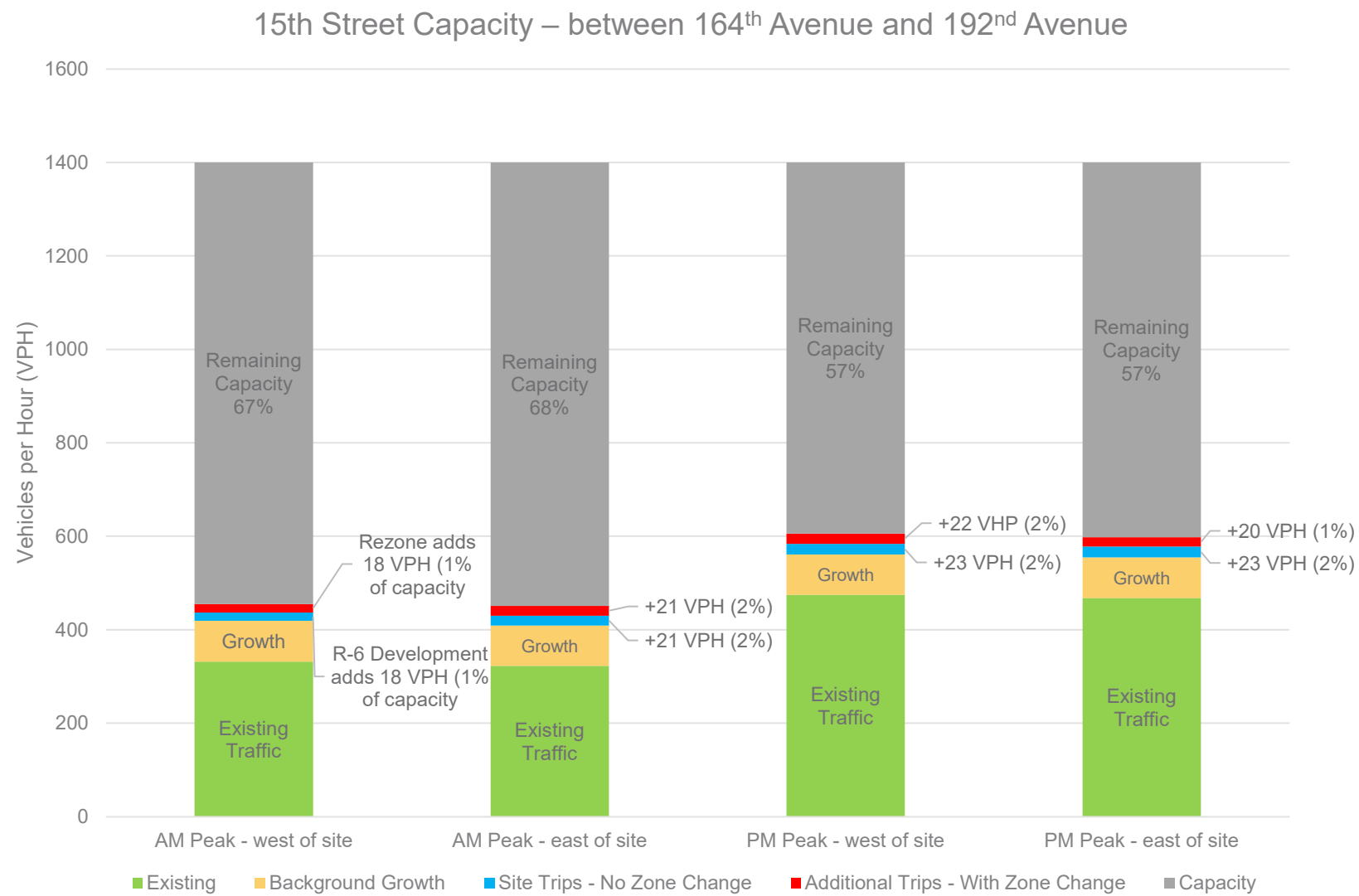
# TRAFFIC STUDY



# TRAFFIC STUDY



# TRAFFIC STUDY



# TRAFFIC STUDY

- Traffic study included crash analysis of study intersections
- We heard concern of neighbors and requested 10 years of crash data along the entire corridor of SE 15<sup>th</sup> Street between 164<sup>th</sup> Avenue and 192<sup>nd</sup> Avenue:
  - 35 total crashes were reported (average of 3.5 crashes per year)
  - 4 crashes involved a bicycle or pedestrian
  - 3 occurred at the traffic signal at 164<sup>th</sup> Avenue, and 1 occurred at an unsignalized driveway
  - Since then, the City has restriped corridor to add buffered bike lanes where feasible
- No safety-based improvements were identified based on review of crash history
- Site development will provide sidewalks, buffered bike lane and lighting along frontage
- City's draft TSP identifies a long-term project to complete buffered bike lane and sidewalk infill along 15<sup>th</sup> Street

# NEIGHBORHOOD OUTREACH

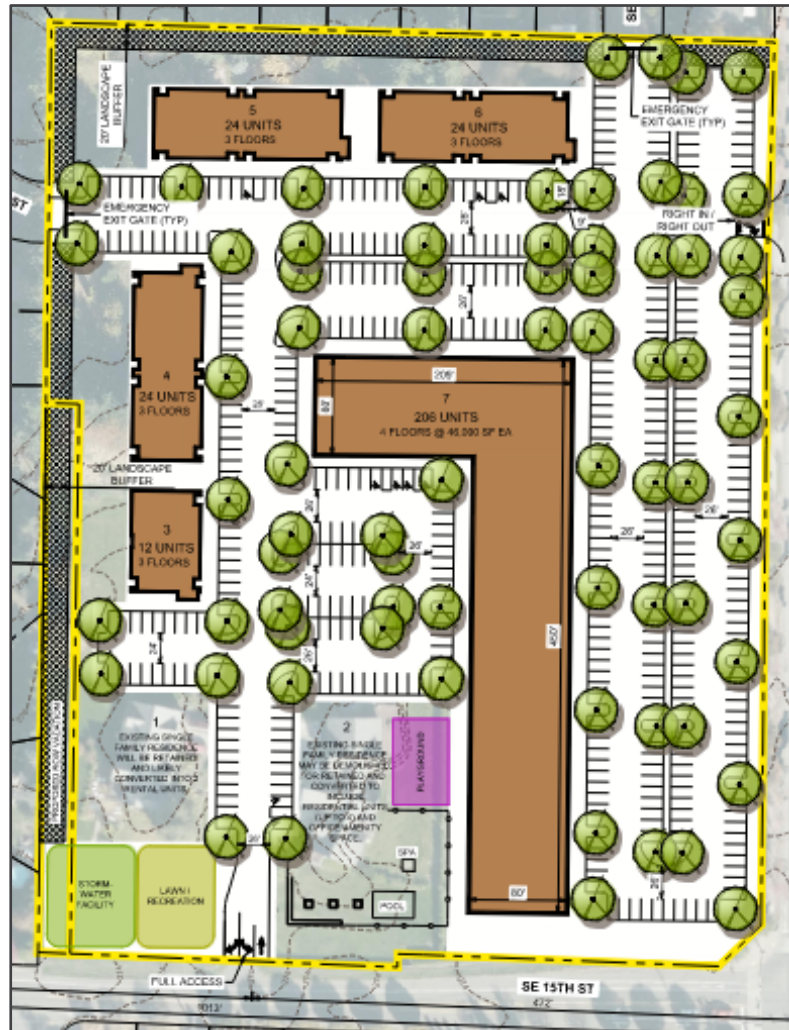
- Canvassed neighborhood May - September.
  - Contact made with all abutting properties.
  - Knocked on doors in neighborhoods to the west and north.
- Applicant facilitated two well attended neighborhood meetings held at Hanna Acres Park September 13<sup>th</sup> and 28<sup>th</sup>.
  - Flyers advertising the meetings were left on 150 homes around site.
- Applicant and consultant team have received and responded to emails from the public throughout the process.
- Applicant is offering additional engagement with adjacent homeowner's associations.
- Applicant provided R-22 alternative proposal materials to approximately 30 interested citizens.



# WHAT WE HEARD

## CONCEPTUAL SITE PLAN REVISIONS R-30 VS. R-22

R-30: 3 and 4 story buildings



R-22: 2 and 3 story buildings



# EXISTING R-6 ZONING VS. PROPOSED R-22 ZONING

|                                 | R-6 Existing Zoning       | R-22 Proposed Zoning      | Development Agreement Commitments                                                                                                                                              |
|---------------------------------|---------------------------|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Building Height                 | 35 feet (2-3 stories)     | 50 feet (4 stories)       | Approx. 30-40 feet (2 - 3 stories)                                                                                                                                             |
| Side / Rear Yard Setbacks       | 5 feet                    | 5 feet                    | 35 feet adjacent to existing residential                                                                                                                                       |
| Front Yard Setback              | 10 feet                   | 10 feet                   | 10 feet                                                                                                                                                                        |
| Maximum Lot Coverage            | 50%                       | 50%                       | 50%                                                                                                                                                                            |
| Minimum Landscaping Requirement | 10% of total net lot area | 10% of total net lot area | 10% of total net lot area<br>AND a commitment to provide a 20-foot landscape buffer and preservation of existing trees adjacent to existing residential to the north and west. |
| Minimum Off-Street Parking      | 1 per lot                 | 0.75 per unit             | 1.75-1.9 per unit anticipated                                                                                                                                                  |



# VANCE DEVELOPMENT SIMILAR BUILDINGS RECENTLY FINISHED CONSTRUCTION





# VANCE DEVELOPMENT SIMILAR BUILDINGS RECENTLY FINISHED CONSTRUCTION



# PREVIOUS DEVELOPMENTS WILSONVILLE, OR





# PREVIOUS DEVELOPMENTS VANCOUVER, WA





# NEARBY APARTMENTS ADJACENT TO SINGLE FAMILY





# SE 192<sup>ND</sup> AVENUE – PRINCIPAL ARTERIAL

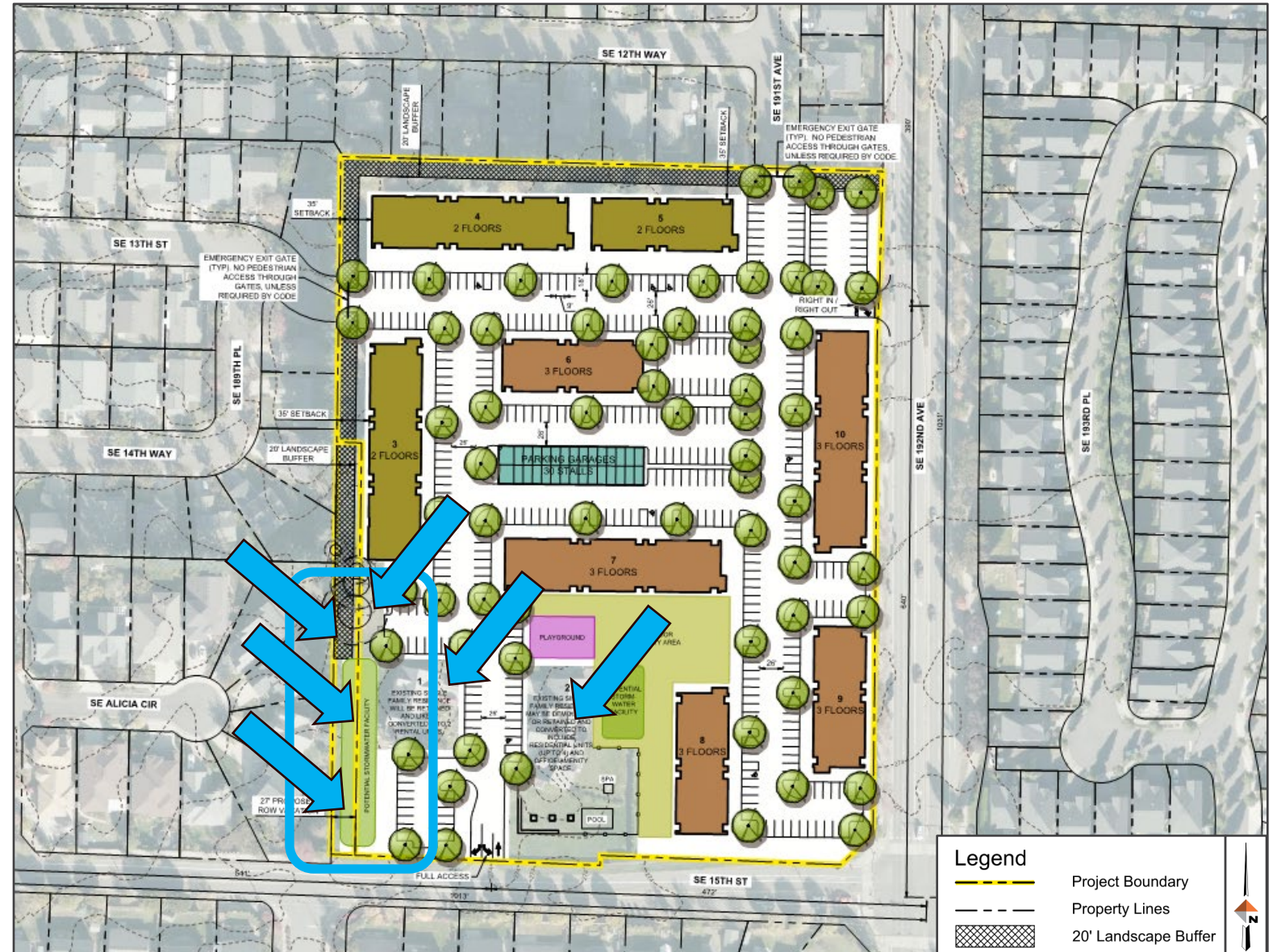
- SE 192<sup>nd</sup> Ave is a Principal Arterial: “It carries large volumes of traffic over long distances. Access is generally limited to intersections with other arterials and collectors. Signalized intersection spacing is regulated. Direct land access is minimal and managed.” VMC 11.80.040
- Land uses adjacent to SE 192<sup>nd</sup> are typically commercial or multifamily, as shown in the image to the right.
- Less than 5% of the property adjacent to SE 192<sup>nd</sup> Ave is developed as single family.
- R-22 is an appropriate zone to transition from the principal arterial to single family zoning.



# WHAT WE HEARD

## Plan Changes following Neighbor Feedback

- Preserve views/existing conditions
  - Keep existing homes
  - Preserve trees with 15", 28" and 36" trunks
- Minimize impact to adjacent homes & neighborhood
  - Solid fence to block headlights
  - Landscape buffer
  - Stormwater facility adjacent to homes – amenity area away from existing homes.

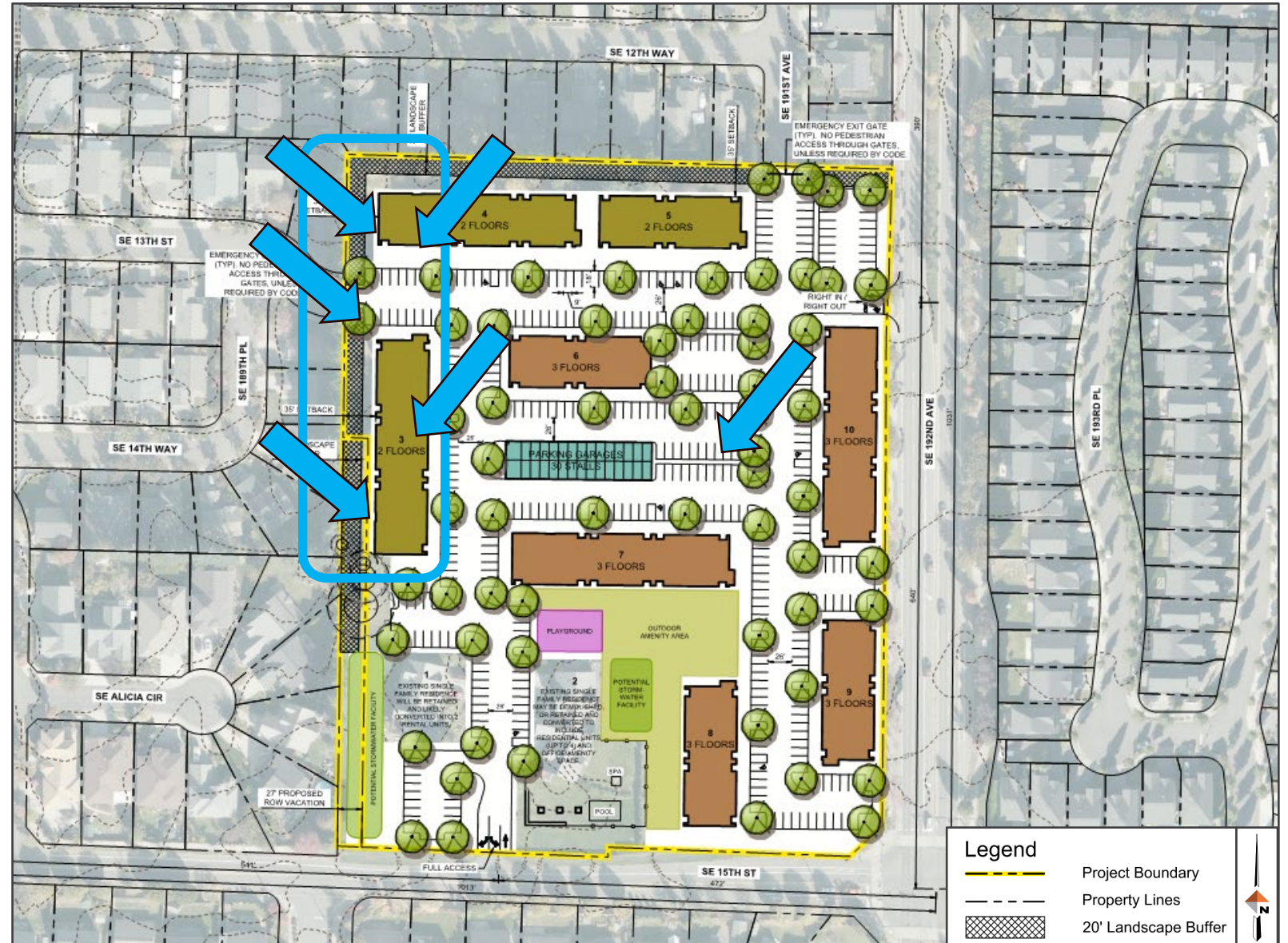




## WHAT WE HEARD

# Plan Changes from Neighbor Feedback

- Preserve views/existing conditions
  - 2 story buildings – matches existing homes
  - Preserve tall pine trees
- Minimize impact to adjacent homes & neighborhood
  - Landscape buffer
  - No vehicular or pedestrian traffic through neighborhood – Emergency access gate to SE 13<sup>th</sup> St
  - High parking ratio to ensure no parking in neighborhood.

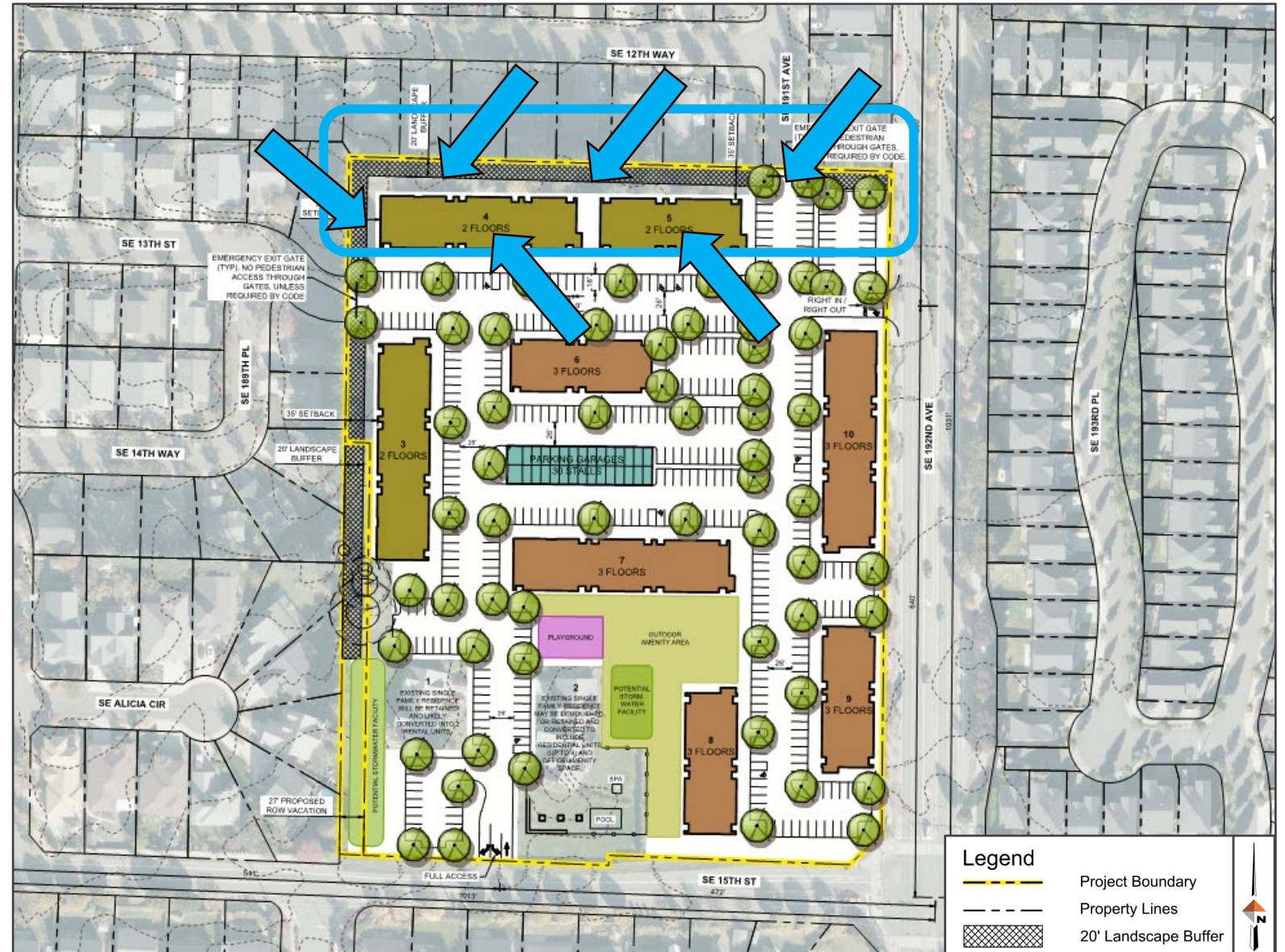




# WHAT WE HEARD

## Plan Changes from Neighbor Feedback

- Preserve views/existing conditions
  - 2 story buildings – matches more than half of existing adjacent homes
  - Preserve tall pine trees
- Minimize impact to adjacent homes & neighborhood
  - Landscape buffer
  - No vehicular or pedestrian traffic through neighborhood – Emergency access gate to SE 191<sup>st</sup> Ave
  - Install fence where missing





# WHAT WE HEARD





# WHAT WE HEARD







# Datepark Residence

3607 E 18th St.

Vancouver, WA 98661



# Meet Our Team



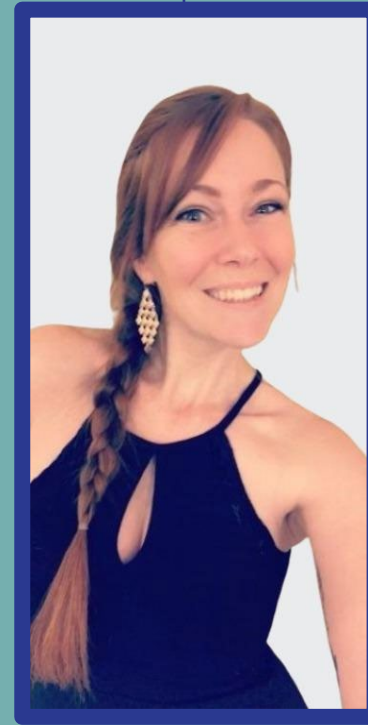
Ashni Prasad  
President



Ashmi Prasad  
Treasurer



Asha Prasad  
General Manager



Danielle Lewis  
Project Manager

# Introduction

Datepark Condominium Inc is an organization that provides affordable housing to help members of our community since 2005. Our organization is comprised of 4 female board members, with three of the four being East Indian.

We have a combined experience of over 25 years in different fields that correlate to this project, including general construction and site development, property management, and real estate. Some past projects our board members have completed are a 45-mixed use apartment complex in Gresham, Oregon and a 31-unit apartment complex in NE Portland, Oregon. We have also remodeled and updated 7 Burger King locations throughout the Portland area.

In addition to that, we have 18 years of experience operating second chance housing complexes, and pride ourselves in serving our community and helping individuals in need to have a safe and stable place to call home. Our vision for Datepark is to provide a larger number of affordable rental units to our community.

From our years of experience, we have a rich understanding of how to assist individuals in our community who face challenges such as mental health concerns, homelessness, addiction, and other struggles. We are not only seen as landlords to these families and individuals, but they also see us as counselors, friends, and most importantly, as someone who is willing to “take a chance on them” and help provide them with stability. This project will continue to build upon our past efforts and allow us to be a better benefit and invaluable resource to our community.



# Datepark Condominiums Inc.



The property is currently located on 4 parcels that total 1.2 acres. It is currently zoned R-18.

# There is currently a total of 5 buildings

- 2 single family homes.
- 13 two-bedroom townhomes, and 1 studio that is divided among 3 separate buildings.
- The townhomes were built in approximately 1974.
- There are currently 36 parking spaces on the 4 parcels



# DEVELOPMENT OF THE SITE

Our goal is to demolish the existing five buildings and build a 72-unit affordable housing complex. We are requesting for our property to be rezoned to R-30 for us to achieve this goal.

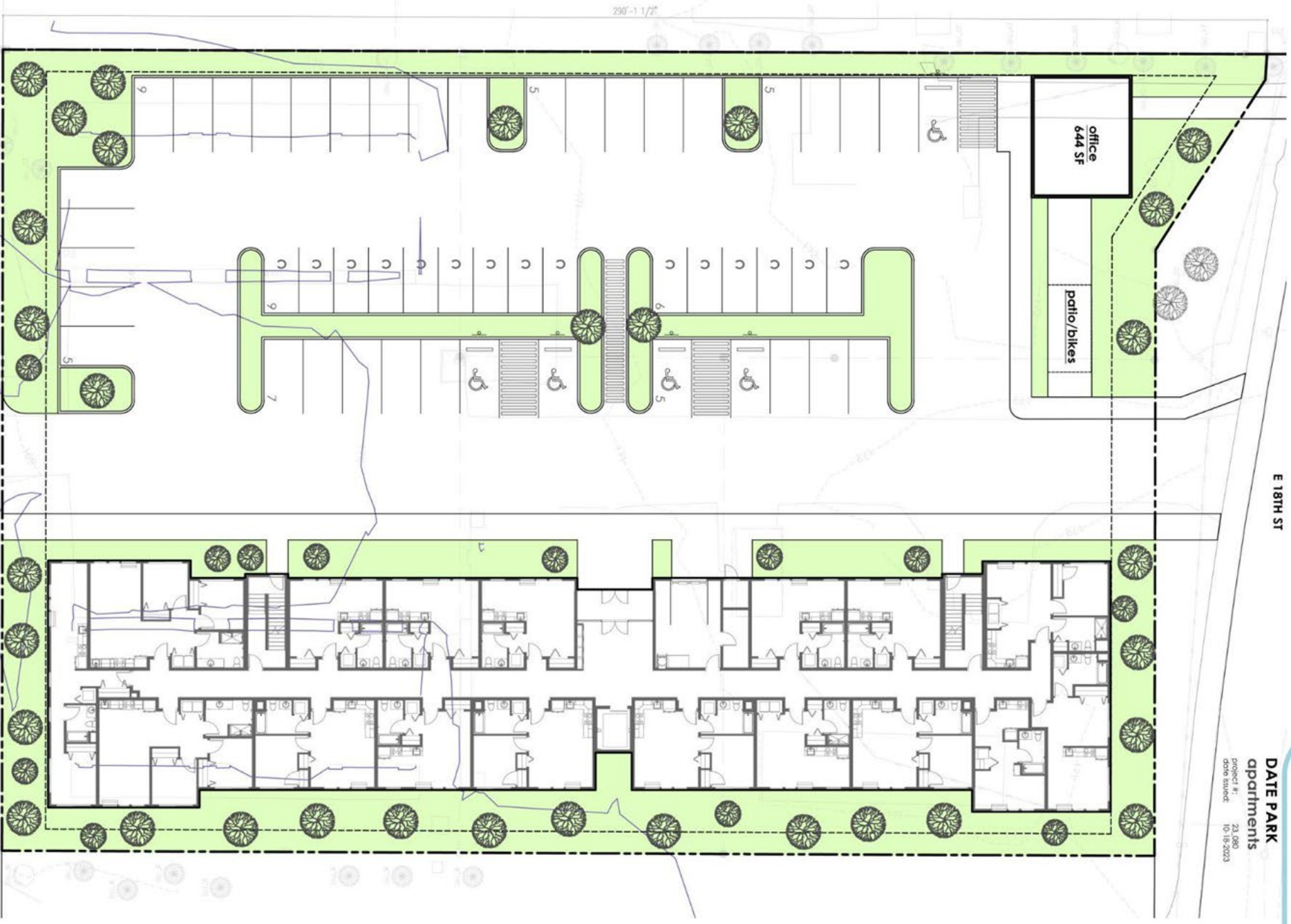
We had previously planned on building a 54-unit complex, but after project review from our architect, we can build up to 72 units. We are excited about being able to expand our unit options to include both one-and two-bedroom units, increasing our ability to help more families.

This entire complex will be affordable housing. We will offer studios, one-bedroom and two-bedroom units. Our complex will be four-stories, and a total of 50' tall and will include amenities such as:

- EV parking stations
- Locking bike area
- Outdoor patio/gazebo area
- Keyless secured entrances
- Elevator
- Common areas
- Washer/dryer in units
- Video surveillance of all outdoor and common areas
- 51 parking spaces



E 18TH ST



① **IDEA 04**

site plan **IDEA 04**



# Rehoming Our Existing Tenants

Our goal for our current tenants is to relocate every one of them to other properties, which will either be owned by us, family, or other community partners. We will not be “evicting” anyone. We have been in constant communication with them, they are aware of this project, and the upcoming changes and relocation. They will have the option to remain at their new housing or move to the new complex once it has been completed.

While deciding on proper placement, we have taken things into consideration, such as disabilities, age and other factors to ensure we can place them in a home that will best meet their needs, while keeping their rent stable and minimizing the impact to them.



# Our Community is in Need

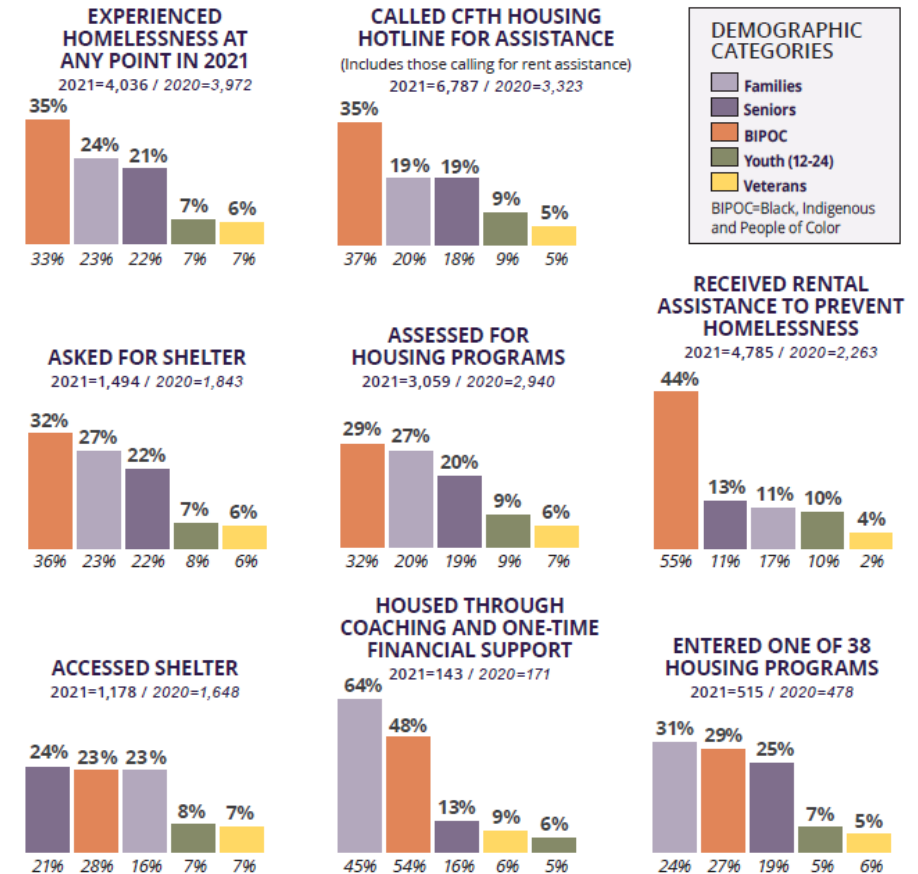
It is a known fact that we do not have enough housing available for all members of our community, it is especially those who have rental qualification barriers.

Each dollar invested in affordable housing will help the community grow. Not only by directly helping individual community members, but directly affecting our community as well. In 2012, the secretary of HUD stated that , “...between shelters and emergency rooms and jails, it costs about \$40,000 a year for a homeless person to be on the streets.” That is a staggering number.

Our complex will be a continual source of low income housing for many, many years to come.

## Homeless System Numbers | 2021 STATE OF HOMELESSNESS IN CLARK COUNTY

The data below illustrates the state of homelessness in Clark County, WA, in 2021. The whole numbers (example 4,036) represent households, not individuals. Percentages do not add up to 100% as households often fit in more than one demographic category. Data from 2020 is italicized and listed below each bar for comparison.



## Homelessness in our Community

June 28th of this year, The Columbian wrote an article regarding the homeless crisis in our community. In that article they stated, "Despite efforts and new strategies by housing officials, 2022 data recently pulled from the Homeless Crisis Response System showed that homelessness is rising in Clark County, with 9,032 people from 5,352 households identified in 2022.". This article also reports "The increase represents a 43.7 percent increase in 2021 levels, when council reported 6,285 people experiencing homelessness."

This article goes on to say "Homelessness does not exist in a vacuum of bad individual choices and circumstances," said Laura Ellsworth, strategic partnerships and advocacy manager for Council for the Homeless. "The pressures that are squeezing people and communities causing homelessness are only increasing as rents have gone up, housing stock remains at critical short supply and impacts of a global pandemic continue to be felt."

Our housing complex will not contribute to a larger homeless population in our community. It will do the exact opposite. It will offer affordable housing to persons who are struggling, and who may turn to the street with no other option for affordable housing.

# Impact

- Referencing Maslow's hierarchy of needs, one of the primary psychological needs for survival is "shelter". Sadly, housing is a comfort many individuals in our community do not have. A home is a safe space that provides stability and security to all families and individuals. For instance, everyday many individuals in our community experience mental health crises. If they had access to a safe haven, it would build a sense of security and help them with a better future.
- Datepark Development would have a direct impact on the homeless crisis by offering low income affordable housing to individuals, in turn reducing our homeless crisis
- As a private entity we want to be an exemplary leader to our community and to encourage other landlords to give individuals a second chance
- We have a strong humanitarian investment in the success of our community, and a desire to see our community grow and excel
- Having stable housing will positively impact individuals' health, help with employment, as well as reduce crime and save the community money.

# Community Partners

Datepark has had a long-standing relationship with the following local agencies and will continue to network with new and existing agencies in our



- SHARE
- YWCA
- YMCA
- Department of Social and Health Services
- PeaceHealth
- Veterans Administration
- Vancouver Housing Authority
- Share House
- Community Services Northwest
- Council for the Homeless

# The End

Thank you for taking the time to listen to our presentation and consider our application. We hope you support us in our decision to develop Datepark Residence and make a difference in our community.

Any questions?





## MEMORANDUM

Date: October 23, 2023

To: Asha Prasad  
Datepark Condominiums  
6315 SE Evergreen Highway  
Vancouver WA 98661

From: Frank Charbonneau, PE, PTOE

Subject: Trip Generation Assessment - update  
**Datepark Residential Development**  
East 18<sup>th</sup> Street, Vancouver

FL2389

As required by the City of Vancouver a trip generation assessment has been prepared for the Datepark Residential development site located between East 17<sup>th</sup> and East 18<sup>th</sup> Streets at address #3607 & #3701 East 18<sup>th</sup> Street. Ultimately the development project will consist of demolishing the existing residential units on four tax lots and rebuilding the site with affordable housing.

Currently located on the site are two single-family homes, 13 townhomes/apartments, and one residential unit operating as an office. The proposed development plans on constructing a total of 72 affordable apartment units in one four-story building. Traffic access will occur through the middle of the site and provide driveway connections on the north end of the property to east 18<sup>th</sup> Street, and to the south at East 17<sup>th</sup>.

Currently the property is zoned as R-18 and the developer is requesting a rezone to R-30. In order to approve the rezone, the City is requiring a trip generation comparison of the potential maximum number of units under each zoning scenario. For R-18 it has been estimated that a total of 41 affordable housing units (apartments) could be placed on the site. For the R-30 zoning the maximum number of affordable housing units equates to 72 apartments.

A trip generation summary was prepared based on recent direction from City transportation staff. For this project rates from the ITE Trip Generation manual (11<sup>th</sup> edition, year 2021) were applied for the category of Affordable Housing, land-use code #223.

According to the ITE Trip Generation manual and as listed in the following summary tables a higher number of trips will be produced under the R-30 zoning than for the R-18 zoning.

| Zoning                 | ADT Trips  | AM Peak Trips | PM Peak Trips |
|------------------------|------------|---------------|---------------|
| R-30                   | 346        | 36            | 33            |
| <u>R-18</u>            | <u>197</u> | <u>21</u>     | <u>19</u>     |
| <b>Trip Difference</b> | <b>149</b> | <b>15</b>     | <b>14</b>     |

Table 1a presents the trip generation projection based on the R-18 zoning with 41 housing units. Table 1b presents the trip generation for the R-30 zoning with 72 housing units.

Table 1c lists the difference in trips relative to the zoning comparisons.

**Table 1a. Projected trip generation for Datepark Residence. (R-18 zoning)**

| ITE Land Use                 | Units              | Weekday |              |       |      |              |       |      |
|------------------------------|--------------------|---------|--------------|-------|------|--------------|-------|------|
|                              |                    | ADT     | AM Peak Hour |       |      | PM Peak Hour |       |      |
|                              |                    |         | Total        | Enter | Exit | Total        | Enter | Exit |
| PROPOSED SITE                |                    |         |              |       |      |              |       |      |
| Affordable Housing (#223)    | 41 apartment units |         |              |       |      |              |       |      |
| Generation Rate <sup>1</sup> |                    | 4.81    | 0.50         | 29%   | 71%  | 0.46         | 59%   | 41%  |
| Site Trips                   |                    | 197     | 21           | 6     | 15   | 19           | 11    | 8    |

<sup>1</sup> Source: Trip Generation, 11th Edition, ITE, 2021, average rates.

**Table 1b. Projected trip generation for Datepark Residence. (R-30 zoning)**

| ITE Land Use                 | Units              | Weekday |              |       |      |              |       |      |
|------------------------------|--------------------|---------|--------------|-------|------|--------------|-------|------|
|                              |                    | ADT     | AM Peak Hour |       |      | PM Peak Hour |       |      |
|                              |                    |         | Total        | Enter | Exit | Total        | Enter | Exit |
| PROPOSED SITE                |                    |         |              |       |      |              |       |      |
| Affordable Housing (#223)    | 72 apartment units |         |              |       |      |              |       |      |
| Generation Rate <sup>1</sup> |                    | 4.81    | 0.50         | 29%   | 71%  | 0.46         | 59%   | 41%  |
| Site Trips                   |                    | 346     | 36           | 10    | 26   | 33           | 19    | 14   |

<sup>1</sup> Source: Trip Generation, 11th Edition, ITE, 2021, average rates.

**Table 1c. Projected trip generation for Datepark Residence. (Trip Difference)**

| ITE Land Use                               | Weekday |              |       |      |              |       |      |
|--------------------------------------------|---------|--------------|-------|------|--------------|-------|------|
|                                            | ADT     | AM Peak Hour |       |      | PM Peak Hour |       |      |
|                                            |         | Total        | Enter | Exit | Total        | Enter | Exit |
| Proposed Site with R-30 zoning (Net Trips) | 346     | 36           | 10    | 26   | 33           | 19    | 14   |
| Proposed Site with R-18 zoning (Net Trips) | 197     | 21           | 6     | 15   | 19           | 11    | 8    |
| Net Trip Difference                        | 149     | 15           | 4     | 11   | 14           | 8     | 6    |

With this memo It is requested that the City approve the zone change to R-30 and support the developer's plan to rebuild the site with 78 affordable housing units. Upon confirmation of the approved zone change Charbonneau Engineering will prepare to follow up with the required trip generation and distribution analysis and report.

If you should have any questions, please contact Frank Charbonneau, PE, PTOE at 971.322.8003 or email [Frank@CharbonneauEngineer.com](mailto:Frank@CharbonneauEngineer.com).

Attachment

- City email 7/21/23, Eric Hahn, PE

## Frank Charbonneau

---

**From:** Hahn, Eric <Eric.Hahn@cityofvancouver.us>  
**Sent:** Friday, July 21, 2023 4:08 PM  
**To:** Frank Charbonneau  
**Subject:** RE: Datepark Residence - Traffic Analysis

Frank,

Actually, no. For the rezone, we're trying to compare **potential theoretical development** under each zone. We're not really wanting or needing analysis of the actual existing units or the actual proposal under the new zone. It's a question of changed zoning, not actual development; council needs to see the **potential** impacts created by the change in zoning. We need to see the difference between what a potential developer might do under each zone.

Let me know if this makes sense.

-Eric

---

**From:** Frank Charbonneau <frank@charbonneauengineer.com>  
**Sent:** Friday, July 21, 2023 3:27 PM  
**To:** Hahn, Eric <Eric.Hahn@cityofvancouver.us>  
**Subject:** FW: Datepark Residence - Traffic Analysis

Eric – Just to confirm, for the existing zoning (R-18) scenario the trip gen needs to be based on the #units in place today, instead of some maxed out number of units that might fit the site under the same R-18 zone.

Frank

---

**From:** Frank Charbonneau  
**Sent:** Thursday, July 20, 2023 10:41 AM  
**To:** Hahn, Eric <[Eric.Hahn@cityofvancouver.us](mailto:Eric.Hahn@cityofvancouver.us)>  
**Cc:** Patrick, Jennifer <[Jennifer.Patrick@cityofvancouver.us](mailto:Jennifer.Patrick@cityofvancouver.us)>; Snodgrass, Bryan <[Bryan.Snodgrass@cityofvancouver.us](mailto:Bryan.Snodgrass@cityofvancouver.us)>; Person, Mark <[mark.person@cityofvancouver.us](mailto:mark.person@cityofvancouver.us)>  
**Subject:** RE: Datepark Residence - Traffic Analysis

Thanks for the input Eric.

Frank

---

**From:** Hahn, Eric <[Eric.Hahn@cityofvancouver.us](mailto:Eric.Hahn@cityofvancouver.us)>  
**Sent:** Wednesday, July 19, 2023 5:13 PM  
**To:** Frank Charbonneau <[frank@charbonneauengineer.com](mailto:frank@charbonneauengineer.com)>  
**Cc:** Patrick, Jennifer <[Jennifer.Patrick@cityofvancouver.us](mailto:Jennifer.Patrick@cityofvancouver.us)>; Snodgrass, Bryan <[Bryan.Snodgrass@cityofvancouver.us](mailto:Bryan.Snodgrass@cityofvancouver.us)>; Person, Mark <[mark.person@cityofvancouver.us](mailto:mark.person@cityofvancouver.us)>  
**Subject:** RE: Datepark Residence - Traffic Analysis

Frank,

For the purposes of the rezone, all we need is the comparison study. Assuming the rezone is approved, we will then need a trip generation & distribution study for the proposed apartments. Please see the attached pre-app report.

Let me know if you have questions.

-Eric

---

**From:** Frank Charbonneau <[frank@charbonneauengineer.com](mailto:frank@charbonneauengineer.com)>

**Sent:** Wednesday, July 19, 2023 11:07 AM

**To:** Hahn, Eric <[Eric.Hahn@cityofvancouver.us](mailto:Eric.Hahn@cityofvancouver.us)>

**Cc:** Patrick, Jennifer <[Jennifer.Patrick@cityofvancouver.us](mailto:Jennifer.Patrick@cityofvancouver.us)>; Snodgrass, Bryan <[Bryan.Snodgrass@cityofvancouver.us](mailto:Bryan.Snodgrass@cityofvancouver.us)>

**Subject:** Datepark Residence - Traffic Analysis

**CAUTION:** This email originated from outside of the City of Vancouver. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Eric – We will be working with the property owner and developer (Asha Prasad, Datepark Condominiums) to prepare the necessary traffic analysis elements for the affordable housing facility planned on several parcels between East 18<sup>th</sup> and East 17<sup>th</sup> Streets in Vancouver. An aerial map of the site is attached for location reference.

The only input we have from the City so far regarding traffic is Brian's email dated 7-12-23 that states a trip generation assessment is necessary that compares the trips under the current and proposed zoning. So initially we will perform this task. Beyond that does the City envision additional analysis such as trip generation/distribution report, or a larger traffic study?

Please let me know as I am in the process of preparing a traffic services proposal for the client. Thanks.

Frank Charbonneau, PE, PTOE  
Charbonneau Engineering  
971.322.8003





# Proposed Warehouse Code Amendments

Planning Commission Public Hearing  
October 24, 2023



**Chad Eiken**, Director, CDD  
**Bryan Snodgrass**, Principal Planner, CDD



# Agenda

- Warehouse Moratorium and Study Goals
- Recap of Process To-Date
- Proposed Code Amendments
- Public Outreach
- Staff Recommendation
- Next Steps



# Warehouse Moratorium/Study Goals



**Understand  
Differences  
& Impacts**



**Gather Public  
and  
Stakeholder Input**



**Propose Code  
Amendments**

# Prior Council and Planning Commission Review

|                                                                  |                                                          |                                                       |                                                        |
|------------------------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------|--------------------------------------------------------|
| <b>December 2022</b><br>City Council enacts emergency moratorium | <b>February 2023</b><br>City Council ratifies moratorium | <b>May 1, 2023</b><br>City Council Workshop           | <b>June 5, 2023</b><br>City Council extends moratorium |
| <b>July 25, 2023</b><br>Planning Commission Workshop             | <b>August 14, 2023</b><br>City Council Workshop          | <b>Sept. 12, 2023</b><br>Planning Commission Workshop | <b>October 2, 2023</b><br>City Council Workshop        |



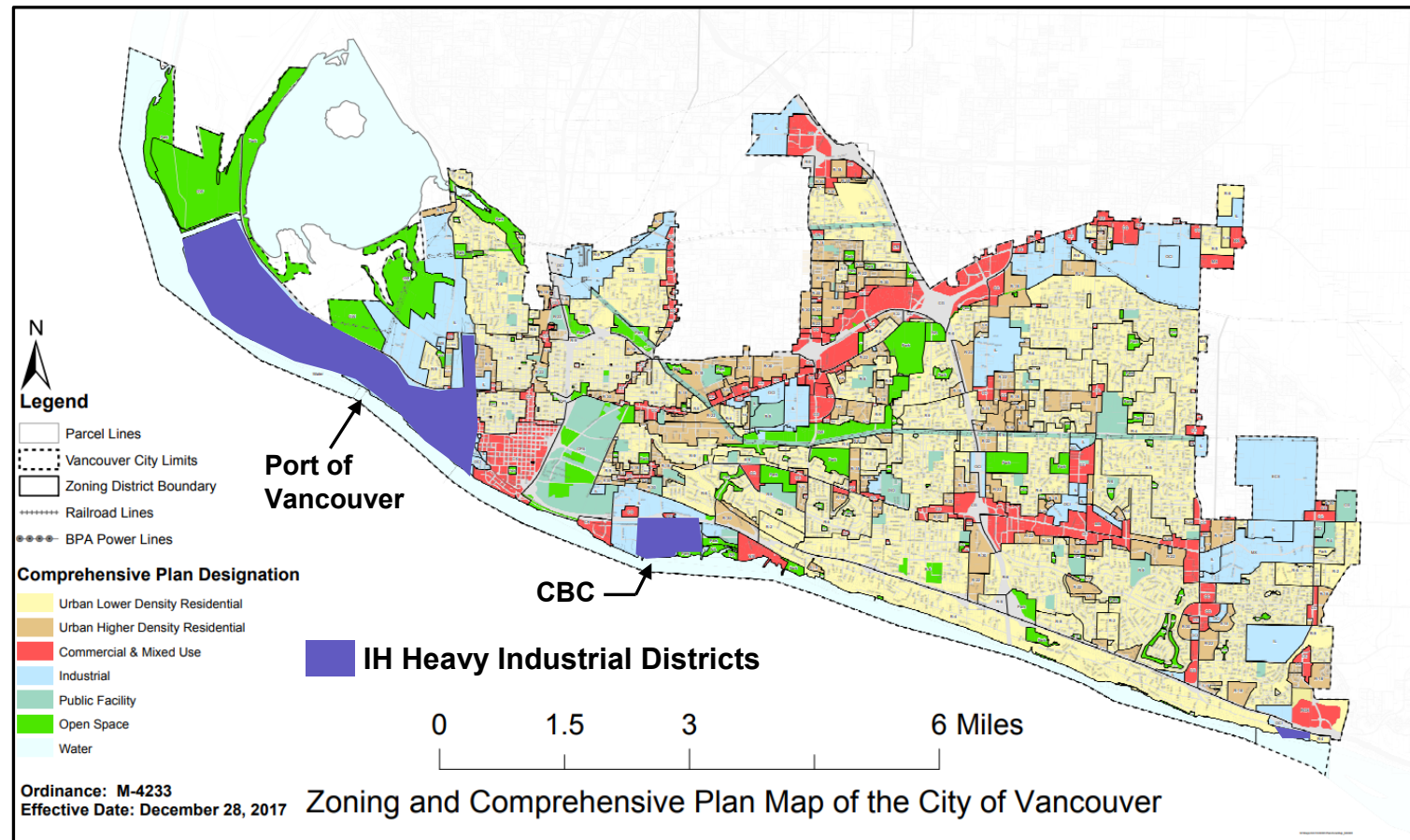
# Proposed Amendments to VMC Title 20

1. Make warehouses >250,000 s.f. (in a single building) prohibited in the IL, Light Industrial District and a limited use ('L' in use table) in the IH, Heavy Industrial District subject to additional standards and restrictions
2. Reduce minimum parking space requirement for all warehouses from 1:2,000 s.f. to 1:5,000 s.f.
3. Decrease maximum lot coverage for large warehouses in IH District from 100% to 75%



# IH Heavy Industrial Districts

- Proposed changes would allow > 250,000 s.f. warehouses only in IH Districts
- Effectively, could only locate in Port of Vancouver or Columbia Business Center (CBC)





# Proposed Amendments to VMC Title 20 (continued)

4. Add limited use/development standards for warehouses > 250,000 s.f. such as:
- Prohibit truck traffic to/from large warehouses on Fruit Valley Road
  - Reduce visual impacts if next to public street or highway: 1) architectural elements, e.g. windows, articulation of façade, and/or moderately-dark wall color, and 2) 25-foot wide landscaped buffer with conifer or climate adaptive trees that mature at 60 feet in height



# Proposed Amendments to VMC Title 20 (continued)

5. Add climate action measures for warehouses > 250,000 s.f. such as:
- Tree density increased from 30 tree units per acre to **33** tree units per acre
  - Building roofs to be designed/constructed to handle structural load of solar panels/equipment; 'solar ready' equipment; HVAC systems to be clustered
  - Skylights and/or clerestory windows
  - Roofs to be white/light colored



# Proposed Amendments to VMC Title 20 (continued)

## Climate action measures (continued)

- Truck engine idling prohibited while parked or loading/unloading
- All loading docks to be outfitted with wiring/conduit for charging electric-powered trucks
- Electric vehicle charging stations to be provided at a minimum of 20% of parking spaces
- Indoor bike storage room to be provided for employees



# Public Outreach

City's BeHeard Webpage

Alliance for Community  
Engagement (ACE)

Identity Clark County (ICC)

Port of Vancouver

Fruit Valley Neighborhood Assoc.

SEPA Agencies





# City Council Feedback from 10/2/23 WS

1. Provide more outreach to Fruit Valley N.A. residents
2. Simplify multiple tree planting requirements
3. Require closer proximity for off-site tree plantings
4. Possible conflict between skylights, solar panels
5. Require conduit/wiring for loading docks, not charging outlets though





# Approval Criteria

## VMC 20.285.090 Zoning Code Text Amendments

*Proposed zoning or development regulation text changes shall be considered based on the following:*

- 1. The proposed change is consistent with the comprehensive plan; and*
- 2. The proposed change is necessary to further the public interest based on present needs and conditions.*



# Staff Recommendation



*Staff recommends that Planning Commission recommend approval of the proposed warehouse code changes to City Council as described in the staff report and specifically in Exhibit B.*



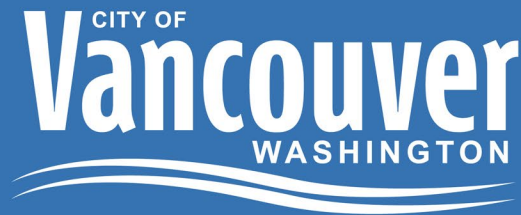
# Next Steps

- November 13: City Council First Reading
- November 20: City Council Second Reading and Public Hearing
- December 6: Ordinance takes effect and moratorium expires



# Thank You

To learn more, visit: [beheardvancouver.org/warehouse](https://beheardvancouver.org/warehouse)





# PLANNING COMMISSION

**TO:** Chair Ledell and Planning Commission

**FROM:** Chad Eiken, Director, Community Development; Bryan Snodgrass, Principal Planner, Community Development

**SUBJECT: Proposed Use and Development Standards for Warehouse and Freight Movement Uses**

**Report Date:** 10/13/2023  
**Hearing Date:** 10/24/2023  
**Proposal:** Updates to VMC Title 20, Land Use and Development Code, Regarding the regulation of Warehouse and Freight Movement Uses  
**Location:** Heavy Industrial and Light Industrial Districts  
**Proponent:** Community Development Department  
**City Staff:** Chad Eiken, CDD Director; Bryan Snodgrass, Principal Planner  
**Recommendation:** Forward to City Council a recommendation for adoption of the proposed code changes to VMC Title 20, with amendments as discussed in the report

## I. PRIOR COMMISSION REVIEW:

The Planning Commission has held two public workshops on the proposed code changes: July 25, 2023 and September 12, 2023. At the September 12 workshop, the Commission indicated that the draft code amendments should be scheduled for a public hearing.

## II. BACKGROUND AND REVIEW PROCESS:

### Moratorium

Late in 2022, city planning staff noticed a trend of very large (as large as 600,000 square feet) warehouses being submitted for development approvals. At the time, there were as many as eight warehouses larger than 100,000 square feet being proposed or under construction, with a cumulative building area of 3.34 million square feet, the equivalent of 58 football fields. Other cities were (and are) experiencing a similar surge in large warehouse projects, and staff was hearing reports of mega-warehouses elsewhere, such as a 2.5 million square foot warehouse in Tacoma.

These extremely large facilities appear to be a growing trend nationally in response to the increasing demand for online retail shopping and parcel delivery as well as supply chain logistics issues, and consume significant swaths of limited industrial land with typically lower jobs per acre ratio than many other industrial uses.



Staff became concerned that if the trend continued, limited industrial lands would be consumed by low-wage, low jobs per acre uses that could otherwise be developed for higher wage skilled manufacturing or research and development jobs. Additional concerns with large warehouses that were identified by staff included an increase in truck traffic and pollution, energy consumption/climate impacts from such large building footprints, visual impacts, and limited potential for adaptive re-use of such structures if in the future they are no longer needed for storage of goods.

In December of 2022, planning and economic development staff took their concerns to City Council and recommended that an emergency six-month moratorium be adopted to prevent the submission of any new pre-applications or land use applications for warehouses larger than 100,000 square feet to allow staff time to study these new types of warehouses and understand the physical, operational, and economic differences from traditional wholesale warehouses - as well as key differences in impacts - to inform possible new use and development standards. Because state law only allows land use moratoriums for six months at a time, staff indicated that one six-month extension would be needed to ensure sufficient time to complete needed analysis, public engagement, and development of code amendments.

On December 12 following an executive session, City Council at their regular meeting adopted an emergency ordinance on new large warehouse applications, and the emergency ordinance was affirmed by City Council following a public hearing as required by state law, on January 23, 2023. Three amendments to the initial moratorium ordinance were requested by City Council, which were adopted by ordinance on February 6, 2023, including: 1) an exemption from the moratorium for the Port of Vancouver; 2) increase in the size of warehouses subject to the moratorium from 100,000 square feet to 250,000 square feet and larger; and 3) an exemption from the moratorium for any storage for a publicly-traded product, if formalized through a development agreement.

On June 5, 2023, following a public hearing, City Council approved a six-month extension of the moratorium but also encouraged staff to propose any code amendments as soon as possible so the moratorium may be terminated sooner. The moratorium will end on December 6, 2023 unless code amendments are adopted sooner. Staff's work plan anticipates taking a set of code amendments to City Council for their approval in early October.

#### Local and National Context: Increase in Need for Warehouse and Distribution Facilities

Warehousing, broadly described as the storage of bulk inventory in large facilities, has undergone substantial evolution, from the introduction of forklifts and pallets in the 1920's to automation and cloud computing today. As a result of advances in technology and proliferation of trucking, warehouses are a critical intermediate step between the supplier and consumer. Additionally, trends like e-commerce and online shopping, near-shoring and reshoring of manufacturing have increased global demand for industrial warehousing, resulting in unprecedented warehouse development in recent years.<sup>1</sup> Changes in shopping behavior during the global pandemic have created further demand for warehouse space.

Nationally, warehouse capacity is reportedly at a premium, with almost 96 percent of existing warehouse space in use. E-commerce, with its direct shipments to consumers, represents a fundamental shift in warehouse logistics. CBRE estimates that the U.S. alone needs 330 million

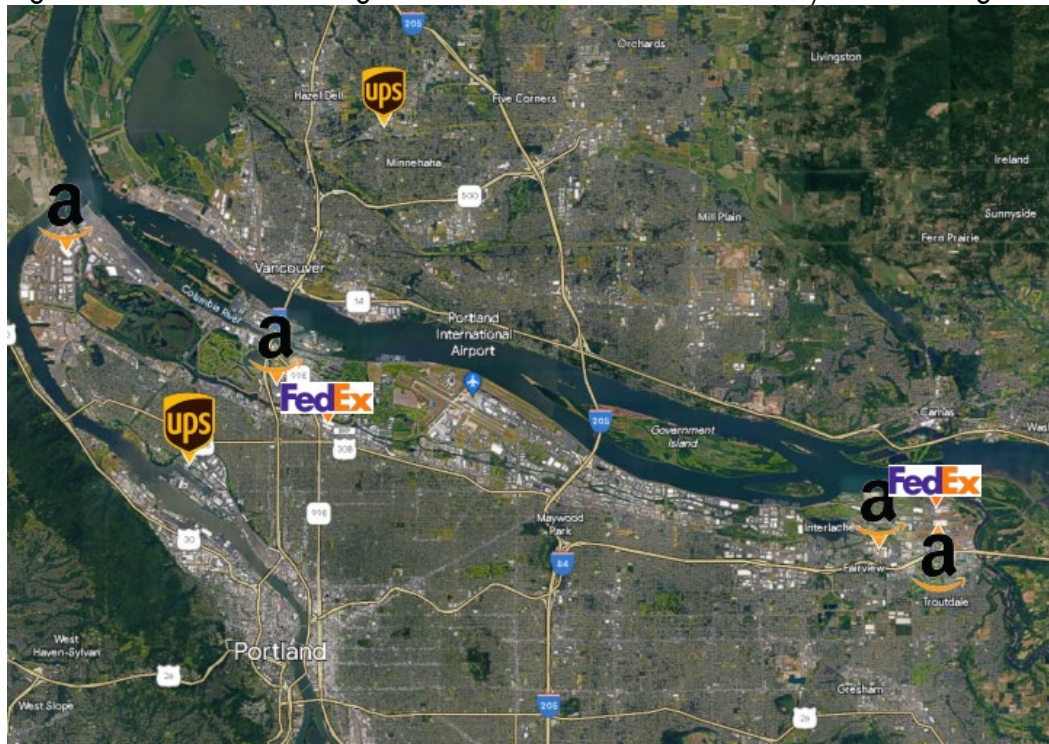
<sup>1</sup>Fehr & Peers, 'Traditional Warehouse Developments vs. Modern E-commerce Facilities,' 2023

<sup>2</sup> "The Warehouse Space Race," [www.Prospect.org](http://www.Prospect.org)

square feet of additional warehouse space to meet e-commerce demand into 2025; to meet total demand, another firm, JLL, put that number at one billion square feet.<sup>2</sup> CBRE further indicates that every \$1 billion in new e-commerce sales requires one million square feet of new warehouse space.

In addition to these national trends, one reason for the surge locally in large warehouses is, aside from a single UPS facility, there is no warehouse/distribution facility in Clark County that specifically stores and repackages individual goods intended for direct delivery to residential or business customers. Home deliveries of goods from Amazon and FedEx to Clark County, for example, originate from the Portland side of the river. (See Figure 1)

**Figure 1: Location of Existing Distribution Facilities in Vancouver/Portland Region**

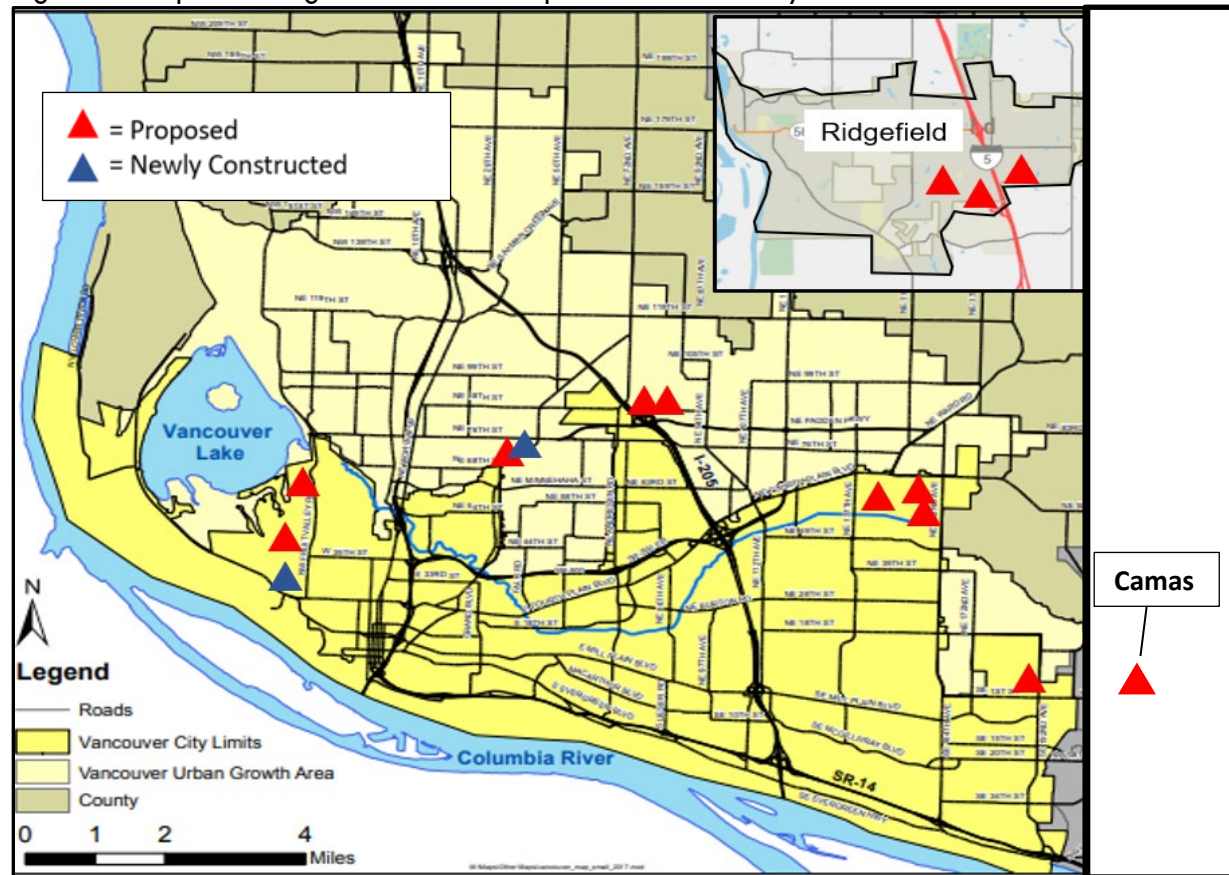


As documented in a [Columbian article](#) last year, there has been a surge of significant recent development of large scale warehouses and distribution centers in Vancouver and elsewhere in Clark County. Planning staff gathered data from Clark County, Ridgefield, Camas, and Vancouver, all of which have one or more large (>250,000 sf) warehouses in their development review process or under construction. While initially staff identified eight warehouse pre-applications or applications of concern in Vancouver alone, this was subsequently reduced to five active projects as one that was under construction was completed, one was only 80,000 square feet, and a third required a comprehensive plan amendment and zone change and was therefore not vested to existing use and development standards. The five warehouses, which are vested to current use and development standards, total 2.8 million square feet and will utilize 156 acres of industrial land. (See Figures 2 and 3)

Figure 2: Current Large Warehouse Applications in Vancouver

| Project Name                 | Location                                                  | Owner/Applicant              | Building SF      | Acres      |
|------------------------------|-----------------------------------------------------------|------------------------------|------------------|------------|
| Prologis Park                | Tax lot 152382000<br>(Fruit Valley)                       | Wellons Group                | 560,000          | 30.22      |
| Harmon Logistics Center      | NW corner of SE 1 <sup>st</sup><br>/192 <sup>nd</sup> Ave | DIRG LLC                     | 450,000          | 24.2       |
| Bridge Development           | 5500 NE 162 <sup>nd</sup> Avenue                          | Bridge Dvpmt<br>Partners LLC | 640,000          | 36.45      |
| Burnt Bridge Creek Logistics | 5920 NE 162 <sup>nd</sup> Avenue                          | Defenbaugh LLC               | 681,000          | 38.48      |
| Fruit Valley Logistics       | 6112 NW Fruit Valley<br>Road                              | Wilson Oil                   | 365,000          | 26.74      |
| <b>TOTAL / AVG</b>           |                                                           |                              | <b>2,776,000</b> | <b>156</b> |

Figure 3: Proposed Large Warehouse Projects in Clark County



#### Analysis of Warehouse Characteristics

E-commerce is, relatively speaking, a newer sector of the global economy, and detailed studies of how warehouses and associated operations may impact communities (either positively or negatively) are fairly limited. City consultants Fehr and Peers and GLD Partners prepared an analysis of the above characteristics from available data and specific projects to help decision-makers understand the differences between traditional business-to-business warehouses and larger warehouses intended for e-commerce shipping.

Key differences between the two types of warehouses are outlined in the consultant's report (See also Exhibit E), as follows:

Various types of warehouse support retail, commercial, and industrial supply chains. Virtually all industries rely directly or indirectly on warehousing services. Directly related to e-commerce, distribution and fulfillment centers typically provide value-added logistics services, allowing operators to efficiently meet varying customer demands and streamlining supply chains. These facilities differ from traditional warehouses from a physical, operational, and economic standpoint.

### 1. Key Physical Differences

Physical characteristics of warehouses include warehousing design (building size, lot coverage, loading bays, and parking spaces) and siting. Key physical differences that distinguish e-commerce facilities from traditional warehouses include:

- *More varied building sizes/footprints.* While traditional warehouses are typically less than 100,000 square feet, e-commerce facilities range from about 100,000 square feet to over 1 million square feet.
- *E-commerce warehouses tend to be taller.* Building clear height, defined as the height of a building from the floor to the bottom of the lowest hanging item on the ceiling, is typically less than 32 feet for traditional warehouses, but often greater than 36 feet for e-commerce facilities.
- *More loading dock doors.* Operations at e-commerce facilities require more loading docks.
- *Different siting locations.* Traditional warehouses are typically situated close to other industrial uses, whereas e-commerce facilities tend to be proposed near population centers and ports.

### 2. Key Operational Differences

Recent technological improvements have resulted in increasingly efficient use of warehouse space and consolidation of facilities. Modern warehouses operate differently than traditional warehouses, particularly regarding hours of operation and the flow of goods:

- *24-7 operations.* Typical hours of operation for e-commerce facilities span 24 hours a day, seven days per week. The non-stop activity in modern warehouses is made possible by shift workers and automation. In contrast, traditional warehouses with slower inventory turnover are typically limited to normal business hours, i.e., 8-hour shifts, five days per week.
- *More constant flow of goods.* E-commerce facilities typically focus less on long-term storage and more on the flow of goods and services. Modern industrial



warehouse facilities are often driven by demand, compared to traditional warehouses, where operations are related to storing the largest amount of goods possible.

### 3. *Traffic Impacts*

Warehouses generate some level of traffic (passenger cars and trucks), but this varies significantly based on the operations of the facilities. In addition, the type of trucks (medium- vs. heavy-duty trucks<sup>4</sup>) also varies. Traffic impacts differ between e-commerce and traditional warehouses in the following ways:

- *Much higher vehicle activity.* Based on data from the Institute of Transportation Engineers (ITE) Trip Generation Manual, e-commerce facilities generate up to four times more daily vehicle trips than traditional warehouses, particularly for fulfillment centers that require extensive sorting.
- *Traffic occurs at all hours of the day.* The fact that most e-commerce facilities involve round-the-clock operations (versus more 8-hour day operations for traditional warehouses), means that traffic often occurs during off-peak times of the day and night.
- *Smaller delivery vehicles are more common.* Whereas traditional warehouses generate mostly medium-duty and heavy-duty truck trips, light-duty trucks and vans play a substantial role in the transport of goods from today's e-commerce facilities.

### 4. *Key Economic Differences*

Industrial warehouses generate jobs and tax revenue (property, sales and use, and utility taxes). Warehousing jobs provide two important community benefits: 1) pay rates that start above minimum wage, and 2) on-the-job-training for career advancement. Warehouses also generate indirect jobs<sup>5</sup> that benefit local and regional economies. Regionally, the U.S. Bureau of Economic Analysis (BEA) estimates that 10 new warehouse jobs create about 14 jobs in other industries.<sup>6</sup> For every \$1.00 of earnings paid to the new warehouse workers, an additional \$1.50 in earnings is generated throughout the economy. Key distinctions in the economic impact of e-commerce versus traditional warehouses include:

- *Higher-skilled labor.* While traditional warehouses rely on unskilled labor and managerial jobs, highly automated e-commerce facilities offer high-paying jobs such as automation engineers with average salaries over \$100,000 annually. With companies such as Amazon investing more in warehouse automation and on-the-job training for skilled labor, observers of these trends indicate that the presence of these high-paying jobs is likely to grow.
- *More ripple effects on the local economy.* Based on building size/footprint and warehouse jobs created, e-commerce facilities typically entail more local and



regional economic impacts (tax revenue, indirect jobs, and new dollars circulating in the economy) than traditional warehouses.

#### Key Takeaways

From a physical, operational, and economic standpoint, there are pronounced differences between traditional warehouses and e-commerce facilities. With the evolving warehousing industry and a market need for e-commerce facilities in Vancouver, the City may benefit from new warehouse developments targeted to store and repackage e-commerce goods intended for various purposes, including retail home delivery. The development of e-commerce facilities will support the growth of the local economy in Vancouver through job creation and tax revenue. Regulatory amendments are needed to ensure that any new development supports the City's economic growth, has adequate transportation infrastructure, and aligns with climate and equity goals and priorities.

For the full analysis, see Fehr and Peer's report, entitled "*Traditional Warehouse Developments vs. Modern E-commerce Facilities*," dated revised July 2023, which is attached as Exhibit E.

#### Proposed Amendments to VMC Title 20

Over the past ten months, staff has consulted with warehouse industry experts and engaged in a series of meetings with environmental advocates and business stakeholders including the Port of Vancouver and representatives from existing warehouse facilities, as well as the Planning Commission. Planning staff have tried where possible to incorporate input on specific code language to make the ordinance clearer and to balance the stated objectives of City Council with industry, neighborhood and environmental perspectives.

The draft code changes presented to Planning Commission for consideration will accomplish several key objectives which are in alignment with the intent of the moratorium and prior Council direction:

- Warehouses larger than 250,000 square feet in a single building would be prohibited in the IL, Light Industrial District which tend to be closer to residential districts. Such warehouses would however be allowed as a limited use in the IH, Heavy Industrial District (effectively only in the Port of Vancouver or Columbia Business Center due to parcel size constraints elsewhere) where they are more compatible with surrounding uses and further away from residential districts, and would need to meet certain proposed additional development requirements.
- The maximum lot coverage standard (e.g., the percent of land that may be occupied by a building) would be reduced from 100% to 75% for all warehouse/freight movement uses in recognition that because a portion of the site is needed for parking, truck loading and maneuvering, storm water detention, tree plantings, etc., it is not possible for buildings to occupy 100% of a given site;
- Warehouses larger than 250,000 square feet in the IH District would be subject to special development standards that: prohibit truck traffic along Fruit Valley Road, reduce the minimum parking requirement, reduce the maximum lot coverage, and require certain climate action measures such as: solar-ready roofs (weight load capacity and electrical), EV charging stations at 20% of parking spaces, truck dock charging conduit and wiring, white-colored roofs to reduce heat storage, skylights or clerestory windows to allow natural light, prohibit truck idling, architectural features (such as windows, darker colors, articulation of

- façade, etc.), a 10% increase in tree plantings over other industrial uses (33 tree units per acre) and 25-foot wide treed buffer if adjacent to public streets to reduce visual impacts;
- The minimum required number of parking spaces for all warehouse and distribution facilities would be reduced from 1 space for every 2,000 square feet of building area to 1 space for every 5,000 square feet of building area, in recognition that warehouses are increasingly becoming more automated and may need less parking for employees. Reducing the amount of paved surfaces improves storm water and climate outcomes (less heat retention) and creates more space for tree plantings; and
  - The proposed code changes have been drafted to be as simple and easy to follow as possible.

### III. SUMMARY OF APPLICANT PROPOSAL:

*(Note: Full text can be found in Exhibit B)*

- A. Amend VMC 20.440.030-1 Industrial District Use Table to make Warehouse and Distribution Facilities larger than 250,000 square feet a prohibited use in the IL, Light Industrial District, but allow smaller warehouses as a limited use as per the current code; and
- B. Amend VMC 20.440.030-1 Industrial District Use Table to make Warehouse and Distribution Facilities larger than 250,000 square feet a limited use in the IH, Heavy Industrial District, with a footnote directing to additional development standards in a new section VMC 20.895.120; and
- C. Amend VMC 20.440.040-1 Industrial District Development Standards Table to lower the maximum lot coverage for warehouses larger than 250,000 square feet in the IH, Heavy Industrial District from 100% to 75%; and
- D. Amend VMC 20.895 Miscellaneous Special Use Standards to add a new section regarding special standards that apply to warehouses larger than 250,00 square feet. That: 1) prohibit large truck traffic from such uses along Fruit Valley Road, 2) require certain climate action measures such as: solar-ready roofs (weight load capacity and electrical), electrical vehicle and truck dock charging outlets, white-colored roofs to reduce heat retention, skylights or clerestory windows to allow natural light, and prohibit truck idling; and 3) require architectural features (such as windows, darker colors, articulation of façade, etc.) and a 25-foot deep treed buffer if adjacent to public streets to reduce visual impacts; and
- E. Amend VMC 20.945.070-2 Minimum Off-Street Vehicle Parking Requirements, Warehouse/Freight Movement Use, by deleting 1.0/2000 and replacing it with 1.0/5000.

### IV. REVIEW CRITERIA AND FINDINGS:

#### A. VMC 20.285.090 Zoning Code Text Amendments

*Approval criteria for Zoning Code text amendments*

*Proposed zoning or development regulation text changes shall be considered based on the following:*

1. *The proposed change is consistent with the comprehensive plan; and*
2. *The proposed change is necessary to further the public interest based on present needs and conditions.*

**B. Applicable Vancouver Comprehensive Plan Policies**

*EN-1 Environmental protection*

*Protect, sustain, and provide for healthy and diverse ecosystems*

*EN-2 Stewardship*

*Demonstrate and promote environmental stewardship and education*

*EN-3 Energy Conservation*

*Promote and facilitate energy conservation and alternative energy sources and generation*

*EN-5 Environmental coordination*

*Coordinate environmental policies and programs. Continue to consolidate environmental regulations*

*EN-8 Water quality and quantity*

*Enhance and protect surface water, stormwater, and groundwater quality from septic discharge, impervious surface runoff, improper waste disposal, and other potential contaminant sources.*

*EN-10 Air quality*

*Protect and enhance air quality, in coordination with local and regional agencies and organizations*

*EN-11 Hazard areas*

*Manage development in geologically hazardous areas and floodplains to protect public health and safety*

**C. SEPA Determination**

Pursuant to the State Environmental Policy Act (SEPA) and WAC 197-11, the City of Vancouver as lead agency has determined that the proposed Warehouse and Freight Distribution Amendments will not have a probable significant adverse impact on the environment. A Determination of Nonsignificance (DNS) was published on September 22, 2023 in the Columbian with a 14-day comment period, which expires at 5 p.m. on October 6, 2023. Copies were emailed to state and local agencies, media representatives, concerned citizens whose names were on the master SEPA list, stakeholders and neighborhood associations. (See Exhibits C and D)

Procedural appeals to the SEPA determination shall be filed in writing within 14 calendar days following the last day of the comment period (October 20, 2023). Substantive SEPA appeals shall be filed in writing within 14 calendar days of the issuance of Council's decision. As of the writing of this report, no SEPA comments had been filed.

**D. Staff Analysis and Findings**

Equity Analysis

Currently, warehouses are permitted as limited uses in the IL, Light Industrial District with minimal development requirements, and are permitted outright in the IH, Heavy Industrial District. The draft code would prohibit new warehouses larger than 250,000 square feet in the IL, Light

Industrial District and would allow them as limited uses in the IH, Heavy Industrial District, with new development standards to mitigate identified impacts.

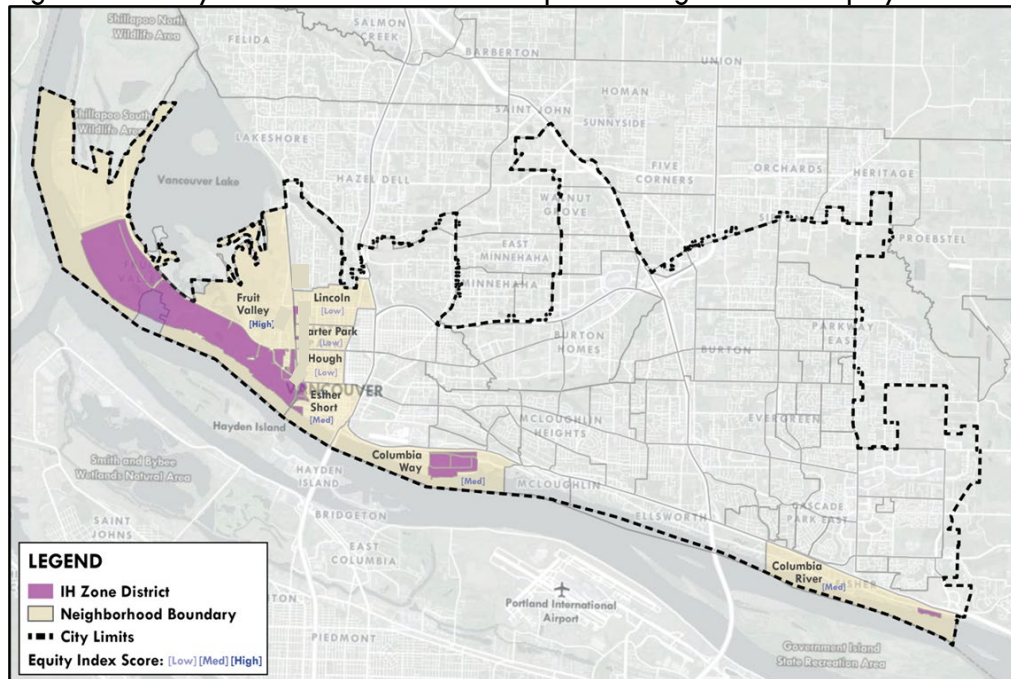
As shown in Figure 4 below, most of the City's Heavy Industrial District is within the Fruit Valley Neighborhood, which includes the Port of Vancouver and industrial properties along Fruit Valley Road. Smaller areas of Heavy Industrial zoning exist further to the east in the Columbia Business Center south of Columbia Way, and a small property near the Columbia River due south of SE 192<sup>nd</sup> Avenue. Due to property size constraints, a large warehouse could not feasibly locate in the small IH District south of 192<sup>nd</sup> Avenue.

The Fruit Valley Neighborhood has a high Equity Index Score due to lower median incomes (\$46,667 FV vs. \$63,617 citywide), higher percentage of persons below the poverty line (14.9% vs. 12.7%), higher percentage of Hispanic and non-white residents (26% vs. 13.9%), and lower education attainment (84.4% high school or higher vs. 91.2%). Areas with high equity scores are typically in need of extra resources to support a thriving community, and additionally tend to have historically suffered from a lack of investment (or conversely, outright disinvestment) of services and/or infrastructure.

Columbia Business Center, located south of SR-14 adjacent to Columbia Way, is located in an area that has a low-to-medium equity score, meaning there is a lower chance of disparate impacts from allowing large warehouses in this area.

The recommended code amendments will address the potential for disparate impacts to high priority equity areas as follows: 1) warehouses larger than 250,000 square feet will only be allowed in the IH, Heavy Industrial District, further away from residential areas, and 2) new special development standards that apply to large warehouses such as prohibiting tractor trailer trucks traveling to or from such large warehouses from using Fruit Valley Road, and 3) measures to increase tree canopy, reduce parking and lot coverage, prohibit truck idling, improve visual impacts next to public streets, and promote climate-friendly measures such as electric vehicle charging stations.

Figure 4: Heavy Industrial Districts and Adjacent Neighborhood Equity Scores



#### Compliance with Applicable Review Criteria

The approval criteria in VMC 20.285.090 include: a) *the proposed change is consistent with applicable Comprehensive Plan policies*, and b) *that the proposed text amendment is necessary to further the public interest based on present needs and conditions*. As described above the applicable policies in the Comprehensive Plan are all in regard to environmental protection, conservation, and stewardship. The proposed code changes are consistent with these policies in that warehouse larger than 250,000 square feet - which typically produce more truck traffic and other environmental impacts than smaller warehouses - will become prohibited in the IL, Light Industrial District which are typically closer to residential areas than Heavy Industrial Districts. Measures to reduce identified impacts and improve environmental outcomes will be required for new warehouses larger than 250,000 square feet, which will only be allowed to locate in the IH, Heavy Industrial District, further away from residential areas. In summary, the proposed code changes further the public interest based on present needs and conditions and meet the approval criteria of VMC 20.285.090.

#### **V. CITY COUNCIL INPUT FROM 10/2/23 WORKSHOP:**

City Council reviewed the draft code changes at their October 2 workshop and provided the following feedback (staff response follows each comment):

- Additional outreach should be provided to the Fruit Valley Neighborhood Association since the attendance was low at the neighborhood meeting where the proposal was discussed.

*Staff response: In order to ensure that every resident in the FVNA was made aware of the proposal and provided with ways to comment and learn more information, individual postcards were mailed to every address in the association boundary.*

- Council expressed concerns about having ‘multiple layers’ of tree planting requirements which could be confusing to applicants.



*Staff response: The draft code amendments have been revised in regard to the “extra” tree density requirement for large warehouses by deleting the requirement that “an area of the project site equivalent to 20% of the building footprint area shall be planted at a density of at least thirty trees per acre...” and replacing it with a requirement that “The minimum tree density required by VMC 20.770.080 shall be thirty-three tree units per acre for new development.” This is in effect a 10% increase in tree plantings beyond what is already required for industrial development in the city.*

- Council suggested that the required tree plantings, if allowed to be planted off-site, should not be planted too far away (e.g. the other side of the city) from where the building is constructed, to ensure that mitigation is not too far removed from the source of the impact.

*Staff response: The language of the tree planting requirement has been revised as follows: “Such trees may be planted in a tree tract on-site or at an off-site location owned by the applicant and within ~~city~~ the limits of the designated neighborhood association within which the development is located, and as approved by the City Forester.” In the case of projects in the Port of Vancouver, such plantings would need to be planted within the Fruit Valley Neighborhood Association boundaries if not planted on-site.*

- Council asked whether the requirement for skylights would conflict with the goal of maximizing roof area for solar panels in the future, or whether the solar panels might cover up the skylights.

*Staff Response: Staff does not see an inherent conflict in requiring roof skylights to promote natural light into the interior of the warehouse and the placement of solar panels and believe that there will be room to accommodate both features. The solar panels would not be installed to cover up the skylights on the roof.*

- Council discussed the proposed requirement for electric charging outlets at each of loading docks, and expressed concerns about the cost of requiring these right away when technology is still evolving and it is unknown what electric fleets will require in the future. Instead of requiring outlets now, Council suggested that the City should only be requiring conduit and electric wiring to the docks to make it easier to convert to charging ports in the future.

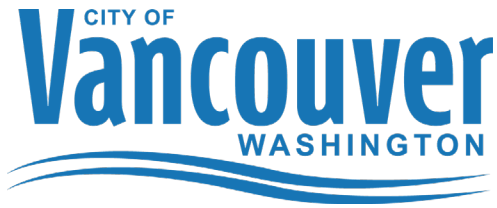
*Staff Response: The draft code language has been amended as follows: “All loading docks shall be outfitted with ~~outlets~~ electric wiring and conduit extending to electric panels to enable future installation of outlets for charging of electric-powered trucks.”*

**VI. RECOMMENDED ACTION:** Forward to City Council a recommendation for adoption of the proposed code amendments to VMC Title 20 in Exhibit B.

City of Vancouver Staff  
Chad Eiken, CDD Director, (360) 487-7882  
Bryan Snodgrass, Principal Planner (360) 487-7946

**Attachments:**

- Exhibit A – Initial Moratorium Ordinance
- Exhibit B – Proposed Code Changes to VMC Title 20
- Exhibit C – SEPA Determination of Nonsignificance (DNS)
- Exhibit D – SEPA Checklist
- Exhibit E – Warehouse Study by Fehr & Peers, July 2023



## Memorandum

**DATE:** October 23, 2023

**TO:** Chair Ledell and Planning Commission

**FROM:** Chad Eiken, Director, Community Development Department

**RE:** **Warehouse Code Changes - Staff Response to Comments Received To-Date**

Two comment letters were submitted to the Planning Commission on the proposed Warehouse Code Changes, one from the Alliance for Community Engagement (ACE) received on 10/18/23 and one from the Port of Vancouver, dated 10/13/23. Both letters were included in the Planning Commission packet.

Staff responses follow the specific comments from both letters below.

### **Alliance for Community Engagement Comments**

- *(T)he City focusing exclusively on warehouses over 250,000 sq. ft. effectively allows developers to have no climate provisions on individual or multi-building warehouses up to 249,999 sq. ft. There are currently no climate considerations whatsoever for the vast majority of warehouses.*

Staff response: The City has only recently started work on the forthcoming Green Building Policies/Standards, which will presumably result in code amendments that will apply to most new buildings and uses, citywide. Because it is not yet known what might be included in this new set of climate standards, staff is proposing a fairly modest set of climate action requirements in the current draft code, which would only apply to warehouse buildings larger than 250,000 square feet, in order to stay within the scope of the moratorium. Over the course of the coming year, staff will undoubtedly be proposing specific green building standards that will apply to uses throughout the city and to maximize consistency, it would be appropriate to wait to add climate measures to smaller warehouses.

- *Making all warehouses Permitted Use prevents the community from engaging in the approval process.*

Staff response: The proposal is to make warehouses larger than 250,000 square feet a limited use in the IH, Heavy Industrial District, which means the use would be permitted if it complies with the list of specific development standards (this is different than being permitted outright). Large warehouses would be prohibited in the IL, Light Industrial District, however. While no public hearing would be required for this use in the IH District, other opportunities for public notice and comment regarding a proposed warehouse project would still exist, such as through the site plan review process (Type II action) and SEPA Review process.

- *Trees need to be planted and maintained onsite at the largest warehouses. Consider requiring that most pavement be shaded, either with trees or with solar canopies, for most new warehouses, not just the largest ones. We will be short of electricity if we don't. Trees mitigate the heat absorbed by vast areas of asphalt and concrete these warehouses bring.*

Staff response: City Code currently requires 30 trees per acre to be planted for all types of developments, as well as shade trees in parking lots (one tree spaced at every 10 spaces). Additional tree plantings would be required for warehouses larger than 250,000 square feet per the proposed code changes to help respond to climate impacts. Current code allows for required tree plantings to be planted at an approved off-site location if the development site cannot accommodate them, and the Port has used such an off-site tree planting site for numerous projects. Staff supports required trees being planted in the area that is being directly affected by the large warehouse while allowing for some flexibility, such as in the Port where tree plantings are not ideal in the marine terminal. Accordingly, staff is proposing that tree plantings be allowed to be located at an approved off-site location but within the boundaries of the designated Neighborhood Association that the warehouse would be located in.

- *Require solar panels (plus 4-hour batteries), ev-ready electrical conduit and wiring, and (double-paned) clerestory windows on the largest warehouses.*

Staff response: As noted above, the proposed climate measures are focused more on making it easier to retrofit buildings for solar panels and electric vehicle charging, than requiring that solar panels/batteries be installed. While the forthcoming Green Building Standards may be more prescriptive, staff recommends a more modest set of climate measures as part of this ordinance that focus on building readiness. EV conduit/wiring and double-paned clerestory windows requested by ACE would be consistent with this 'readiness' approach.

- *Require solar-ready roofs, ev-ready electrical conduit and wiring of all warehouses over 100,000 sq. ft.*

Staff response: As noted above, staff is not presently recommending any climate measures for warehouses smaller than 250,000 square feet in order to stay within the limits established by the moratorium.

- *Prevent municipal code loopholes whereby developers could build a 249,999 sq. ft. warehouse or multiple smaller warehouses to avoid climate provisions. If it's not possible to create air-tight municipal code to prevent that, please change warehouses over 100,000 sq. ft. to Conditional Use.*

Staff response: While the moratorium applies to warehouse projects that have multiple buildings totaling more than 250,000 square feet, staff believes it would be simpler to apply the limited use criteria to *individual buildings* that are larger than 250,000 square feet. However, if the Planning Commission wishes to reconsider this and make the threshold apply to groups of buildings that in total exceed 250,000 square feet, staff would recommend that language be included that it be applied to groups of buildings exceeding 250,000 square feet *in a single development application* so that tracking the area of warehouse developments over time on multiple parcels, which would be burdensome, is not necessary.

- *Idling for non-electric truck engines should be banned.*

Staff response: The proposed code changes would ban idling for non-electric truck engines when parked or loading/unloading at the facility.

- *No new buildings should be built, where the primary heating system for space and water is fossil fuel. Electric heat-pump water heaters and space heaters should be required. OR as the Washington State Energy Strategy says – Make new buildings all-electric ready.*

Staff response: While these additional measures would certainly advance the City's Climate Action Goals, staff feels this is an issue that needs to be studied further to fully understand its implications and as such will be analyzed in the forthcoming Green Building Standards project, which is currently underway.

- *Please do not rezone other parts of the city for Heavy Industrial use to allow the larger warehouses to go in there. Truck traffic associated with these 250,000 sq. ft. warehouses should not be on Fruit Valley Road. Reducing parking lot sizes is good; as is clustering HVAC on rooftops.*

Staff response: The proposal does not contemplate the rezoning of any properties to Heavy Industrial as part of these code changes. City Council, at its October 2, 2023 workshop, indicated they would not be in support of allowing very large warehouses in the IL, Light Industrial District either. Comments regarding the reduction in parking lots/spaces and clustering of HVAC units on rooftops are noted.

### **Port of Vancouver Comments**

- *Allowance of warehouses larger than 250,000 square feet only in Heavy Industrial (IH) zoning as a limited use. Recommendation: While most of the port's land is already zoned IH, the port requests to retain flexibility in its Light Industrial (IL) zoned properties that are not adjacent to residential zoned land and that are within one mile of a state or interstate highway. The port's marine / industrial area is focused on receiving, staging and transloading cargo from one mode to another. It is conceivable that future development could require a warehouse facility exceeding 250,000 square feet. The port appreciates the recognition that a limited use process is more appropriate than a conditional use in IH zones for the type of project under consideration. There are, however, few parcels, such as the port's Parcel 7, which are appropriately zoned as IL and could accommodate a large warehouse without generating the negative impacts of concern in the moratorium. Without favoring the port specifically, the city may consider requiring large warehouses in the IL zones to be located within a certain distance to a state or interstate highway and to be a certain distance away from residential or other zones of concern.*

Staff Response: The request to allow warehouses larger than 250,000 square feet in the IL Light Industrial District with additional locational requirements (proximity to state or interstate highway and not adjacent to residential zoned land) would allow Port properties zoned IL (specifically Parcel 7) to be developed for a large warehouse. Staff has not undertaken a detailed analysis of other IL properties that might be able to be developed for a large



warehouse if this change is made, but one such property that would be eligible for a large warehouse is the west end of Columbia Business Center which is zoned Light Industrial immediately adjacent to a hotel and office building (zoned mixed use, not residential). City Council considered this request at a 10/2/23 workshop and directed staff not to make any change to the current proposal to allow large warehouses in the Heavy Industrial District only.

- *Clarification on “warehouse” versus “Warehouse / Freight Movement” Recommendation: The memo refers to both “warehouses” and “Warehouse / Freight movement.” This should be clarified by referring only to “Warehouse / Freight Movement” as outlined in the current VMC (Vancouver Municipal Code). There are different warehouses defined in the VMC, but the focus is on one warehouse class (“Warehouse / Freight Movement”). VMC 20.160.D. Industrial Uses classifies “Warehouse/Freight Movement” as: “5. Warehouse/Freight Movement. Uses involved in the storage and movement of large quantities of materials or products indoors and/or outdoors; associated with significant truck and/or rail traffic. Examples include freestanding warehouses associated with retail furniture or appliance outlets; household moving and general freight storage; food banks; cold storage plants/frozen food lockers; weapon and ammunition storage; major wholesale distribution centers; truck, marine and air freight terminals, and dispatch centers; bus barns; grain terminals; and stockpiling of sand, gravel, bark dust or other aggregate and landscaping materials.” Defining code changes only to the “Warehouse/Freight Movement” use defined above focuses the proposed code changes to developments that results in “significant truck” traffic. Additionally, ensuring that code changes are specific to “Warehouse / Freight Movement” would still allow “Manufacturing and Production Facilities” to be developed in both light and heavy zones areas. VMC 20.160D defines “Manufacturing and Production” development separately from “Warehouse / Freight Movement”: Manufacturing and Production. Includes production, processing, assembling, packaging, or treatment of semifinished or finished products from raw materials or previously prepared materials or components. Manufacturing production is intended for the wholesale market rather than for direct sales.”*

Staff Response: Comment noted. While the staff report and other documents may use the terms “warehouse,” “warehouse/freight movement,” “warehouse and distribution,” and “e-commerce warehouse” interchangeably, the proposed code language to be added to VMC Title 20 will only refer to “warehouse/freight movement” uses, which is the actual use classification terminology.

- *Limitation of truck traffic from Warehouse / Freight Movement to Designated Freight Corridors Recommendation: Change the proposed wording in 20.895.120.B. Traffic (Page 5 of Memo) to the below: Tractor trailers delivering goods to or from “Warehouse / Freight Movement” covered by this section shall only travel on designated freight corridors. This recommendation removes the specific reference to named roads and allows the City the opportunity to designate freight corridor restrictions (which could include Fruit Valley Road) throughout the city as necessary, which may change over time.*

Staff Response: The reason for the specific reference in the proposed code regarding Fruit Valley Road is because the Fruit Valley Neighborhood is a high priority equity area which already experiences significant truck traffic along Fruit Valley Road. Staff disagrees with the proposed alternative approach because Fruit Valley is a designated freight corridor and the city does not have any plans to un-designate it as such. The city simply does not want to add more truck traffic from large new warehouses to this already busy corridor in a high priority equity area.

- *Buffer depth and tree planting requirements Recommendation: The City should change the buffer depth requirement (proposed 20.895.120 section C.2) from 25 feet to 15 feet, and clearly state that any tree requirement required in proposed 20.895.120 Section D can be planted in the landscaped buffer area. At developer's discretion, allow any tree requirement to be completed at an approved off-site location. This requirement should also be reconsidered if the project's environmental assessment can mitigate wildlife, water retention and climate impacts in other ways if necessary. The port suggests removing the required area (20% of the building area) from the tree planting requirements. Increasing the setback to 25 feet AND requiring an additional 20 percent of the building footprint area to be covered by trees significantly impacts the financial viability for a development project so burdened – especially since the proposed code would also restrict development to 75 percent of the project area or less. Without the recommended changes outlined above, the site reduction (100 to 75 percent), landscape buffer (currently 25 feet), and tree plantings (20 percent of building footprint) will make large scale warehouses – whether they are freight related or manufacturing related – extremely difficult to construct. The Port does not have space in its marine operations area to limit required marine facilities to the proposed “maximum lot coverage of 75 percent” versus the current 100 percent allowed. Additionally, it would not be appropriate or effective to require the port to plant trees in its marine industrial areas. Allowing the planting of trees offsite, when onsite tree planting is deemed impractical, will also allow developers to use any tree credits they may have or to buy tree credits if needed. Additionally, reducing the landscape buffer to 15 feet would improve traffic safety – especially as site lines would be obscured as the plantings mature.*

**Staff Response:**

- The proposed depth of the visual buffer is still 25 feet, but the draft code language has been revised to make it clear that trees planted in this buffer area may be counted toward the overall required tree unit density.
- The draft code language contemplates allowing required trees to be planted at an approved off-site, so long as the off-site location is within the designated neighborhood association boundary (Fruit Valley Neighborhood Association for the Port). The Port has used an off-site tree planting site for other projects that would be within the FVNA boundary.
- Currently all development projects must plant trees at a rate of 30 per acre of the development site. City Council commented that the previously-proposed additional tree planting requirement based on 20% of the building area was overly complex, and therefore the draft code language has been amended to add 3 additional trees per acre to the existing tree requirement of 30 trees per acre. As an example, for a 250,000 square foot warehouse on 14 acres, this change would result in 8 more trees (462 vs. 454 trees).
- The proposed reduction in maximum lot coverage (ratio of building area to the lot area) from 100% to 75% is not anticipated to have any adverse impact on Port operations, as all large warehouses currently being reviewed have proposed lot coverage of between 40-45% due to space needed for driveways, parking lots, truck loading and maneuvering areas, landscaping, and storm water facilities.
- The City Forester has recommended a 25-foot-wide buffer area to reduce visual impacts to ensure adequate space for the large species trees. Staff does not understand how reducing the landscape buffer to 15 feet would improve sight distance and traffic safety, which would need to be provided anyway regardless of how deep the planter area is.

- *Trip generation for Warehouse / Freight Movement facilities exceeding 250,000 square feet Recommendation: Add a traffic metric (such as 100 tractor trailer trips per 24-hour period) in addition to the use and size criteria for “Warehouse / Freight Movement” facilities exceeding 250,000 square feet to invoke the additional miscellaneous special use standards of proposed in VMC 20.895.120. Adding a traffic count to the “Warehouse / Freight Movement” use category for proposed warehouses of at least 250,000 square feet would provide a clear metric that both developer and city can understand when applying these code changes. This metric would come from a traffic consultant paid for by the developer.*

Staff Response: Staff disagrees with this proposed alternative threshold for determining when the limited use standards apply because: 1) traffic is not the only thing that the limited use standards are attempting to mitigate (e.g. visual impacts, climate impacts), and 2) adding a traffic threshold, as the Port correctly notes, would likely involve input from a traffic engineer (at additional time and expense) in order to determine whether the limited use standards apply. Using building size as the single threshold for determining whether the use is allowed in the district and whether certain development standards apply is a much simpler (anyone can measure building size) and transparent approach.

- *EV outlets at loading docks Recommendation: Restate 20.895.120 Section D. 6 as outlined below: All loading docks will have conduit and other electrical infrastructure to allow for future installation of electrical systems to charge electric powered freight trucks servicing the facility. The port supports and is pursuing electrification within our adopted Climate Action Plan. As currently proposed, however, the port has concerns that underutilized, charging infrastructure would be prone to costly vandalism and theft. Developers would rather have the conduit in place to meet future demands and standardization with the technology in place at that time. Requiring developers to install full charging infrastructure will result in capital wasted as newer and more secure electrical technologies emerge.*

Staff Response: The draft code changes, as revised, would require warehouses larger than 250,000 square feet to provide electrical charging wiring and conduit from each loading dock to the electrical panel to make it easier to add charging stations/connections in the future. Charging outlets and transformers to power charging ports at the loading docks would not be required at this time. This provision recognizes that charging technology, which is expensive to purchase and install, is still evolving and may be different by the time truck fleets are electrified.

- *EV charging stations for parking area Recommendation: Restate 20.895.120 Section D.7 as outlined below: For any warehouse over 250,000 feet at least 10 electric vehicle (EV) charging stations will be provided at initial occupancy. Conduit to support EV charging will be constructed to serve all parking spaces at initial occupancy. Designating a specific number of parking stalls to have EV charging stations (10) meets the City’s goal to have adequate EV charging installed during initial construction. Requiring conduit to be placed for the remainder of the parking stalls allows for future upgrades to occur efficiently as EV’s capture more of the market and anti-vandalism solutions can be developed.*

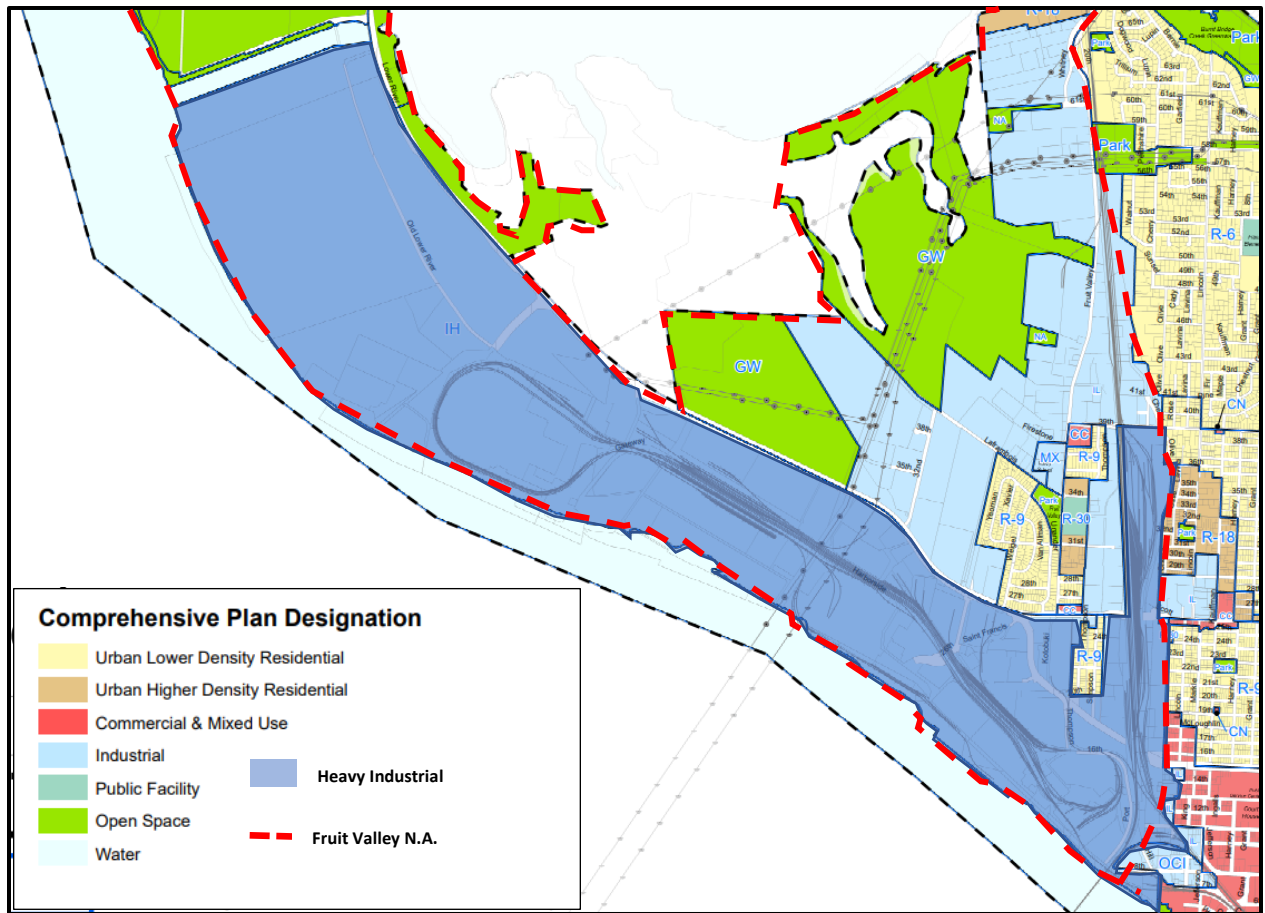
Staff Response: Staff does not object to the Port’s alternative proposal regarding EV charging infrastructure and a minimum of 10 EV charging stations versus EV charging stations for 20%

of parking spaces proposed by the draft code. A 250,000 square foot warehouse which provides the minimum number of parking spaces (using the proposed ratio of 1 space per 5,000 square feet) would need to provide exactly 10 EV charging stations ( $250,000/5,000 = 50 \text{ spaces} \times .20 = 10 \text{ EV spaces}$ ). The Port's idea of requiring conduit to be placed for the remainder of the stalls (40) would help to "future-proof" the site for future additional EV charging stations and staff would support adding this as a limited use standard.

- *Calculation of Total Square Footage Recommendation: The ordinance should clearly state that the threshold of 250,000 square feet applies to any single structure on a given site, and not the total square footage of multiple separate structures or facilities.*

Staff Response: The proposed code changes have been revised to clearly state that the 250,000 square foot building area threshold is for an individual building, not total area of a group of buildings.

Map Showing Fruit Valley N.A. Boundary and Heavy Industrial (IH) District





02/06/2023

RESOLUTION NO. M-\_\_\_\_\_

A RESOLUTION making findings of fact in support of the adoption of Ordinance M-4396 declaring an emergency and imposing a temporary moratorium for the duration of six months upon the acceptance and processing of applications for permits for the development or expansion of large warehouse and distribution facilities totaling more than 100,000 square feet under the Warehouse/Freight Movement use classification in the Light Industrial (IL) and Heavy Industrial (IH) zoning districts, as defined in Vancouver Municipal Code Title 20 or as otherwise allowed, such as by prior development agreement, based on certain findings of fact justifying such action and adopted by City Council, and establishing an immediate effective date.

WHEREAS, on December 12, 2022, the City Council adopted Ordinance M-4396 as an emergency action in the absence of a public hearing; and

WHEREAS, the City has the authority to adopt temporary moratoria pursuant to RCW 36.70A.390 and RCW 35.63.200, provided that such action is justified by adopted findings of fact and a public hearing is scheduled and held within 60 days of adopting this emergency moratorium in accordance with these statutes; and

WHEREAS, the Council held a public hearing on February 6, 2023, and sets forth in this resolution its findings as follows.

NOW, THEREFORE,

BE IT RESOLVED BY THE CITY OF VANCOUVER:

Section 1. The City currently has eight such proposed development projects in the land use application or building permit process, one with 80,000 square feet and seven with between

275,000 to 681,000 square feet of planned large warehouse and distribution facility space resulting in a total of 3.34 million allocated square feet.

Section 2. The City currently allows facilities for the Warehouse/Freight Movement use classification in the Light Industrial (IL) and Heavy Industrial (IH) zoning districts, as defined in Vancouver Municipal Code Title 20 or as otherwise allowed, such as by prior development agreement.

Section 3. Nationally, warehouse capacity is reportedly at a premium with ninety-six percent of available space in use and the continued post-COVID-19 growth in e-commerce represents a fundamental shift in warehouse and shipping logistics requiring more and larger facilities not contemplated by the existing code or evaluated in the context of the City's Climate Action Framework, which indicates that 90% of Vancouver's emissions are from either transportation or buildings.

Section 4. Commercial real estate market data and warehouse development standards indicate that warehouses are typically constructed at less than 25,000 square feet or greater than 100,000 square feet for large-scale distribution and that those large warehouse and distribution facilities of greater than 100,000 square feet are developing at an unprecedented and unforeseen rate.

Section 5. Warehouse and distribution facilities have a role in the local and regional economy but, because they are typically a low skill and low employment use, they are not a high priority sector in the *Clark County Economic Development Plan*.

Section 6. the City currently allows warehouse and distribution facilities as a permitted use in the Light Industrial (IL) and Heavy Industrial (IH) zones with no limit on size and such facilities may be a permitted pursuant to existing development agreements.

Section 7. The City does not have unlimited industrial land, particularly larger, contiguous parcels, and the consumptive nature of these facilities may foreclose opportunities for higher value employment sectors with lesser climate impacts.

Section 8. The City currently has eight such proposed development projects in the land use application or building permit process, one with 80,000 square feet and seven with between 275,000 to 681,000 square feet of planned large warehouse and distribution facility space resulting in a total of 3.34 million allocated square feet.

Section 9. The rapid expansion of large warehouse and distribution facilities throughout the United States and regionally is primarily related to an increase in home delivery of retail goods and changes in supply chain systems

Section 10. The surge in new, large warehouse developments and national trends suggest that more such proposals will be forthcoming with unconsidered and potentially irreversible implications for the City's supply of industrial land for higher employment uses, climate action goals, transportation systems, and stated goal of attracting high-skilled, high-wage employment uses.

Section 11. Without a temporary moratorium the City could, in the near future, receive applications for development that would vest to existing standards that may conflict with the achievement of the long-range vision for these areas according to the City's Strategic Plan, Comprehensive Plan, and Climate Action Framework and the City finds that in order to preserve the ability the most beneficial land use and future development, it is necessary to temporarily restrict development and expansion of large warehouse and distribution facilities and to further evaluate and potentially refine appropriate warehouse and distribution use and development standards within certain zones or transportation corridors.

Section 12. City Council recognizes that bulk storage warehouses are integral to the operations of the Port of Vancouver USA, which, since it was established in 1912 as an authorized Port district pursuant to Chapter 53.04 RCW, has played a key role in the region's economy and is the primary point of entry for goods arriving by ship and rail in Southwest Washington, and that the Port of Vancouver USA requires warehouse space to store goods that are arriving or being shipped to other destinations in fulfillment of its mission as a public jobs-creating agency.

Section 13. The enactment of Ordinance M-4396 provided an exception from the temporary moratorium for permits required for upkeep, repair, or basic maintenance of existing large warehouse and distribution facilities or to work mandated by the City as necessary to maintain public health and safety.

Section 14. The City Council finds that an additional exception to Ordinance M-4396 for warehouse development projects specifically for the transshipment and storage bulk goods on land owned and retained by the Port of Vancouver USA is merited based on the unique character of the Port of Vancouver USA as a public agency, however this exception does not allow the Port of Vancouver USA to transfer any vested rights obtained while Ordinance M-4396 is effective, in its current form or as subsequently amended or extended, that would otherwise be prohibited under the temporary moratorium.

Section 15. The enactment of Ordinance M-4396 constituted an emergency due to potential irreversible land use impacts that would result from continued development of large warehouse and distribution facilities without a thorough evaluation of current economic, transportation, and climate impacts, an assessment of buildable industrial land within City limits, and an assessment of whether existing land use standards are adequate for the changing market.

Section 16. The temporary moratorium will allow the City additional time to research and

develop standards for the development of large warehouse and distribution facilities, implement additional new regulation elements, and amend existing zoning ordinances, if necessary.

Section 17. A temporary moratorium will enable the City to engage in community outreach, evaluate strategies implemented by comparable municipalities, and maximize public input in the development of standards without jeopardizing any possible land use options that may be precluded by unrestricted development.

Section 18. The City Council finds that the adoption of this temporary moratorium promotes the public health, safety, and general welfare and convenience of the people of Vancouver, and will encourage the most desirable and productive use of land and properties.

ADOPTED at by the Vancouver City Council this 6<sup>th</sup> day of February, 2023.

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Anne McEnery-Ogle, Mayor

Attest:

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Natasha Ramras, City Clerk

Approved as to form:

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Jonathan Young, City Attorney



## **Exhibit B**

### **Proposed Warehouse-Related Changes to VMC 20, Land Use and Development Code**

**October 24, 2023**

*Editor's Note: Text to be deleted is indicated with ~~strike-throughs~~, and new text is indicated with underlines. For purposes of brevity, this exhibit includes excerpts only of Title 20 VMC chapters, that are proposed to be modified.*

## **Chapter 20.440 INDUSTRIAL DISTRICTS**

Sections:

- 20.440.010 Purpose.**
- 20.440.020 List of Zoning Districts.**
- 20.440.025 Industrial Zone Function and Location Criteria.**
- 20.440.030 Uses.**
- 20.440.040 Development Standards.**
- 20.440.050 Additional OCI Development Standards.**

### **20.440.010 Purpose.**

A. *Provide a range of industrial services for City residents.* One of the major purposes of the regulations governing development in industrial zoning districts is to ensure that a full range of job opportunities are available throughout the City so that residents can work close to home if they choose. The location of land within each industrial district must be carefully selected and design and development standards created to minimize the potential adverse impacts of industrial activity on established residential areas.

B. *Facilitate economic goals.* Another purpose of these regulations is to ensure that there is a full range of economic activities and job opportunities within the City limits, in compliance with the economic goals of the City of Vancouver Comprehensive Plan. (Ord. M-3643, 01/26/2004)

## **20.440.020 List of Zoning Districts.**

A. OCl: Office Commercial Industrial. The OCl zoning district provides appropriate locations for office, light industrial and small-scale commercial uses (e.g., restaurants, personal services and fitness centers) either singly or in combination. Only those light industrial uses with no off-site impacts, e.g., noise, glare, odor, vibration, outdoor storage, or process visibility are permitted in the OCl zone. In addition to mandatory site plan review, design and development standards in the OCl zone have been adopted to ensure that developments will be well-integrated, attractively landscaped, and pedestrian friendly. The OCl zone combines two zones that were referred to as the Office Campus (OC) and Industrial Commercial (MC) zones prior to March 11, 2004.

B. IL: Light Industrial. The IL zoning district provides appropriate locations for combining light, clean industries including industrial service, manufacturing, research/development, small scale warehousing activities and freight movement, and general office uses and limited retail. These activities do not require rail or marine access and have limited outdoor storage.

C. IH: Heavy Industrial. The IH zoning district provides appropriate locations for intensive industrial uses including industrial service, manufacturing and production, research and development, warehousing and freight movement, railroad yards, waste-related and wholesale sales activities. Activities in the IH zone include those that involve the use of raw materials, require significant outdoor storage and generate heavy truck and/or rail traffic. Because of these characteristics, IH-zoned property has been carefully located to minimize impacts on established residential, commercial and light industrial areas.

D. ECX: Employment Center Mixed-Use. The ECX zoning district is designed to provide for a concentrated urban mix of office, light industrial and small-scale commercial uses (e.g., restaurants, personal services and fitness centers) either singly or in combination in the Section 30 Employment Center Plan District. Only those light industrial uses with no off-site impacts, e.g., noise, glare, odor, vibration, outdoor storage, or process visibility are permitted in the ECX zone. In addition, the ECX zoning district provides for optional Urban Neighborhood Overlay(s), allowing for two concentrated urban mixed-use commercial/residential neighborhoods. Mandatory master planning and development standards in the ECX zone have been adopted to ensure that developments will be well-integrated, attractively landscaped, and pedestrian friendly. (Ord. M-3930 § 6, 10/05/2009; Ord. M-3730 § 24, 12/19/2005; Ord. M-3643, 01/26/2004)

## **20.440.025 Industrial Zone Function and Location Criteria.**

A. *General Criteria.* Increasing industrially zoned land shall be favorably considered when such action will provide additional opportunities for business expansion, retention of manufacturing and other industrial firms, or increased employment, especially employment that adds to or maintains the diversity of job opportunities.

B. *OCI (Office-Commercial-Industrial) Location Criteria.* The OCI (Office-Commercial-Industrial) zone designation is most appropriate in areas generally characterized by the following:

1. Areas with existing concentrations of technology-oriented, research and development, and professional service uses or close proximity to major institutions capable of utilizing or supporting new technology-oriented, research and development, and professional service businesses.
2. Existing light or heavy industrial areas which are undergoing a transition to predominantly office and/or mixed commercial and industrial activity.
3. Areas which are underutilized and could provide the type of environment attractive for new technology-oriented, research and development, and professional service office-style development.
4. Areas with access primarily along major highways and arterials, preferably well served by transit.

C. *IL (Light Industrial) Location Criteria.* The Light Industrial (IL) zone designation is most appropriate in areas generally characterized by the following:

1. Areas that are currently developed with a mix of industrial activity and related or limited commercial uses;
2. Areas that, because of their size, isolation, or separation by another type of zone or major physical barrier (such as a topographic break, major arterial, waterway, or open space) can accommodate more industrial activity without conflicting with the function of nearby commercial and residential activity.
3. Areas with adequate access to the existing and planned arterial street network, such that additional trips generated by increased industrial activity in the area can be accommodated

without conflicting with the access and circulation needs of nearby commercial and residential activity.

4. Large parcels of land with generally flat topography;
5. Adequate water, sewer, and fire protection services are available.

D. *IH (Heavy Industrial) Location Criteria.* The IH (Heavy Industrial) zone designation, as defined above, is most appropriate in areas generally characterized by the following:

1. Areas with suitable water access for marine industrial activity and/or directly served by major freight rail lines serving industrial businesses;
2. A character established by existing industrial uses and related commercial activity including manufacturing use, warehousing, transportation, utilities, and similar activities;
3. Areas that, because of their size, isolation, or separation by a nonresidential zone or major physical barrier (such as a topographic break, major arterial, waterway, or open space) can accommodate more industrial activity without conflicting with the function of nearby commercial and residential activity.
4. Access by roads designed/developed to accommodate heavy load or high volume truck traffic, with minimal mixing with nonindustrial traffic.
5. Large parcels of land with generally flat topography;
6. Adequate water, sewer, and fire protection services are available. (Ord. M-3730, Added, 12/19/2005, Sec 23)

## **20.440.030 Uses.**

A. *Types of uses.* For the purposes of this chapter, there are four kinds of use:

1. A permitted (P) use is one that is permitted outright, subject to all of the applicable provisions of this title.
2. A limited (L) use is permitted outright providing it is in compliance with special requirements, exceptions or restrictions.

3. A conditional use (C) is a discretionary use reviewed through the process set forth in Chapters [20.245](#) and [20.210](#) VMC, governing conditional uses and decision-making procedures, respectively.
  4. A prohibited use (X) is one that is not permitted in a zoning district under any circumstances.
  5. Uses may also be subject to restrictions and standards set forth in the Water Resource Protection Ordinance (VMC Title [14](#)).
- B. *Use table.* A list of permitted, limited, conditional, and prohibited uses in the industrial zoning districts is shown in Table 20.440.030-1.

**Table 20.440.030-1. Industrial Zoning Districts Use Table**

| USE                                     | OCI <sup>20</sup>  | IL <sup>1</sup> | IH             | ECX <sup>27</sup>  |
|-----------------------------------------|--------------------|-----------------|----------------|--------------------|
| <b>RESIDENTIAL</b>                      |                    |                 |                |                    |
| Household Living                        | L <sup>2</sup>     | L <sup>2</sup>  | L <sup>2</sup> | L <sup>28</sup>    |
| Group Living                            | P <sup>21</sup> /X | X               | X              | P <sup>21</sup> /X |
| Home Occupation                         | L <sup>3</sup>     | L <sup>3</sup>  | L <sup>3</sup> | L <sup>3</sup>     |
| <b>HOUSING TYPES</b>                    |                    |                 |                |                    |
| Single Dwelling, Attached               | L <sup>2</sup>     | X               | X              | L <sup>28</sup>    |
| Single Dwelling, Detached               | X                  | X               | X              | X                  |
| Accessory Dwelling Units                | X                  | X               | X              | X                  |
| Duplexes                                | L <sup>2</sup>     | X               | X              | L <sup>28</sup>    |
| Multi-Dwelling Units                    | L <sup>2</sup>     | X               | X              | L <sup>28</sup>    |
| Existing Manufactured Home Developments | X                  | X               | X              | X                  |
| Designated Manufactured                 | X                  | X               | X              | X                  |
| New Manufactured Homes                  | X                  | X               | X              | X                  |
| <b>CIVIC (Institutional)</b>            |                    |                 |                |                    |



| USE                                            | OCI <sup>20</sup> | IL <sup>1</sup> | IH              | ECX <sup>27</sup> |
|------------------------------------------------|-------------------|-----------------|-----------------|-------------------|
| Basic Utilities                                | P                 | P               | P               | P                 |
| Colleges                                       | X                 | X               | X               | C                 |
| Community Centers                              | P                 | X               | P               | P                 |
| Community Recreation                           | L <sup>24</sup>   | P               | X               | L <sup>24</sup>   |
| Cultural Institutions                          | X                 | P               | X               | P                 |
| Day Care                                       |                   |                 |                 |                   |
| - Child Care Center                            | L <sup>4</sup>    | L <sup>4</sup>  | X               | L <sup>4</sup>    |
| - Adult Day Care                               | P                 | P               | X               | P                 |
| Emergency Services (except ambulance services) | P                 | P               | P               | P                 |
| Medical Centers                                | C                 | X               | X               | P                 |
| Parks/Open Space                               |                   |                 |                 |                   |
| - Neighborhood Parks                           | P                 | P               | P               | P                 |
| - Community Parks                              | P                 | P               | P               | P                 |
| - Regional Parks                               | C                 | C               | C               | C                 |
| - Trails                                       | P                 | P               | P               | P                 |
| Postal Service                                 | X                 | P               | P               | X                 |
| Religious Institutions                         | X                 | X               | X               | X                 |
| Schools                                        | X                 | X               | X               | X                 |
| Social/Fraternal Clubs                         | X                 | X               | X               | X                 |
| Transportation Facility                        | P/X <sup>26</sup> | P               | P               | P/X <sup>26</sup> |
| Park and Ride Facilities                       |                   |                 |                 |                   |
| Surface                                        | X                 | L <sup>31</sup> | L <sup>31</sup> | X                 |
| Structure                                      | L <sup>31</sup>   | L <sup>31</sup> | L <sup>31</sup> | L <sup>31</sup>   |

| USE                                                      | OCI <sup>20</sup> | IL <sup>1</sup> | IH               | ECX <sup>27</sup>  |
|----------------------------------------------------------|-------------------|-----------------|------------------|--------------------|
| <b>COMMERCIAL</b>                                        |                   |                 |                  |                    |
| Commercial and Transient Lodging                         | X                 | X               | X                | P                  |
| Eating/Drinking Establishments                           | L                 | L <sup>5</sup>  | L <sup>5</sup>   | L <sup>6</sup>     |
| Entertainment-Oriented                                   |                   |                 |                  |                    |
| - Adult Entertainment                                    | X                 | L <sup>7</sup>  | L <sup>7</sup>   | X                  |
| - Indoor Entertainment                                   | X                 | X               | X                | X                  |
| - Major Event Entertainment                              | X                 | X               | X                | X                  |
| Artisan Small Scale Manufacturing                        | X                 | X               | X                | P                  |
| General Retail                                           |                   |                 |                  |                    |
| - Sales-Oriented                                         | L                 | L <sup>6</sup>  | L/C <sup>6</sup> | L <sup>6</sup>     |
| - Personal Services                                      | L                 | L <sup>6</sup>  | X                | L <sup>6</sup>     |
| - Repair-Oriented                                        | L                 | L <sup>6</sup>  | X                | L <sup>6</sup>     |
| - Bulk Sales                                             | X                 | X               | X                | X                  |
| - Outdoor Sales                                          | X                 | X               | P                | X                  |
| Motor Vehicle Related                                    |                   |                 |                  |                    |
| - Motor Vehicle Sales/Rental                             | X                 | X               | X                | X                  |
| - Motor Vehicle Servicing/Repair                         | X                 | L <sup>8</sup>  | L <sup>8</sup>   | X                  |
| - Vehicle Fuel Sales                                     | X                 | X               | L <sup>8</sup>   | L <sup>8, 29</sup> |
| - EV Basic Charging Stations (accessory and stand-alone) | P                 | P               | P                | P                  |
| - EV Rapid Charging Stations (accessory and stand-alone) | P                 | P               | P                | P                  |
| - EV Battery Exchange Stations                           | P                 | P               | X                | P                  |

| USE                                                                   | OCI <sup>20</sup> | IL <sup>1</sup>    | IH                  | ECX <sup>27</sup> |
|-----------------------------------------------------------------------|-------------------|--------------------|---------------------|-------------------|
| Office                                                                |                   |                    |                     |                   |
| - General                                                             | P                 | P                  | L/C <sup>9</sup>    | P                 |
| - Medical                                                             | P                 | P                  | X                   | P                 |
| - Extended                                                            | P                 | P                  | X                   | P                 |
| Marina (See also Chapter <a href="#">20.760</a> VMC)                  | X                 | C                  | X                   | X                 |
| Nonaccessory Parking                                                  | C <sup>10</sup>   | L <sup>10</sup> /X | X                   | L <sup>30</sup>   |
| Self-Service Storage                                                  | P <sup>35</sup>   | P <sup>35</sup>    | X                   | X                 |
| <b>INDUSTRIAL</b>                                                     |                   |                    |                     |                   |
| Industrial Services                                                   | P                 | P                  | P                   | P                 |
| Manufacturing and Production                                          | P                 | P <sup>11</sup>    | P <sup>11</sup>     | P                 |
| Railroad Yards                                                        | X                 | X                  | P                   | X                 |
| Bulk Fossil Fuel Storage and Handling Facilities                      | X <sup>34</sup>   | X <sup>34</sup>    | X/L/C <sup>34</sup> | X <sup>34</sup>   |
| Cleaner Fuel Storage and Handling Facilities                          | X                 | X                  | C <sup>37</sup>     | X                 |
| Small Fossil Fuel or Cleaner Fuel Storage and Distribution Facilities | X                 | X                  | C <sup>37</sup>     | X                 |
| Petroleum/Oil Refineries                                              | X                 | X                  | X                   | X                 |
| Research and Development                                              | P                 | P                  | C                   | P                 |
| Warehouse/Freight Movement                                            | X                 | L/X <sup>12</sup>  | P/L <sup>30</sup>   | X                 |
| Waste-Related                                                         | X                 | X                  | P <sup>22</sup> /X  | X                 |
| Wholesale Sales                                                       | P                 | L <sup>12</sup>    | X                   | X                 |
| Major Utility Facilities                                              | X                 | X/P <sup>32</sup>  | L <sup>33</sup>     | X                 |

| USE                                          | OCI <sup>20</sup> | IL <sup>1</sup>   | IH              | ECX <sup>27</sup> |
|----------------------------------------------|-------------------|-------------------|-----------------|-------------------|
| <b>OTHER</b>                                 |                   |                   |                 |                   |
| Agriculture/Horticulture                     | X                 | P                 | P               | X                 |
| Airport/Airpark                              | X                 | L <sup>19</sup>   | P               | X                 |
| Animal Kennel/Shelters                       | X                 | L <sup>17</sup>   | L <sup>17</sup> | X                 |
| Cemeteries                                   | X                 | X                 | C               | X                 |
| Detention and Post Detention Facilities      | X                 | C/X <sup>13</sup> | C <sup>14</sup> | X                 |
| Dog Day Care                                 | L <sup>15</sup>   | L <sup>15</sup>   | L <sup>15</sup> | L <sup>15</sup>   |
| Heliports                                    | C                 | C                 | C               | C                 |
| Medical Marijuana Cooperatives               | X                 | X                 | X               | X                 |
| Recreational Marijuana Retail                | X                 | X                 | X               | X                 |
| Recreational Marijuana Growing or Processing | X                 | L <sup>36</sup>   | L <sup>36</sup> | X                 |
| Mining                                       | C <sup>18</sup>   | C <sup>18</sup>   | C <sup>18</sup> | C <sup>18</sup>   |
| Rail Lines/Utility Corridors                 | P/X <sup>23</sup> | P                 | P               | P/X <sup>23</sup> |
| Wireless Communication Facilities            | L <sup>16</sup>   | L <sup>16</sup>   | L <sup>16</sup> | L <sup>16</sup>   |

**1** Due to the unique character and combination of uses in the Columbia Business Center area, uses existing prior to March 11, 2004, on parcels zoned IL in the Columbia Business Center may be altered, expanded or replaced regardless of use limitations in Table 20.440.030-1.

**2** In the OCI zone, multifamily housing allowed above ground floor only as specified by VMC [20.430.060\(B\)\(2\)](#). In all industrial zones, one caretaker residence permitted per use.

**3** Subject to the conditions in Chapter [20.860](#) VMC, Home Occupations.

**4** Child care centers allowed as a Limited (L) use, subject to a Type II procedure. Child care centers are permitted in order to provide service for those employees working in the IL district, subject to provisions in Chapter [20.840](#) VMC, Child Care Centers.

**5** If within an industrial building, these uses shall consume no more than 10 percent of the building's total gross square footage. If freestanding, they shall be considered together with the rest of the project and shall consume no more than 10 percent of the site's total gross square footage.

**6** These limited uses, separately or in combination, may not exceed 20 percent of the entire building square footage within a development complex. No retail uses shall exceed 40,000 gross square feet (gsf) per building or business; retail uses greater than 40,000 gsf but less than 60,000 gsf require conditional use review.

**7** Subject to provisions in Chapter [20.820](#) VMC, Adult Entertainment.

**8** Subject to provisions in VMC [20.895.070](#), Motor Vehicle Fuel Sales and Repair.

**9** Offices not accessory to a permitted use may not exceed 40,000 gsf; offices greater than 40,000 gsf but less than 60,000 gsf require conditional use review.

**10** In the OCI zone, nonaccessory surface parking is conditionally permitted on brownfields where subsurface environmental constraints effectively preclude other uses, provided such development complies with applicable local, state and federal environmental standards. In the IL zone, nonaccessory surface parking is permitted, and nonaccessory structured parking is prohibited. In the ECX zone, nonaccessory structural parking only shall be permitted.

**11** Electroplating and related uses not permitted.

**12** Warehouse/Freight Movement buildings up to 250,000 square feet of gross floor area on the ground floor of the building Permitted allowed as a limited use provided all activities, except outdoor storage of materials, are wholly contained within building(s); Warehouse/Freight Movement buildings larger than 250,000 square feet of gross floor area on the ground floor of the building are prohibited.

**13** Secure Community Transition Facilities as per Chapter [20.150](#) VMC are prohibited.

**14** In addition to other detention and post-detention facilities, Secure Community Transition Facilities are allowed by conditional use permit, subject to criteria set forth in VMC [20.855.020\(B\)\(6\)\(a\)](#).

**15** Subject to provisions in Chapter [20.850](#) VMC, Dog Day Care.

**16** Subject to requirements in Chapter [20.890](#) VMC, Wireless Telecommunications Facilities.

**17** Subject to provisions in VMC [20.895.020](#), Kennels/Shelters.

**18** Surface mining is only allowed by conditional use on sites of 20 acres or larger which are adjacent to existing mining operations. Reclamation activity for existing mining operations approved by the Washington State Department of Natural Resources is a permitted use in any nonresidential zoning district.

**19** Allow airport/airpark related activities such as hangars, air cargo, and warehousing, pilot schools, aircraft sales and repairs, aviation clubs, and museum in the Light Industrial District (IL). New airports/airparks are prohibited.

**20** All uses locating the OCI zone shall comply with the special use limitations of VMC [20.440.040\(C\)](#) and [20.440.050\(A\)](#). Development agreements in existence on the effective date of the ordinance codified in this



section shall control the uses and development standards of the affected properties. In order to protect the investments made in reliance upon such agreements, improvements made or site plans approved consistent with these agreements shall not be deemed nonconforming.

**21** Existing legally established group living uses are permitted. New group living is prohibited.

**22** Ten-day hazardous waste handling and transfer facilities, excluding facilities handling radioactive or high explosive materials, are allowed, provided such facilities: (a) do not repackage waste (except as necessary to address damaged or improper packaging); (b) are located at least 200 feet from any residential zoning district; and (c) do not store hazardous wastes (except for "universal wastes," as that term is defined in Code of Federal Regulations, Title [40](#), Part 273) for more than 10 days.

**23** Prohibited within 200 feet of a residential zone.

**24** Subject to provisions of VMC [20.895.040](#), Community Recreation and Related Facilities.

**25** The language for this footnote has been deleted.

**26** Transportation facilities are permitted except for large or land-intensive facilities such as water taxi and ferry stations.

**27** All uses locating in the ECX zone shall comply with Chapter [20.690](#) VMC, Section 30 Employment Center Plan District. Development agreements in existence on the effective date of this ordinance shall control the uses and development standards of the affected properties, unless property owners choose differently as provided under VMC [20.690.030](#). In order to protect the investments made in reliance upon such agreements, improvements made or site plans approved consistent with these agreements shall not be deemed nonconforming.

**28** In the ECX zone, multi-family housing is allowed above ground floor only; and one caretaker residence permitted per use.

**29** Vehicle fuel sales is limited to one operation within the Section 30 Plan District

**30** ~~The language for this footnote has been deleted.~~ Warehouse/Freight Movement uses larger than 250,000 square feet of gross floor area on the ground floor per building allowed as a limited use, subject to miscellaneous special use standards of VMC 20.895.120.

**31** See VMC [20.430.040\(E\)](#), Park and Ride Facility Development Standards.

**32** Major Utility Facilities are prohibited with the exception that sewer treatment plants and lagoons are allowed outright.

**33** Coal-fired electricity generating plants are prohibited in all districts. Biomass generating plants are prohibited on Heavy Industrial zoned properties within the Vancouver City Center Subarea and Hough Neighborhood Association boundaries located west of Lincoln Street and east of the Burlington Northern Santa Fe Railroad tracks.

**34** New bulk fossil fuel storage and handling facilities are prohibited. Maintenance and safety improvements to existing bulk fossil fuel storage and handling facilities are allowed subject to compliance with requirements in VMC 20.895.110. Existing bulk fossil fuel storage and handling facilities including vested projects as November 3, 2022 may convert to Cleaner Fuels and as part of such conversion may expand the amount of storage by up to 15 percent of the baseline capacity subject to a Conditional Use Permit and compliance with the requirements of VMC 20.895.110.

**35** Subject to requirements and standards within the Miscellaneous Special Use Standards for Self-Service Storage, pursuant to VMC [20.895.100](#).

**36** Subject to compliance with Chapter [20.884](#) VMC, Marijuana Businesses.

**37** Subject to compliance with VMC 20.895.110.

## **20.440.040 Development Standards.**

A. Compliance Required. All developments must comply with:

1. All of the applicable development standards contained in the underlying zoning district.
2. All other applicable standards and requirements contained in this title.
3. Stormwater Control VMC 14.25, and Water Resource Protection VMC 14.26.

B. Development standards. Development standards in industrial zoning districts are contained in Table 20.440.040-1.

**Table 20.440.040-1. Industrial Zoning Districts Development Standards**

| <b>STANDARD</b>      | <b>OCI<sup>5</sup></b> | <b>IL</b> | <b>IH</b>             |
|----------------------|------------------------|-----------|-----------------------|
| Minimum Lot Size     | None                   | None      | None                  |
| Minimum Lot Coverage | 100%                   | 75%       | 100%/75% <sup>1</sup> |
| Minimum Lot Width    | None                   | None      | None                  |

|                                                                |                                                                                                                                                                                                                                                                                                   |                  |      |
|----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|------|
| Minimum Lot Depth                                              | None                                                                                                                                                                                                                                                                                              | None             | None |
| Minimum Setbacks                                               |                                                                                                                                                                                                                                                                                                   |                  |      |
| Minimum setbacks adjacent to residential district              | Pursuant <del>ce</del> to the screening and buffering standards contained in VMC Tables 20.925.030-1 and 20.925.030-2, plus an additional ½ foot for each foot the building exceeds 20 feet in height to a maximum setback requirement of 40 feet. Buildings in excess of 20 feet may be stepped. |                  |      |
| Minimum setbacks adjacent to nonresidential district           | Pursuant to buffering and screening standards contained in VMC Tables 20.925.030-1 and 20.925.030-2.                                                                                                                                                                                              |                  |      |
| Maximum Height                                                 | 35'-75' <sup>3</sup>                                                                                                                                                                                                                                                                              | 45' <sup>2</sup> | None |
| Minimum Landscaping Requirement (percentage of total net area) | 15% <sup>4</sup>                                                                                                                                                                                                                                                                                  | 10%              | 0%   |

1 Warehouse/Freight Distribution uses in buildings over 250,000 square feet of gross floor area on the ground floor shall have a maximum lot coverage of 75%

2 Or greater, if set back 1' from property line for every additional 2' of height.

3 See VMC 20.440.040(C)(1) below for a complete explanation of maximum height requirements.

4 See VMC 20.440.040(C)(3) below for additional landscaping requirements.

5 Development agreements in existence on the effective date of this ordinance shall control the uses and development standards of the affected properties. In order to protect the investments made in reliance upon such agreements, improvements made or site plans approved consistent with these agreements shall not be deemed nonconforming.

6 The Planning Official may reduce or waive the setback requirements when setbacks are imposed on industrially-designated land as a result of the redesignation of adjacent land to residential on or after January 1, 1995.

## Chapter 20.895

### MISCELLANEOUS SPECIAL USE STANDARDS

Sections:

- 20.895.010 Purpose.
- 20.895.020 Animal Kennels/Shelters.
- 20.895.030 Cemeteries.
- 20.895.040 Community Recreation and Related Facilities.
- 20.895.050 Domestic Animals and Livestock.
- 20.895.060 Indoor Target Shooting Ranges.
- 20.895.070 Motor Vehicle Fuel Sales and Repair.
- 20.895.080 Private Use Landing Strips for Aircraft and Heliports.
- 20.895.090 Temporary Storage Units.
- 20.895.100 Self-Service Storage.
- 20.895.110 Fossil Fuel or Cleaner Fuel Storage and Handling
- 20.895.120 Warehouses Larger than 250,000 Square Feet

#### 20.895.010 Purpose.

Purpose. In addition to other standards and requirements imposed by this Title, all uses included in this Chapter shall comply with the provisions stated below. Should a conflict arise between the requirements of this Chapter and other requirements of this Title, the more restrictive provision shall control. (Ord. M-3643, 01/26/2004)

#### **20.895.120 Warehouses Larger than 250,000 Square Feet**

- A. Defined. The standards in this section apply to warehouse/freight movement buildings larger than 250,000 square feet of gross floor area on the ground floor.
- B. Traffic. Tractor trailers delivering goods to or from warehouses covered by this section shall not travel on Fruit Valley Road.
- C. Visual impact reduction. Warehouses covered by this section located adjacent to a public street or highway shall provide a combination of:
  - 1. Architectural elements such as windows, articulation of the façade, and/or moderately-dark color (e.g. not white or light-colored) walls, and
  - 2. A 25-foot deep landscaped buffer between the building and street or highway consisting of native or climate adaptive conifer trees that typically reach at least 60 feet in height

at maturity, spaced no further than twenty feet apart. If a sidewalk or utility easement exists in the landscaped buffer, the minimum width shall be increased accordingly. Such buffer area may be counted toward meeting tree density requirements.

D. Climate action measures.

1. Building roofs shall be designed and constructed to handle the structural load of solar panels and equipment, electrical panels and conduit shall be installed to facilitate rooftop solar panels in the future, and rooftop HVAC Systems shall be clustered as much as possible to facilitate maximum use of roof area for solar panels.
2. Skylights and/or clerestory windows shall be provided to facilitate natural light; skylights shall be located to facilitate maximum use of roof area for solar panels.
3. Roofs shall be white or light colored to reduce heat retention.
4. Truck engine idling is prohibited while parked or loading/unloading.
5. All loading docks shall be outfitted with ~~outlets~~ electric wiring and conduit extending to electric panels to enable future installation of outlets for charging of electric-powered trucks.
6. Secure indoor bicycle storage shall be provided for employees in accordance with the requirements of VMC 20.945.050, Bicycle Parking Design Standards.
7. Electric Vehicle Charging. EV charging stations shall be provided at a minimum of 20% of parking spaces.
8. ~~In addition to the tree density requirements of VMC 20.770, Tree, Vegetation and Soil Conservation, an area of the project site equivalent to 20% of the building footprint area shall be planted with trees~~ trees shall be planted at a density of at least thirty-three tree units per acre of the project site, subject to the size, locational and maintenance requirements of VMC 20.770. Such additional trees may be planted in a tree tract on-site or at an off-site location owned by the applicant and within ~~city~~ the limits of the designated neighborhood association within which the development is located, and as approved by the City Forester.

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## Chapter 20.945

### PARKING AND LOADING

Sections:

- 20.945.010 Purpose.**
- 20.945.020 Applicability of Provisions.**
- 20.945.030 General Provisions.**
- 20.945.040 General Design Standards for Surface Parking Areas.**



- 20.945.050     Bicycle Parking Design Standards.**
- 20.945.060     Parking Structure Design Standards.**
- 20.945.070     Minimum Off-Street Parking Requirements.**
- 20.945.080     Off-Street Loading Requirements.**

## **20.945.070 Minimum Off-Street Parking Requirements**

**Table 20.945.070-2. Minimum Off-Street Vehicle Parking Requirements**

| <b>Use</b>                 | <b>Minimum</b>                                                                                                                                       |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>RESIDENTIAL</b>         |                                                                                                                                                      |
| Household Living           | See Housing Types below                                                                                                                              |
| Group Living               | 1.0 space per 7 residents served under age 12<br><br>1.0 space per resident served ages 12 – 17<br><br>1.0 space per resident served age 18 or older |
| Transitional Housing       | 1.0:3 beds                                                                                                                                           |
| Home Occupations           | None                                                                                                                                                 |
| <b>HOUSING TYPES</b>       |                                                                                                                                                      |
| Single Dwellings, Attached | 1.0/DU <sup>1</sup>                                                                                                                                  |

| Use                                                                    | Minimum                                                                                                                                        |
|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Single Dwellings, Detached                                             | 1.0/DU                                                                                                                                         |
| Accessory Dwelling Units                                               | None                                                                                                                                           |
| Duplexes                                                               | 1.0/DU                                                                                                                                         |
| Market Rate Multifamily Dwelling Units                                 | 0.75/DU if located within 0.25 mile of frequent transit line, <sup>6</sup> 1.0/DU if located 0.25 mile or further from a frequent transit line |
| Housing for Low-Income Households Earning Under 60% Median Area Income | 0.75/DU                                                                                                                                        |
| Manufactured Home Subdivisions                                         | 1.0/DU                                                                                                                                         |
| Manufactured Home Parks                                                | 1.0/DU                                                                                                                                         |
| Senior Housing Facilities and Housing for People With Disabilities     | 0 spaces for residential units<br><br>0.75 space per employee <sup>7</sup> plus 1.0 visitor space per 10 residents                             |
| <b>CIVIC (Institutional)</b>                                           |                                                                                                                                                |
| Basic Utilities                                                        | None                                                                                                                                           |
| Community Centers                                                      | Per approved parking study                                                                                                                     |
| Community Recreation                                                   | Per approved parking study                                                                                                                     |

| Use                   | Minimum                                                                                                                                                    |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cultural Institutions | 1.0:400 sq. ft.                                                                                                                                            |
| Day Care              |                                                                                                                                                            |
| - Child Care          | Family Day Care Home: none<br><br>Institutional: 1.0/employee + 1.0/12 children served                                                                     |
| - Adult Day Care      | Family Day Care Home: none<br><br>Institutional: 1.0/employee + 1.0/12 clients served                                                                      |
| - Dog Day Care        | 1.0/employee +<br>1.0/12 animals served                                                                                                                    |
| Emergency Services    | 1.0:300                                                                                                                                                    |
| Medical Centers       | 1.0/4 beds (hospital, residential care center);<br>1.0/2 beds for patients or residents<br>(convalescent hospital, nursing home, congregate care facility) |
| Parks/Open Space      |                                                                                                                                                            |
| - Neighborhood Parks  | Parks Department to Determine                                                                                                                              |
| - Community Parks     |                                                                                                                                                            |

| Use                        | Minimum                                                                                                                                |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| - Regional Parks           |                                                                                                                                        |
| - Trails                   |                                                                                                                                        |
| Postal Service             | 1.0:300                                                                                                                                |
| Religious Institutions     | 1.0/6 seats or 12' of bench in main assembly area                                                                                      |
| Social/Fraternal Clubs     | 1.0/100                                                                                                                                |
| Transportation Facilities  | None                                                                                                                                   |
| Schools                    |                                                                                                                                        |
| - Preschool                | 2.0/classroom                                                                                                                          |
| - Elementary and Middle    | 1.0 space/4 seats or 8 feet of bench length in auditorium or assembly room, whichever is greater                                       |
| - High School              | 1.0 space/employee, plus 1.0 space/each 6 students, or 1.0 space/4 seats or 8 feet of bench length in auditorium, whichever is greater |
| - College*                 | 1.0 space/3 seats in classrooms                                                                                                        |
| *Classrooms = 30 students. |                                                                                                                                        |

| Use                                                                                                                                          | Minimum                                                   |
|----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| Lecture halls require additional parking of 12.0 spaces per 30 seats. Additional parking may be required as determined by planning official. |                                                           |
| <b>COMMERCIAL</b>                                                                                                                            |                                                           |
| Commercial and Transient Lodging                                                                                                             | 1.0/lodging unit                                          |
| Eating/Drinking Establishments                                                                                                               | 1.0/250                                                   |
| Entertainment-Oriented                                                                                                                       |                                                           |
| – Adult Entertainment                                                                                                                        | Refer to specific use, i.e., theater, book or video store |
| Indoor Entertainment                                                                                                                         |                                                           |
| – Movie/Live Performance Theaters                                                                                                            | 1.0/6 seats or 12' of bench                               |
| – Skating Rinks/Arcades                                                                                                                      | 1.0/150                                                   |
| – Bowling Alleys                                                                                                                             | 5.0 spaces per lane                                       |
| – Shooting Ranges                                                                                                                            | 1.0 space per lane                                        |
| – Major Event Entertainment                                                                                                                  | 1.0/6 seats or 12' of bench                               |
| General Retail                                                                                                                               |                                                           |



| Use                          | Minimum                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| - Sales-Oriented             | 1.0/300                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| - Personal Services          | 1.0/400                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| - Repair-Oriented            | 1.0/400                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| - Bulk Sales                 | <p>(a) Properties with less than 10,000 square feet of open sales or rental area shall provide 1.0 space for each 1,000 square feet of gross floor area, plus 1.0 space for each 2,500 square feet of open sales or rental area.</p> <p>(b) Properties with 10,000 square feet or more of open sales or rental area shall provide 1.0 space for each 1,000 square feet of gross floor area, plus 4.0 spaces, plus 1.0 space for each 10,000 square feet of open sales or rental area in excess of 10,000 square feet.</p> |
| - Outdoor Sales              | Same as Bulk Sales                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Animal Kennels/Shelters      | 1.0/600 plus 1.0 per employee                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Motor Vehicle Related        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| - Motor Vehicle Sales/Rental | <p>(a) Properties with less than 10,000 square feet of open sales or rental area shall provide 1.0 space for each 1,000 square feet of gross</p>                                                                                                                                                                                                                                                                                                                                                                          |

| Use                                   | Minimum                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                       | <p>floor area, plus 1.0 space for each 2,500 square feet of open sales or rental area.</p> <p>(b) Properties with 10,000 square feet or more of open sales or rental area shall provide 1.0 space for each 1,000 square feet of gross floor area, plus 4.0 spaces, plus 1.0 space for each 10,000 square feet of open sales or rental area in excess of 10,000 square feet.</p> |
| – Motor Vehicle Servicing/Repair      | 1.0/500                                                                                                                                                                                                                                                                                                                                                                         |
| – Vehicle Fuel Sales <sup>3</sup>     | No less than 2.0                                                                                                                                                                                                                                                                                                                                                                |
| – Electric Vehicle Recharging Station | None                                                                                                                                                                                                                                                                                                                                                                            |
| Office                                |                                                                                                                                                                                                                                                                                                                                                                                 |
| – General                             | 1.0/400                                                                                                                                                                                                                                                                                                                                                                         |
| – Medical                             | 1.0/200                                                                                                                                                                                                                                                                                                                                                                         |
| – Extended                            | 1.0/300                                                                                                                                                                                                                                                                                                                                                                         |
| Nonaccessory Parking                  | N/A                                                                                                                                                                                                                                                                                                                                                                             |
| Self-Service Storage                  | Based on area of office                                                                                                                                                                                                                                                                                                                                                         |
| Marinas                               |                                                                                                                                                                                                                                                                                                                                                                                 |

| Use                          | Minimum                                                                       |
|------------------------------|-------------------------------------------------------------------------------|
| <b>INDUSTRIAL</b>            |                                                                               |
| Industrial Services          | 1.0/600                                                                       |
| Manufacturing and Production | 1.0/800                                                                       |
| Railroad Yards               | None                                                                          |
| Research and Development     | 1.0/600                                                                       |
| Warehouses/Freight Movement  | 1.0/ <del>2,000</del> <u>5,000</u>                                            |
| Wholesale Sales              | 1.0/1,250                                                                     |
| Waste-Related                | 1.0 space per 200 square feet of office space,<br>plus 1.0 space per employee |
| <b>OTHER</b>                 |                                                                               |
| Agriculture/Horticulture     | None                                                                          |
| Airports/Airparks            | None                                                                          |
| Cemeteries                   | 1.0/6 seats or 12' of bench in chapels                                        |
| Detention Facilities         | 1.0/3 beds                                                                    |
| Heliports                    | None                                                                          |

| Use                               | Minimum                        |
|-----------------------------------|--------------------------------|
| Mining                            | 1.0 per employee maximum shift |
| Rail Lines/Utility Corridors      | None                           |
| Temporary Uses                    | None                           |
| Wireless Communication Facilities | 1.0                            |

**1** DU = dwelling unit.

**2** Does not include outpatient clinics or medical offices; see Medical/Dental Offices.

**3** Gasoline stations offering other retail goods for sale, in enclosed spaces accessible by the customer, shall also comply with the parking requirements for convenience stores. Gasoline stations providing vehicle repair or maintenance services shall also comply with the parking requirements for vehicle repair or service facilities.

**4** Senior multifamily housing project shall provide on-site parking at a minimum rate of one space per dwelling unit.

**5** *(Reserved for future use)*

**6** "Frequent transit service" means a bus rapid transit or other high capacity transit corridor, or transit corridors, with existing weekday peak service frequencies of 35 minutes or less, as indicated in the C-Tran 2018-2033 Transit Development Plan.

**7** The number of employees based on maximum number of employees present at any given time (i.e., during the largest shift of employees).

(Ord. M-4377 § 2(c), 2022; Ord. M-4255 § 12, 2018; Ord. M-4254 § 3(QQ), 2018; Ord. M-4223 § 4, 2017; ACM dated 2/18/2014, Correction to E.3 Type III Variance changed to Type II; Ord. M-4002 § 12, 2011; Ord. M-3959 § 48, 2010; Ord. M-3931 § 33, 2009; Ord. M-3922 § 44, 2009; Ord. M-3847 § 16, 2007; Ord. M-3701 § 33, 2005; Ord. M-3643, 2004)

# WAC 197-11-960: SEPA ENVIRONMENTAL CHECKLIST

## TEXT CHANGE REQUEST

### *Purpose of checklist:*

Governmental agencies use this checklist to help determine whether the environmental impacts of your proposal are significant. This information is also helpful to determine if available avoidance, minimization or compensatory mitigation measures will address the probable significant impacts or if an environmental impact statement will be prepared to further analyze the proposal.

### A. BACKGROUND

1. **Name of proposed project, if applicable:** Amendments to VMC Title 20, Land Use and Development Code, Affecting Warehouse and Freight Movement Use
2. **Name and contact information of applicants:** Chad Eiken, AICP, Director, Community Development Department, [chad.eiken@cityofvancouver.us](mailto:chad.eiken@cityofvancouver.us)
3. **Date checklist prepared:** September 14, 2023
4. **Agency requesting checklist:** City of Vancouver, WA
5. **Proposed timing or schedule (including phasing, if applicable):** A public hearing on this item is scheduled before the City of Vancouver Planning Commission on Tuesday, October 10, 2023, at 6:30 p.m and tentatively with the Vancouver City Council on November 13, 2023. The hearings are hybrid, with in-person and virtual opportunities for testimony and participation. Information about upcoming Planning Commission hearings may be accessed [here](#).
6. **Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.** None known at this time
7. **List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.** None beyond this checklist.
8. **Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.** None known.
9. **List any government approvals or permits that will be needed for your proposal, if known.** None are known.
10. **Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)**



## WAC 197-11-960: SEPA ENVIRONMENTAL CHECKLIST

Text Changes to the Vancouver Land Use and Development Code, VMC Title 20, are proposed as indicated:

### 1. Amend Use Table VMC 20.440.030-1, Industrial Zoning Districts Use Table

**Current Situation:** Warehouse/Freight Movement Use is allowed as a limited use in the Light Industrial (IL) District subject to no outdoor storage, and as a permitted use in the Heavy Industrial (IH) District with no limitations. Such use is prohibited in all other zoning districts.

**Proposed Change:** Make Warehouse/Freight Movement Use 250,000 square feet or larger in a single building prohibited in the IL District (smaller facilities continue as a limited use) and allow warehouses 250,000 square feet or larger as a limited use in the IH District, subject to certain requirements (smaller warehouse facilities continue as a permitted use).

**Intended Outcome:** Large warehouses would effectively be allowed in the Port of Vancouver or Columbia Business Center where they are more compatible with surrounding uses (and away from residential districts), and would be subject to certain additional development requirements.

**Proposed Language** (deletions shown as strike-through, and new text shown in underline):

| USE                        | OCI | IL                | IH                | ECX |
|----------------------------|-----|-------------------|-------------------|-----|
| Warehouse/Freight Movement | X   | L/X <sup>12</sup> | P/L <sup>38</sup> | X   |

<sup>12</sup> Warehouse/Freight Movement buildings up to 250,000 square feet of gross floor area on the ground floor of the building ~~Permitted~~ allowed as a limited use, provided all activities, except outdoor storage of materials are wholly contained within building(s); buildings larger than 250,000 square feet of gross floor area on the ground floor of the building are prohibited.

<sup>38</sup> Warehouse/Freight Movement uses larger than 250,000 square feet of gross floor area on the ground floor of the building allowed as a limited use, subject to miscellaneous special use standards of VMC 20.895.120.

### 2. Amend the IH, Heavy Industrial Dimensional Standards at VMC 20.440.040-1 to lower the maximum lot coverage for warehouses to 75%.

**Current Situation:** The lot coverage standard determines how much area of a property can be occupied by a structure, and is shown as a percentage. The current standard in the IH, Heavy Industrial District is 100%, which means that 100% of the property can be developed for a building, which does not

## WAC 197-11-960: SEPA ENVIRONMENTAL CHECKLIST

leave any room on-site for parking, loading, or tree planting.

Proposed Change: Reduce the maximum lot coverage standard from 100% to 75% for all warehouse/freight movement uses.

Intended Outcome: Allow for on-site space to plant trees to reduce climate impacts from very large warehouse buildings.

Proposed Language:

| STANDARD             | OCI  | IL  | IH                              |
|----------------------|------|-----|---------------------------------|
| Maximum Lot Coverage | 100% | 75% | 100%<br><u>/75%<sup>7</sup></u> |

<sup>7</sup> Warehouse/Freight Distribution uses in buildings over 250,000 square feet of gross floor area on the ground floor shall have a maximum lot coverage of 75%

3. Amend Miscellaneous Special Use Standards VMC 20.895 to add a new section regarding Large Warehouse special standards, as VMC 20.895.120.

Current Situation: There are currently no special use or development standards or large warehouses, which generate significantly more freight movement both day and night, and have potential to contribute to adverse environmental and climate outcomes through fossil fuel consumption for power, heat absorption by building materials, and impervious surfaces. Minimum required parking spaces are calculated at 1 space per 2,000 square feet of building area. The maximum lot coverage (percent of a parcel that is occupied by a building) in the IH district is 100%.

Proposed Change: Warehouses larger than 250,000 square feet would be allowed in the IH, Heavy Industrial District subject to special development standards that prohibit truck traffic along Fruit Valley Road, reduce the minimum parking requirement, reduce the maximum lot coverage, and require certain climate action measures such as: solar-ready roofs (weight load capacity and electrical), EV and truck dock charging outlets, white-colored roofs to reduce heat storage, skylights or clerestory windows to allow natural light, prohibit truck idling, architectural features (such as windows, darker colors, articulation of façade, etc.) or treed buffer if adjacent to public streets to reduce visual impacts.

Intended Outcome: Reduce impacts from large truck traffic to priority equity areas, reduce visual impacts along public streets, and improve environmental and climate action outcomes.

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Proposed Language:

### **20.895.120 Warehouses Larger than 250,000 Square Feet (NEW)**

- A. Defined. The standards in this section apply to warehouse/freight movement buildings larger than 250,000 square feet of gross floor area on the ground floor.
- B. Traffic. Tractor trailers delivering goods to or from warehouses covered by this section shall not travel on Fruit Valley Road.
- C. Visual impact reduction. Warehouses covered by this section located adjacent to a public street or highway shall provide a combination of:
  - 1. Architectural elements such as windows, articulation of the façade, and/or moderately-dark color (e.g. not white or light-colored) walls, and
  - 2. A 25-foot deep landscaped buffer between the building and street or highway consisting of evergreen trees that will reach at least 35 feet in height at maturity.
- D. Climate action measures.
  - 1. An area of the project site equivalent to 20% of the building footprint area shall be planted with trees at a density of at least thirty trees per acre. Evergreen trees shall be least 4 feet tall at the time of planting and deciduous trees shall be at least 1.5" caliper at 4 feet at the time of planting. Trees may be planted at an off-site location as approved by the City Forester.
  - 2. Building roofs shall be designed and constructed to handle the structural load of solar panels and equipment, and electrical panels and conduit shall be installed to facilitate rooftop solar panels in the future.
  - 3. Skylights and/or clerestory windows shall be provided to facilitate natural light.
  - 4. Roofs shall be white or light colored to reduce heat retention.
  - 5. Truck engine idling is prohibited while parked or loading/unloading.
  - 6. All loading docks shall be outfitted with outlets for charging electric-powered trucks.
  - 7. Electric Vehicle Charging. EV charging stations shall be provided at a minimum of 20% of parking spaces.

#### **4. Amend Table 20.945.070-2 Minimum Off-Street Vehicle Parking Requirements to lower the parking requirement for all warehouse uses.**

Current Situation: Warehouses must provide a minimum of one parking space for every 2,000 square feet of building area, typically for employees as opposed to customers. While this rate has not caused any major problems, larger facilities which are increasingly more automated may not need as much parking for employees, so the minimum requirement may inadvertently be resulting in more impervious surface and spaces that will not be used.

Proposed Change: Require that parking spaces be provided for warehouses at a minimum

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rate of 1.0 space per 5,000 square feet.

Intended Outcome: Reduce the minimum amount of parking and impervious surface that is needed to serve warehouse uses. Warehouse developers would be able to provide more parking if they choose to, but city regulations would not be the reason that more parking spaces are provided than are needed. As an example, a 250,000 square foot building would be required to provide only 50 spaces, as opposed to 125 spaces under current regulations. Reducing the amount of paved surfaces improves storm water and climate outcomes (less heat retention) and creates more space for tree plantings.

Proposed Language:

Table 20.945.070-2 Minimum Off-Street Parking Requirements

| Use                        | Minimum         |
|----------------------------|-----------------|
| Warehouse/Freight Movement | 1.0/2,000-5,000 |

The Vancouver Planning Commission held workshops on July 25, 2023 and September 12, 2023 addressing text changes. City Council held a workshop on potential code changes on August 14, 2023 and a second workshop is scheduled for October 2, 2023.

**11. Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.**

Text changes to VMC Title 20 will apply citywide, but more specifically to properties and uses in the IL, Light Industrial District and IH, Heavy Industrial District.

### B. ENVIRONMENTAL ELEMENTS

**1. EARTH:** Not Applicable to Non-Project Actions: See Section D

**a. General description of the site**

**(circle one):** Flat, rolling, hilly, steep slopes, mountainous,  
other \_\_\_\_\_ Does Not Apply

**b. What is the steepest slope on the site (approximate percent slope)?** Does Not Apply

**c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any**

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agricultural land of long-term commercial significance and whether the proposal results in removing any of these soils. Does Not Apply

- d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe. Does Not Apply
- e. Describe the purpose, type, total area, and approximate quantities and total affected area of any filling, excavation, and grading proposed. Indicate source of fill. Does Not Apply
- f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe. Does Not Apply
- g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)? Does Not Apply
- h. Proposed measures to reduce orth, if any:  
Does Not Apply

### **2. AIR: Not Applicable to Non-Project Actions: See Section D**

- a. What types of emissions to the air would result from the proposal during construction, operation, and maintenance when the project is completed? If any, generally describe and give approximate quantities if known. Does Not Apply
- b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe. Does Not Apply
- c. Proposed measures to reduce or control emissions or other impacts to air, if any: Does Not Apply

### **3. WATER: Not Applicable to Non-Project Actions: See Section D**

#### **a. Surface Water: Not Applicable to Non-Project Actions: See Section D**

- 1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into. Does Not Apply
- 2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans. Does Not Apply
- 3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material. Does Not Apply
- 4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known. Does Not Apply
- 5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan. Does Not Apply
- 6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge. Does Not Apply

#### **b. Ground Water: Not Applicable to Non-Project Actions: See Section D**

- 1) Will groundwater be withdrawn from a well for drinking water or other purposes? If so, give a general description of the well, proposed uses and approximate quantities



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withdrawn from the well. Will water be discharged to groundwater? Give general description, purpose, and approximate quantities if known. Does Not Apply

- 2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals. . . ; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve. Does Not Apply

c. Water runoff (including stormwater): Not Applicable to Non-Project Actions: See Section D

- 1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe. Does Not Apply

- 2) Could waste materials enter ground or surface waters? If so, generally describe. Does Not Apply

- 3) Does the proposal alter or otherwise affect drainage patterns in the vicinity of the site? If so, describe. Does Not Apply

d. Proposed measures to reduce or control surface, ground, and runoff water, and drainage pattern impacts, if any: Not Applicable to Non-Project Actions

4. PLANTS: Not Applicable to Non-Project Actions: See Section D

a. Check the types of vegetation found on the site:

\_\_\_deciduous tree: alder, maple, aspen, other

\_\_\_evergreen tree: fir, cedar, pine, other

\_\_\_shrubs

\_\_\_grass

\_\_\_pasture

\_\_\_crop or grain

\_\_\_ Orchards, vineyards or other permanent crops.

\_\_\_ wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other

\_\_\_water plants: water lily, eelgrass, milfoil, other

\_\_\_other types of vegetation Does Not Apply

b. What kind and amount of vegetation will be removed or altered? Does Not Apply

c. List threatened and endangered species known to be on or near the site. Does Not Apply

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any: Does Not Apply

e. List all noxious weeds and invasive species known to be on or near the site. Does Not Apply

5. ANIMALS: Not Applicable to Non-Project Actions: See Section D

a. List any birds and other animals which have been observed on or near the site or are known to be on or near the site. Examples include: Does Not Apply

birds: hawk, heron, eagle, songbirds, other:

mammals: deer, bear, elk, beaver, other:

fish: bass, salmon, trout, herring, shellfish, other \_\_\_\_\_

b. List any threatened and endangered species known to be on or near the site. Does Not Apply

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- c. Is the site part of a migration route? If so, explain. Does Not Apply
  - d. Proposed measures to preserve or enhance wildlife, if any: Does Not Apply
  - e. List any invasive animal species known to be on or near the site. Does Not Apply
- 6. ENERGY & NATURAL RESOURCES:** Not Applicable to Non-Project Actions: See Section D
- a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc. Does Not Apply
  - b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe. Does Not Apply
  - c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any: See Section D
- 7. ENVIRONMENTAL HEALTH:** Not Applicable to Non-Project Actions: See Section D
- a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal? If so, describe. Does Not Apply  
Describe any known or possible contamination at the site from present or past uses. Does Not Apply
    - 1) Describe existing hazardous chemicals/conditions that might affect project development and design. This includes underground hazardous liquid and gas transmission pipelines located within the project area and in the vicinity. Does Not Apply
    - 2) Describe any toxic or hazardous chemicals that might be stored, used, or produced during the project's development or construction, or at any time during the operating life of the project. Does Not Apply
    - 3) Describe special emergency services that might be required. Does Not Apply
    - 4) Proposed measures to reduce or control environmental health hazards, if any: Does Not Apply
  - b. Noise: Not Applicable to Non-Project Actions: See Section D
    - 1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)? Does Not Apply
    - 2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site. Does Not Apply
    - 3) Proposed measures to reduce or control noise impacts, if any: See Section D
- 8. LAND AND SHORELINE USE:** Not Applicable to Non-Project Actions: See Section D
- a. What is the current use of the site and adjacent properties? Will the proposal affect current land uses on nearby or adjacent properties? If so, describe. Does Not Apply
  - b. Has the project site been used as working farmlands or working forest lands? If so, describe. How much agricultural or forest land of long-term commercial significance will be converted to other uses as a result of the proposal, if any? If resource lands have not been

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designated, how many acres in farmland or forest land tax status will be converted to nonfarm or nonforest use? Does Not Apply

- 1) Will the proposal affect or be affected by surrounding working farm or forest land normal business operations, such as oversized equipment access, the application of pesticides, tilling, and harvesting? If so, how: Does Not Apply

- c. Describe any structures on the site. Does Not Apply
- d. Will any structures be demolished? If so, what? Does Not Apply
- e. What is the current zoning classification of the site? Does Not Apply
- f. What is the current comprehensive plan designation of the site? Does Not Apply
- g. If applicable, what is the current shoreline master program designation of the site? Does Not Apply
- h. Has any part of the site been classified as a critical area by the city or county? If so, specify. Does Not Apply
- i. Approximately how many people would reside or work in the completed project? Does Not Apply
- j. Approximately how many people would the completed project displace? Does Not Apply
- k. Proposed measures to avoid or reduce displacement impacts, if any: Does not apply
- l. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any: Does Not Apply
- m. Proposed measures to ensure the proposal is compatible with nearby agricultural and forest lands of long-term commercial significance, if any: Does Not Apply

### **9. HOUSING: Not Applicable to Non-Project Actions: See Section D**

- a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing. Does Not Apply
- b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing. Does Not Apply
- c. Proposed measures to reduce or control housing impacts, if any: Does Not Apply

### **10. AESTHETICS: Not Applicable to Non-Project Actions: See Section D**

- a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed? Does Not Apply
- b. What views in the immediate vicinity would be altered or obstructed? Does Not Apply
- c. Proposed measures to reduce or control aesthetic impacts, if any: See Section D

### **11. LIGHT & GLARE: Not Applicable to Non-Project Actions: See Section D**

- a. What type of light or glare will the proposal produce? What time of day would it mainly occur? Does Not Apply
- b. Could light or glare from the finished project be a safety hazard or interfere with views? Does Not Apply
- c. What existing off-site sources of light or glare may affect your proposal? Does Not Apply
- d. Proposed measures to reduce or control light and glare impacts, if any: See Section D

### **12. RECREATION: Not Applicable to Non-Project Actions: See Section D**

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**a. What designated and informal recreational opportunities are in the immediate vicinity?**

Does Not Apply

**b. Would the proposed project displace any existing recreational uses? If so, describe.**

Does Not Apply

**c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:** Does Not Apply

**13. HISTORIC & CULTURAL PRESERVATION:** Not Applicable to Non-Project Actions: See Sec. D

**a. Are there any buildings, structures, or sites, located on or near the site that are over 45 years old listed in or eligible for listing in national, state, or local preservation registers located on or near the site? If so, specifically describe.** Does Not Apply

**b. Are there any landmarks, features, or other evidence of Indian or historic use or occupation? This may include human burials or old cemeteries. Are there any material evidence, artifacts, or areas of cultural importance on or near the site? Please list any professional studies conducted at the site to identify such resources.** Does Not Apply

**c. Describe the methods used to assess the potential impacts to cultural and historic resources on or near the project site. Examples include consultation with tribes and the department of archeology and historic preservation, archaeological surveys, historic maps, GIS data, etc.** Does Not Apply

**d. Proposed measures to avoid, minimize, or compensate for loss, changes to, and disturbance to resources. Please include plans for the above and any permits that may be required.** Does Not Apply

**14. TRANSPORTATION:** Not Applicable to Non-Project Actions: See Section D

**a. Identify public streets and highways serving the site or affected geographic area and describe proposed access to the existing street system. Show on site plans, if any.** Does Not Apply

**b. Is the site or affected geographic area currently served by public transit? If so, generally describe. If not, what is the approximate distance to the nearest transit stop?** Does Not Apply

**c. How many additional parking spaces would the completed project or non-project proposal have? How many would the project or proposal eliminate?** Does Not Apply

**d. Will the proposal require any new or improvements to existing roads, streets, pedestrian, bicycle or state transportation facilities, not including driveways? If so, generally describe (indicate whether public or private).** Does Not Apply

**e. Will the project or proposal use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.** Does Not Apply

**f. How many vehicular trips per day would be generated by the completed project or proposal? If known, indicate when peak volumes would occur and what percentage of the volume would be trucks (such as commercial and nonpassenger vehicles). What data or transportation models were used to make these estimates?** Does Not Apply

**g. Will the proposal interfere with, affect or be affected by the movement of agricultural and forest products on roads or streets in the area? If so, generally describe.** Does Not Apply

**h. Proposed measures to reduce or control transportation impacts, if any:** See Section D

## WAC 197-11-960: SEPA ENVIRONMENTAL CHECKLIST

### 15. PUBLIC SERVICES: Not Applicable to Non-Project Actions: See Section D

- a. Would the project result in an increased need for public services (for example: fire protection, police protection, public transit, health care, schools, other)? If so, generally describe. N/A
- b. Proposed measures to reduce or control direct impacts on public services, if any. Does N/A

### 16. UTILITIES: Not Applicable to Non-Project Actions: See Section D

- a. Circle utilities currently available at the site:  
electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other \_\_\_\_\_ Does Not Apply
- b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed. Does Not Apply

### C. Signature

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature: 

Name of signee Chad Eiken

Position and Agency/Organization

Director, City of Vancouver Community Development Department

Date Submitted: September 14, 2023

### D. SUPPLEMENTAL SHEET FOR NON-PROJECT ACTIONS

#### 1. How would the proposal be likely to increase discharge to water; emissions to air; production, storage, or reuse of toxic or hazardous substances; or production of noise?

The text changes would not increase discharges, emissions, or releases. Currently there are no limitations in city code other than maximum building height, maximum lot coverage, and minimum setbacks for warehouses larger than 250,000 square feet. The proposed text amendments are intended to address certain impacts from very large (greater than 250,000 square foot) warehouses on adjacent land uses, truck traffic, visual, air, energy use, and climate change.

**Proposed measures to avoid or reduce such increases are:** Warehouses are currently allowed in the IL, Light Industrial District, which in many locations in the City are adjacent to or near



## **WAC 197-11-960: SEPA ENVIRONMENTAL CHECKLIST**

residentially-zoned properties. To improve compatibility with very large warehouses (larger than 250,000 square feet) and adjacent land uses, such warehouses would only be allowed in the IH, Heavy Industrial District. Effectively, very large warehouses could only locate in the Port of Vancouver and Columbia Business Center, both of which are well-removed from residential development.

- 2. How would the proposal be likely to affect plants, animals, fish, or marine life?** The proposed text amendments are intended to address certain impacts from very large (greater than 250,000 square foot) warehouses on adjacent land uses, traffic, visual, air, energy use, and climate change.

**Proposed measures to protect or conserve plants, animals, fish, or marine life are:** Warehouses larger than 250,000 square feet would be required to plant trees at a rate of 30 trees per acre in an area that equals 20% of the building area. For example, a 300,000 square foot warehouse would be required to plant 41 trees on 1.37 acres. This will provide habitat for wildlife, and water retention and climate benefits.

- 3. How would the proposal be likely to deplete energy or natural resources?** See response to #1 above.

**Proposed measures to protect or conserve energy and natural resources are:** The proposed code amendments which would apply to warehouses larger than 250,000 square feet include climate-friendly standards such as: 20% of parking stalls shall have EV charging stations, minimum required parking would be reduced by about 60%, skylights and clerestory windows would be required, roofs would be required to be solar-ready, and all loading docks would be required to be served by outlets capable of charging E-trucks.

- 4. How would the proposal be likely to use or affect environmentally sensitive areas or areas designated (or eligible or under study) for governmental protection; such as parks, wilderness, wild and scenic rivers, threatened or endangered species habitat, historic or cultural sites, wetlands, floodplains, or prime farmlands?** See response to #1 above.

**Proposed measures to protect such resources or to avoid or reduce impacts are:** The proposal is to implement certain use and development standards for warehouses larger than 250,000 square feet in size. Such warehouses would only be allowed in the IH Heavy Industrial zoning district, and would no longer be allowed in the IL, Light Industrial zoning district. Sensitive natural areas including wetlands, rivers, historic and cultural sites, floodplains, etc. are currently protected by existing development regulations.

- 5. How would the proposal be likely to affect land and shoreline use, including whether it would allow or encourage land or shoreline uses incompatible with existing plans?** See response to #1 above.

**Proposed measures to avoid or reduce shoreline and land use impacts are:** The proposal to only allow very large warehouses in the IH Heavy Industrial District will improve compatibility

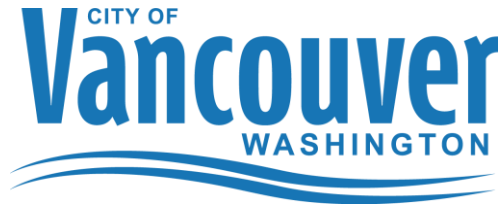
## **WAC 197-11-960: SEPA ENVIRONMENTAL CHECKLIST**

with nearby land uses and in particular will result in such uses being located further away from residential areas. The City's Shoreline Management Master Program and associated regulations will serve to protect shoreline areas from impacts from very large warehouses.

**6. How would the proposal be likely to increase demands on transportation or public services and utilities? See response to #1 above.**

**Proposed measures to reduce or respond to such demand(s) are:** Large warehouses, particularly those associated with e-commerce distribution facilities, have been found to generate significantly more daily vehicle trips including large trucks, medium trucks, and vans. The proposal would allow very large warehouses in the IH Heavy Industrial Districts (Port and Columbia Business Center) which have good access to designated truck routes, without having to traverse residential areas or local streets. The one exception is that trucks driving between I-5 and the Port frequently take Fruit Valley Road which bisects the Fruit Valley Neighborhood, a high priority equity area. To reduce impacts from trucks driving to and from very large warehouses, a proposed condition would be applied to any new warehouse larger than 250,000 square feet to prohibit such trucks from using Fruit Valley Road.

**7. Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment.** The proposed text changes do not conflict with local, state or federal laws or requirements for the protection of the environment.



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### Notice of SEPA Determination of Non-Significance (DNS)

**September 19, 2023** - SEPA Determination of Non-Significance for proposed text changes to VMC Title 20, Land Use and Development Code, regarding warehouse/freight distribution uses and specifically, warehouses larger than 250,000 square feet.

#### Proposed Text Changes:

1. Amend Use Table VMC 20.440.030-1, Industrial Zoning Districts Use Table as follows:

| USE                        | OCI | IL                       | IH                       | ECX |
|----------------------------|-----|--------------------------|--------------------------|-----|
| Warehouse/Freight Movement | X   | <u>L/X</u> <sup>12</sup> | <u>P/L</u> <sup>38</sup> | X   |

<sup>12</sup> Warehouse/Freight Movement buildings up to 250,000 square feet of gross floor area on the ground floor of the building ~~Permitted~~ allowed as a limited use, provided all activities, except outdoor storage of materials are wholly contained within building(s); buildings larger than 250,000 square feet of gross floor area on the ground floor of the building are prohibited.

<sup>38</sup> Warehouse/Freight Movement uses larger than 250,000 square feet of gross floor area on the ground floor of the building allowed as a limited use, subject to miscellaneous special use standards of VMC 20.895.120.

2. Amend the IH, Heavy Industrial Dimensional Standards at VMC 20.440.040-1 to lower the maximum lot coverage for warehouses to 75%, as follows:

| STANDARD             | OCI  | IL  | IH                               |
|----------------------|------|-----|----------------------------------|
| Maximum Lot Coverage | 100% | 75% | 100%<br><u>/75%</u> <sup>7</sup> |

<sup>7</sup> Warehouse/Freight Distribution uses in buildings over 250,000 square feet of gross floor area on the ground floor shall have a maximum lot coverage of 75%

3. Amend Miscellaneous Special Use Standards VMC 20.895 to add a new section regarding Large Warehouse special standards, as VMC 20.895.120, as follows:

**20.895.120 Warehouses Larger than 250,000 Square Feet (NEW SECTION)**

- A. Defined. The standards in this section apply to warehouse/freight movement buildings larger than 250,000 square feet of gross floor area on the ground floor.
- B. Traffic. Tractor trailers delivering goods to or from warehouses covered by this section shall not travel on Fruit Valley Road.
- C. Visual impact reduction. Warehouses covered by this section located adjacent to a public street or highway shall provide a combination of:
1. Architectural elements such as windows, articulation of the façade, and/or moderately-dark color (e.g. not white or light-colored) walls, and
  2. A 25-foot deep landscaped buffer between the building and street or highway consisting of native or climate adaptive conifer trees that typically reach at least 60 feet height at maturity, spaced no further than twenty feet apart. If a sidewalk or utility easement exists in the landscaped buffer, the minimum width shall be increased accordingly.
- D. Climate action measures.
1. Building roofs shall be designed and constructed to handle the structural load of solar panels and equipment, electrical panels and conduit shall be installed to facilitate rooftop solar panels in the future, and rooftop HVAC systems shall be clustered as much as possible to facilitate maximum use of roof area for solar panels.
  2. Skylights and/or clerestory windows shall be provided to facilitate natural light.
  3. Roofs shall be white or light colored to reduce heat retention.
  4. Truck engine idling is prohibited while parked or loading/unloading.
  5. All loading docks shall be outfitted with outlets for charging electric-powered trucks.
  6. Electric Vehicle Charging. EV charging stations shall be provided at a minimum of 20% of parking spaces.
  7. In addition to the tree density requirements of VMC 20.770, Tree, Vegetation and Soil Conservation, an area of the project site equivalent to 20% of the building footprint area shall be planted with trees at a density of at least thirty trees per acre subject to the size, locational and maintenance requirements of VMC 20.770. Such additional trees may be planted in a tree tract on-site or at an off-site location owned by the applicant and within city limits, as approved by the City Forester.

4. Amend Table 20.945.070-2 Minimum Off-Street Vehicle Parking Requirements to lower the parking requirement for all warehouse uses, as follows:

Table 20.945.070-2 Minimum Off-Street Parking Requirements

| Use                        | Minimum                     |
|----------------------------|-----------------------------|
| Warehouse/Freight Movement | 1.0/ <del>2,000</del> 5,000 |

The City of Vancouver, lead agency, has reviewed the Environmental Checklist as required by WAC 197-11-330(1), pursuant to the State Environmental Policy Act (SEPA), and determined that the proposals will not have a probable significant adverse impact on the environment. Under the authority of WAC 197-11-330(1) and 197-11-350, this Notice of Determination of Non-Significance (DNS) has been issued.

A SEPA checklist and background information are available from City staff. Pursuant to WAC 197-11-340, comments ***on this SEPA determination*** will be received until **5:00 p.m., October 23, 2023**. Procedural appeals to the SEPA determination must be filed in writing within 14 calendar days following the end of the comment period.

A City Council decision of the SEPA procedural appeal shall be final and not subject to further administrative appeal. Substantive SEPA appeals shall be filed in writing within 14 calendar days of the issuance of Council's decision.

**Contact: Bryan Snodgrass, Principal Planner, Vancouver Community Development Department (360 487-7946), [bryan.snodgrass@cityofvancouver.us](mailto:bryan.snodgrass@cityofvancouver.us)**



September 19, 2023

Name

Date



# Traditional Warehouse Developments vs. Modern E-commerce Facilities

Prepared for:  
The City of Vancouver

June 2023 (Revised July 2023)

PT23-0086

FEHR  PEERS

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# Executive Summary

Warehousing, broadly described as the storage of bulk inventory in large facilities, has undergone substantial evolution, from the introduction of forklifts and pallets in the 1920s to automation and cloud computing today. As a result of advances in technology and proliferation of trucking, warehouses are a critical intermediate step between supplier and consumer. Additionally, trends like e-commerce and online shopping, near-shoring and reshoring<sup>1</sup> of manufacturing have increased global demand for industrial warehousing, resulting in unprecedented warehouse development in recent years. These factors have been accelerated by the COVID-19 global pandemic.

Given Vancouver's location near a major airport, seaport, and population center, warehousing demand in the Vancouver/Portland region is particularly robust. Over the past year, the City of Vancouver received five applications to develop large industrial warehouses (>250,000 square feet), which are expected to store and repackage e-commerce goods intended for various purposes including retail home delivery. In response to this regional trend, the City seeks to better understand key characteristics of these larger, typically e-commerce-oriented facilities in comparison to smaller-sized, more traditional warehouses, and how these differences might impact the local economy, street capacity, the environment, and overall quality of life for Vancouver residents.

This report details physical, operational, and economic differences between traditional and modern industrial warehouses, including e-commerce facilities. The report includes strategies for the City of Vancouver to consider in ensuring that future warehouse developments support the City's economic vision, have adequate transportation infrastructure, and align with climate goals and priorities. Given the relevant newness of the e-commerce sector, data about its impacts are evolving and incomplete. This report summarizes insights from a high-level analysis of available literature, data from the US Census Bureau and the Bureau of Economic Analysis, previously collected empirical warehouse traffic data from California<sup>2</sup>, correspondence with developers, and a review of peer cities. This serves as an initial step towards understanding the how Vancouver might respond to the growth of e-commerce-oriented facilities.

## Warehousing Trends

The size, design, function, level of automation, and siting of warehouses has evolved considerably over the years in response to market changes and in support of supply chain efficiencies. There has been a

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<sup>1</sup> Reshoring describes the process of returning domestic product manufacturing from a foreign country back to the home country of where a business' products are sold. Near-shoring focuses on moving manufacturing operations to nearby countries or close to the point of use.

<sup>2</sup> The previously collected empirical warehouse traffic data from California is assumed to provide general insights of the differences in traffic impacts between traditional warehouses and e-commerce facilities. An in-depth review of local warehouse developments sites in the Vancouver/Portland region would help inform more representative trends that are context sensitive.



recent trend toward high-tech warehousing that supports e-commerce and Just-in-Time (JIT)<sup>3</sup> inventory practices aimed at businesses saving costs by using less space to hold both consumer goods and inputs to production. These are the top three factors influencing warehousing demand in Vancouver today:

- **E-commerce** (electronic commerce), defined as the process of buying and selling goods or services via the internet, has garnered popularity over the past years, particularly due to the COVID-19 pandemic. Growth in e-commerce has impacted supply chain management and increased the demand for industrial property development.
- **Just-in-Time (JIT) versus Just-in-Case (JIC) inventory management**<sup>3</sup> played a significant role in the shortages for basic household goods, such as toilet paper and cleaning supplies, over the past years. JIT offers cost savings because less space is needed for storage, but JIC is trending back due to the hardships the lack of inventory created for many companies. Both practices are anticipated to continue, and more warehousing space is needed to support this.
- **Market Need** – warehouse sites near logistics hubs, such as intermodal rail yards, airports and seaports are in high demand. As a City surrounded a major airport and seaport, and population center, there is a market need for warehouse developments in Vancouver to support e-commerce and online shopping. Due to the absence of e-commerce facilities within City limits, households and businesses currently rely on facilities/warehouses in Portland.

## Warehouse Characteristics

Various warehouse types support retail, commercial, and industrial supply chains. Virtually all industries rely directly or indirectly on warehousing services. Directly related to e-commerce, distribution and fulfillment centers typically provide value-added logistics services, allowing operators to efficiently meet varying customer demands streamlining supply chains. These facilities differ from traditional warehouses from a physical, operational, and economic standpoint.

### *Key Physical Differences*

Physical characteristics of warehouses include warehousing design (building size, lot coverage, loading bays, and parking spaces) and siting. Key physical differences that distinguish e-commerce facilities from traditional warehouses include:

- **More varied building sizes/footprints.** While traditional warehouses are typically less than 100,000 square feet, e-commerce facilities range from about 100,000 square feet to over 1 million square feet.
- **E-commerce warehouses tend to be taller.** Building clear height, defined as the height of a building from the floor to the bottom of the lowest hanging item on the ceiling, is typically less than 32 feet for traditional warehouses, but often greater than 36 feet for e-commerce facilities.
- **More loading dock doors.** Operations at e-commerce facilities require more loading docks.

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<sup>3</sup> JIT inventory practices are strategies in which commerce companies receive the exact amount of inventory they need, right when they need it. A contrasting approach is Just-in-Case (JIC) inventory management which centered around keeping a lot of stock/ inventory on hand to reduce the risk of stock-out.

- **Different siting locations.** Traditional warehouses are typically situated close to other industrial uses, whereas e-commerce facilities tend to be proposed near population centers and ports.

### *Key Operational Differences*

Recent technological improvements have resulted in increasingly efficient use of warehouse space and consolidation of facilities. Modern warehouses operate differently than traditional warehouses, particularly regarding hours of operation and the flow of goods:

- **24-7 operations.** Typical hours of operation for e-commerce facilities span 24 hours a day, seven days per week. The non-stop activity in modern warehouses is made possible by shift workers and automation. In contrast, traditional warehouses with slower inventory turnover are typically limited to normal business hours, i.e., 8-hour shifts, five days per week.
- **More constant flow of goods.** E-commerce facilities typically focus less on long-term storage and more on the flow of goods and services. Modern industrial warehouse facilities are often driven by demand, compared to traditional warehouses, where operations are related to storing the largest amount of goods possible.

### *Traffic Impacts*

Warehouses generate some level of traffic (passenger cars and trucks), but this varies significantly based on the operations of the facilities. In addition, the type of trucks (medium- vs. heavy-duty trucks<sup>4</sup>) also varies. Traffic impacts differ between e-commerce and traditional warehouses in the following ways:

- **Much higher vehicle activity.** Based on data from the Institute of Transportation Engineers (ITE) Trip Generation Manual, e-commerce facilities generate up to four times more daily vehicle trips than traditional warehouses, particularly for fulfillment centers that require extensive sorting.
- **Smaller delivery vehicles are more common.** Whereas traditional warehouses generate mostly medium-duty and heavy-duty truck trips, light-duty trucks and vans play a substantial role in the transport of goods from today's e-commerce facilities.

### *Key Economic Differences*

Industrial warehouses generate jobs and tax revenue (property, sales and use, and utility taxes). Warehousing jobs provide two important community benefits: 1) pay rates that start above minimum wage, and 2) on-the-job-training for career advancement. Warehouses also generate indirect jobs<sup>5</sup> that benefit local and regional economies. Regionally, the U.S. Bureau of Economic Analysis (BEA) estimates that 10 new warehouse jobs create about 14 jobs in other industries.<sup>6</sup> For every \$1.00 of earnings paid to

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<sup>4</sup> Trucks are placed into classifications based on the gross vehicle weight rating (GWVR). The Federal Highway Administration (FHWA) categorizes medium duty trucks as classes 3-6, with GWVR range of 10,001- 26,000 lbs. and heavy-duty trucks as classes 6-7, with GWVR greater than 26,001 lbs.

<sup>5</sup> Indirect jobs are jobs generated in supporting industries; these include repair and maintenance jobs, service jobs and third-party vendors.

the new warehouse workers, an additional \$1.50 in earnings is generated throughout the economy.<sup>6</sup> Key distinctions in the economic impact of e-commerce versus traditional warehouses include:

- **Higher-skilled labor.** While traditional warehouses rely on unskilled labor and managerial jobs, highly automated e-commerce facilities offer high-paying jobs such as automation engineers with average salaries over \$100,000 annually. With companies such as Amazon investing more in warehouse automation and on-the-job training for skilled labor, the prominence of these high-paying jobs is likely to grow.
- **More ripple effects on the local economy.** Based on building size/footprint and warehouse jobs created, e-commerce facilities typically entail more local and regional economic impacts (tax revenue, indirect jobs, and new dollars circulating in the economy) than traditional warehouses.

## Key Takeaways

From a physical, operational, and economic standpoint, there are pronounced differences between traditional warehouses and e-commerce facilities. With the evolving warehousing industry and a market need for e-commerce facilities in Vancouver, the City may benefit from new warehouse developments targeted to store and repackage e-commerce goods intended for various purposes, including retail home delivery. The development of e-commerce facilities will support the growth of the local economy in Vancouver through job creation and tax revenue. Regulatory amendments are needed to ensure that any new development supports the City's economic growth, has adequate transportation infrastructure, and aligns with climate goals and priorities.

## Regulatory Recommendations

Recent best practices focus on understanding the operations of industrial warehousing and taking a performance-based zoning approach directly addresses the potential impacts of modern warehouse facilities. The following provides some potential conditions of approval for the City's consideration:

### General

- **Update conditional use permitting (CUP) requirements** to make applicants describe their proposed operations, such as hours of operation, number of employees per shift, number of shifts, daily and AM/PM peak hour trips by vehicle type, number of dock doors, number of parking spaces for employees, trailers, tractor-trailers, and/or tractors, and anticipated water/sewer usage in volume, and power requirements in megawatts.
- **Address impacts early in the entitlement process.** There are several measures that the City can take to mitigate impacts related to traffic congestion, air and noise pollution, such as identifying

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<sup>6</sup> The region discussed is the Portland-Vancouver-Hillsboro Metropolitan Statistical Area. The provided estimates are based on U.S. Bureau of Economic Analysis (BEA) RIMS II multipliers: 1.408 for each new job and 1.508 for earnings in the Portland/Vancouver/Hillsboro MSA. The multipliers estimate the impact from changes in final demand on one or more regional industries in terms of output, employment, and labor earnings. These multipliers are based on estimates of local area personal income and on the national input-output (I-O) accounts.

truck routes and access, right sizing the employee, truck and trailer parking requirements, and requiring sustainable development standards specific to each facility's anticipated impacts.

### *Traffic Impacts*

- **Develop a traffic impact assessment/analysis (TIA) template** to guide the assumptions to use in preparing TIAs.
- **Update the City's parking and circulation regulations** to address parking and queueing concerns that often arise with warehouse developments. Specifications of truck parking for long duration or overnight parking, trailer storage, and dock spaces in length and width, should accommodate the largest commercial motor vehicle that is anticipated to utilize a facility. The number of spaces offered and their dimensions should be consistent with the proposed use and potential future re-uses of the site.
- **Consider trails, sidewalks, and access to transit facilities** when planning for the location of freight-based operations. This infrastructure serves both drivers and employees accessing the site.
- **Require tenants to establish and promote rideshare programs** that discourage single-occupancy vehicle trips and provide financial incentives for modes like carpooling, public transit, and biking.

### *Adaptive Reuse*

- **Require design features that support broader uses** to accommodate potential future adaptive reuse of warehousing sites. Warehouses have been converted to "ghost" kitchens, segmented artist studios, start-up office space, and production or testing facilities for industries like biotech.

### *Environment and Climate*

- **Further the City's Climate Action Plan** to reduce greenhouse gas emissions and build resiliency to climate change impacts by providing incentives or codifying sustainable design features or business practices, where applicable. Example features include bicycle, hybrid/electric, and carpool vehicle parking for employees, auxiliary power/electric truck charging, alternative energy sources like solar, water conservation measures, dedicated area for onsite recycling, and environmentally friendly building materials.

# Introduction

In recent years, the rapid growth in e-commerce and online shopping, near-shoring and reshoring of manufacturing, demand for industrial warehousing, and aging warehouse inventory, has resulted in unprecedented warehouse development.<sup>7,8</sup> Between March 2020 and November 2021, warehouse space purchases were up 300 percent among the five biggest retailers (Amazon, Walmart, Costco, Target, and TJX companies) compared to the 2019 to 2020 period.<sup>7</sup> This was largely accelerated by the COVID-19 global pandemic. The nearly two-year boom in warehouse development is being followed by a slow-down in new development as economic factors including inflation and increases in borrowing rates have resulted in a pivot to optimization of available space. In the first part of 2023, only 6,700 warehouses were added to the global building stock, a decline of 35 percent compared to the same time period in 2022.<sup>8</sup> With warehouse vacancy rates at three percent, a 30-year low, this slowdown in development appears to be more of a reflection of capitalization than decreasing demand.

Despite the indication that demand for new warehousing space is slowing at the global level, warehousing demand in the Vancouver/Portland region remains strong. Over the past year, the City of Vancouver received five applications for the development of new industrial warehouses with gross floor areas greater than 250,000 square feet, shown in **Figure 1**. While the intended use or expected tenants for the proposed warehouses are not known, these developments are expected to be operated as high-tech industrial warehousing facilities, which are likely to include e-commerce operators. This use, along with the size of these proposed developments compared to the size of existing warehouse uses in Vancouver has resulted in a desire to better understand several key characteristics of these larger, frequently e-commerce-oriented facilities. This report will explore:

- The typical number of employees per acre compared to more traditional warehouses, as the City has limited buildable land remaining that is zoned for industrial uses
- Anticipated local and regional economic impacts and tax revenue generation associated with these facilities
- How travel associated with these warehouses, specifically by trucks, may impact roadway maintenance costs
- How these warehouses result in increases in heavy truck traffic that adversely impacts air quality, noise, congestion and safety, which are noted community concerns
- If development of these warehouses would conflict with the City's newly adopted Climate Action Plan based on their travel patterns or other factors<sup>9</sup>

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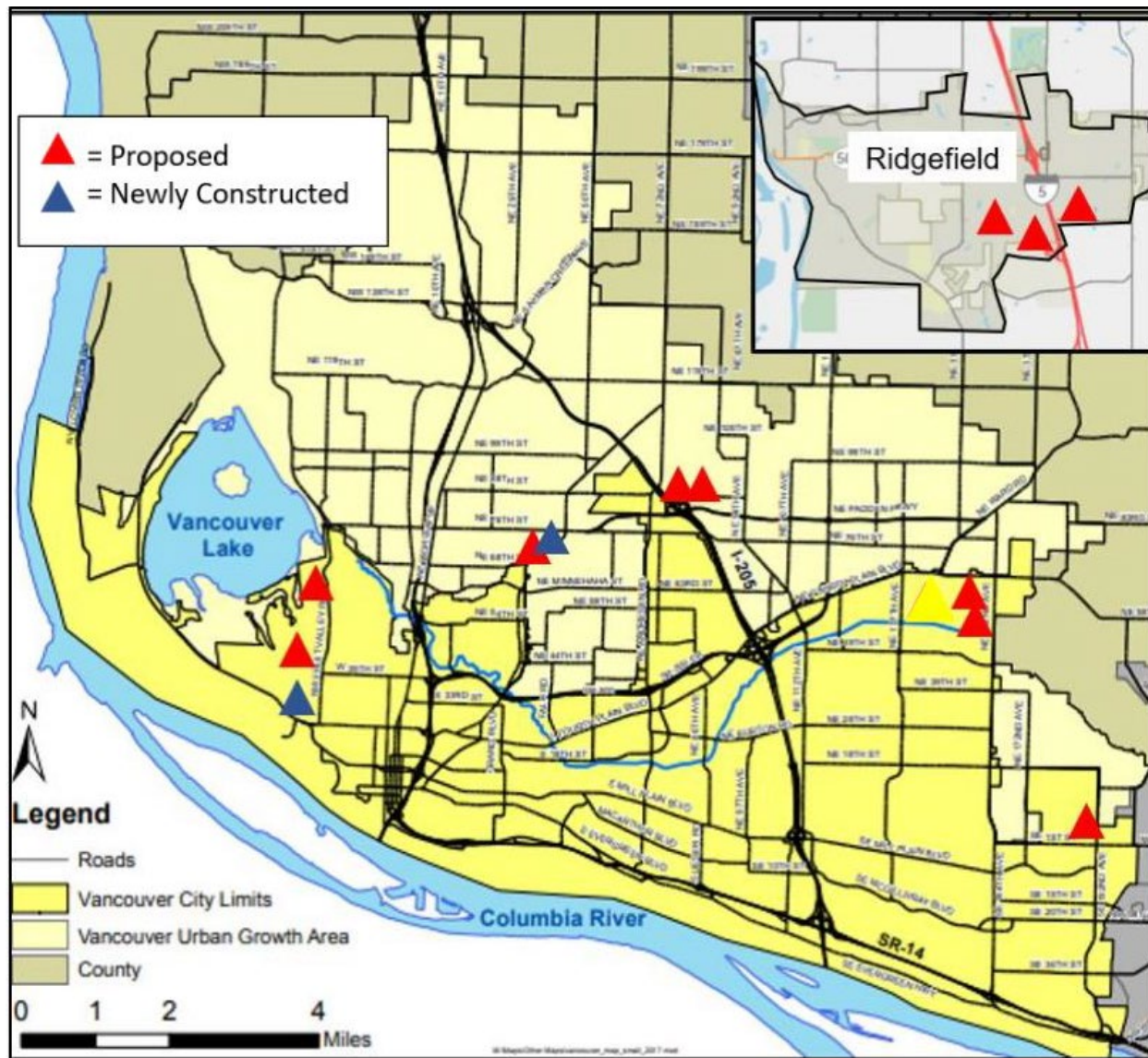
<sup>7</sup> [Bloomberg. Covid E-commerce Boom Sees US Retailers Hunt for Warehouses. 2022](#)

<sup>8</sup> [Freight Waves. Global Warehouse, Fulfillment Construction Seen Waning. 2023](#)

<sup>9</sup> [City of Vancouver. Climate Action Framework. 2022](#)



**Figure 1: Proposed Warehouse Developments with GFA greater than 100 KSF**



Source: City of Vancouver. 2023

On December 12, 2023, Vancouver City Council enacted a six-month moratorium on new applications for the development of warehouses and distribution facilities totaling more than 100,000 square feet (100 KSF) in the Light Industrial (IL) and Heavy Industrial (IH) zoning districts, as defined in Vancouver Municipal Code Title 20.<sup>10</sup> This is consistent with Washington State law (RCW 36.70A.390 and RCW 35.63.200), which allows for a six-month maximum moratorium on land uses, with one six-month extension, if necessary. The moratorium has since been amended to increase the threshold to only include developments that exceed 250 KSF. The City's moratorium exempts warehouses supplying storage for

<sup>10</sup> [City of Vancouver. Six-month Moratorium. 2022](#)

traded sector goods, as defined in the Clark County Comprehensive Economic Development Plan, and a bulk storage exemption for the Port of Vancouver on property owned by the Port in Vancouver.

The moratorium was put in place to provide the City with the necessary time to closely study the emerging trend of applications for warehouse and distribution facilities, understand how those trends may impact the City's economy and transportation system, and develop appropriate land use regulations. This report documents the physical, operational, economic, and environmental/quality of life differences between traditional warehouses that store goods for delivery to businesses and larger, modern industrial warehouses that support today's just-in-time (JIT) inventory practices by storing and repackaging goods intended for retail home delivery or business to business delivery (including e-commerce facilities, grocers, and high-pace manufacturing/assembly).

This report is split into two sections. The first section, **Warehouse Characteristics**, describes the differences in physical, operational, and economic characteristics between traditional warehouses and modern, high-tech industrial warehouse facilities. This section also discusses sustainable warehousing practices which touch on environmental sustainability and adaptive re-use feasibility of warehouses. The second section, **Recommendations**, includes key takeaways from the comparison and strategies the City could consider to ensure that these developments support the City's economic, transportation, and climate goals and priorities. A summary table of the differences between traditional warehouses and e-commerce facilities is provided in **Appendix A**. Additional supporting documentation that informed report findings is included in **Appendix B**.

# Warehouse Characteristics

Having space available in a large building, often referred to as a warehouse, where physical goods or inventory can be stored prior to selling has long been a critical piece of the supply chain. Traditionally, warehouses have been used for the prolonged storage of bulk inventory or business-to-business (B2B) orders. In recent years, changing consumer habits have led to the emergence of high-tech warehousing that support e-commerce and Just-in-Time (JIT) inventory practices aimed at saving costs by using less space to hold both consumer goods and inputs to production.

Directly related to e-commerce, distribution centers (DCs) and fulfillment centers (FCs) are designed to provide value-added logistics services, which allow operators to efficiently meet varying customer demand using technology and processes to streamline the supply chain. Even though FCs and DCs have become a prevalent use of warehousing space, modern high-tech facilities are still being utilized for other uses. The subsequent section describes the different types of warehouses which serve different parts of the supply chain process.

## Facility Types

There are various warehouse types and functions that support retail, commercial, and industrial supply chains. Virtually all industries rely directly or indirectly on warehousing services.

Traditional warehouses receive goods, store them for prolonged periods, and then send them out again. In contrast, distribution centers (DCs) take in different bulk goods from a variety of vendors, store those products in ways that allow for quickly filling orders, then repack the products to meet multiple customer orders.<sup>11</sup> This includes labeling the orders accurately, packing orders together for shipment out of the center, then loading trucks that take orders on the next leg of their journey or to their final destination.

Modern distribution centers are not traditional warehouses. They are high-tech distribution hubs that require significant investment, including building design and construction, as well as advanced technological, safety, and logistical equipment.

The main role of a DC is to store products in bulk and shipped in bulk to a retailer, whereas the main role of a fulfillment center (FC) is to pick, pack and ship the products directly to the consumer.<sup>12</sup> While DC and FC are frequently used interchangeably, they are quite different in design and operation. The main difference in fulfillment centers versus distribution centers is that DCs rarely offer small parcel order fulfillment. Instead, warehouse space for DCs moves large quantities of items in and out quickly. Fulfillment center operations typically work best for e-commerce companies who need small parcel order processing.

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<sup>11</sup> [ShipBob. Distribution Center Benefits and Key Processes Explained. 2021](#)

<sup>12</sup> [ShipBob. Fulfillment Center: What Is It, Why It's Important, & How Does It Compare to Warehousing. 2018](#)

A distinguishing feature of a DC is that it acts as a hub for shipments. These businesses may take large volumes and redistribute the products into smaller shipments that will be sent to various destinations, including warehouses and fulfillment companies. Another key factor is how products are transported. A DC will often handle multiple modes of transportation when receiving and shipping inventory. A product may arrive by rail but leave the facility by air transport to a fulfillment center. DC Services are as follows:

- **Receiving Inventory:** Materials come on pallets or floor loaded in containers. The distribution center's job is to document and categorize all inbound materials. This way they can be sent to their proper destination such as a fulfillment center or big box retail store.
- **Replenishing Retailers:** One major service that distribution centers provide is restocking or replenishment of inventory for retailers. Considering a store like Target or Walmart as an example, there are thousands of individual SKUs in any given store and thus need a process that ensures inventory replenishes to the store before it runs out of stock.
- **Just-in-Time Materials:** A useful service that distribution centers provide is just-in-time inventory replenishment. Manufacturers use a lot of parts to assemble and build their various products. These parts require storage space. But manufacturers only need a limited number of parts for their output in a particular period. A distribution center can send materials on a regular basis to the manufacturer so they can maintain production. At the same time, the manufacturer can dedicate their warehouse space to their manufacturing activities.
- **Wholesale Marketing:** Wholesale distributors usually operate within a single industry like plumbing, construction, or electronics and offer their own marketing, sales, and product fulfillment. These distributors sell to resellers (and sometimes the general public) at discounted prices. Manufacturers choose to work with them at a lower price point because they come with a larger customer base.

FCs usually rely on a third-party logistics provider (3PL) to handle the storage, packaging, and shipping of products to be sent directly to the consumer (business-to-consumer or B2C) or directly to a business (business-to-business or B2B). Typically, an FC stores all of the products from a web site that are to be individually picked and packaged to be sent out to the consumer. Fulfillment centers are typically used by industries that require fast inventory turnaround and order fulfillment, such as e-commerce businesses. FCs may be used for time-critical and time-sensitive products — including food and pharmaceutical commodities — to fill orders quickly for businesses and consumers. A fulfillment center has three important functions in the supply process. These include:

1. Receiving and storing inventory
2. Fulfilling orders for customers
3. Packing and shipping goods to their final destination

Fulfillment centers are ideal for e-commerce businesses because their warehouse locations are closer to their customers. Fulfillment center services may include:

- **Pick and pack fulfillment services**, which are typically the core component of every fulfillment center. When customers place orders, the fulfillment center generates pick lists for all the items. A warehouse employee collects the items on the list and places the item(s) in shipping packages.
- **Kitting and Assembly**: A kit is a collection of items that your customers order together like a bundle. Fulfillment center services may prepackage and bundle these items beforehand. This assigns each group of merchandise a new stock keeping unit (SKU). Kitting is critical for a business offering products like subscription boxes.
- **Freight Shipping**: Some warehouse fulfillment services include shipping goods in bulk. An example is B2B orders going to big box stores, or retailers. A fulfillment warehouse may also transport oversized goods with less-than-truckload (LTL) service.
- **Cross-docking** is useful in the supply chain when a business needs to transfer cargo from 40-foot marine shipping containers into larger 53-foot over-the-road shipping containers. Not only does this reduce the number of trucks on the road and overall shipping costs, but this is also an efficient means for combining multiple goods that are destined for the same location, such as a local big box retail store. Both distribution centers and fulfillment centers perform this service.

The following sections summarize the differences between traditional warehouses and modern e-commerce facilities<sup>13</sup> with respect to physical, operational, and economic characteristics.

## Physical Characteristics

For the purpose of this comparison, physical characteristics include warehousing siting and design (building size, lot coverage, loading bays, and parking spaces).

### City of Vancouver - Code Requirements

Within City limits, warehouse developments are required to adhere to Vancouver's Municipal Code (VMC). Warehouses are only permitted in the IL (Light Industrial) and IH (Heavy Industrial) zones. The siting of warehouses in the IL zone requires that all activities, except outdoor storage of materials, are completely contained within building(s). The IH zone is exempt from this condition. For both zones, setbacks determined by adjacent zone as follows:<sup>14</sup>

- When IL and IH zones are adjacent to nonresidential districts, buffering and screening standards are contained in VMC Tables 20.925.030-1 and 20.925.030-2.
- When adjacent to residential districts, buffering and screening standards are also pursuant to standards in VMC Tables 20.925.030-1 and 20.925.030-2, plus an additional 1/2 foot for each foot the building exceeds 20 feet in height to a maximum setback requirement of 40 feet. Buildings in excess of 20 feet may be stepped.

<sup>13</sup> This report focuses on comparisons between traditional warehouses and e-commerce facilities. However, it should be noted that e-commerce is not the only freight sector that relies on modern industrial warehouse design and operations.

<sup>14</sup> [City of Vancouver. Municipal Codes: Minimum Landscaping and Buffer Setback Standards](#)



Lot coverage, defined as the footprint of a building in relation to the development site, is set to the following requirements for warehouse developments:

- IL: maximum lot coverage of 75%; maximum height of 45 feet
- IH: maximum lot coverage of 100%; no maximum height

VMC 20.945.080 outlines the off-street loading requirements based on the gross floor area of a building. The minimum number of loading berths or off-street loading spaces based on varying floor area thresholds are provided in **Table 1**.

**Table 1: Loading Dock Requirements**

| Gross Floor Area                                 | Required Number of Loading Docks |
|--------------------------------------------------|----------------------------------|
| 5,000 sq. ft. up to 25,000 sq. ft.               | 1                                |
| 25,000 sq. ft. up to 50,000 sq. ft.              | 2                                |
| 50,000 sq. ft. up to 100,000 sq. ft.             | 3                                |
| Each 50,000 sq. ft. in excess of 100,000 sq. ft. | 1                                |

Source: City of Vancouver. Municipal Codes: Off-street Loading Requirements.

### Physical Differences between Traditional Warehouses and E-commerce Facilities

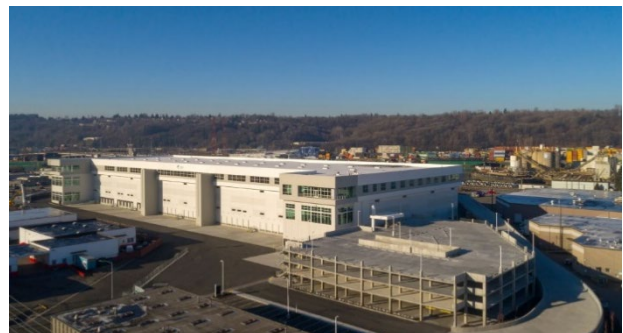
Based on the 250 KSF threshold outlined in the City's amended warehouse moratorium, only a subset of the proposed warehouse developments that exceed this threshold were selected for this study. The building footprints for these selected developments range from 280 KSF to about 570 KSF, while traditional warehouses within City limits are typically under 100 KSF. This variation in size and footprint is depicted in the images below. While size and footprint are typically reliable indicators of the type of warehousing that is occurring, in urban in-fill locations with higher land values and therefore, higher barriers to entry, e-commerce facilities may be closer in size to traditional warehouses.

*Example of Existing Warehouse in Vancouver, WA (70 KSF)*



Source: LoopNet Commercial Property. 2023

*Example of Prologis Georgetown Crossroads Facility in Seattle, WA (590 KSF)*

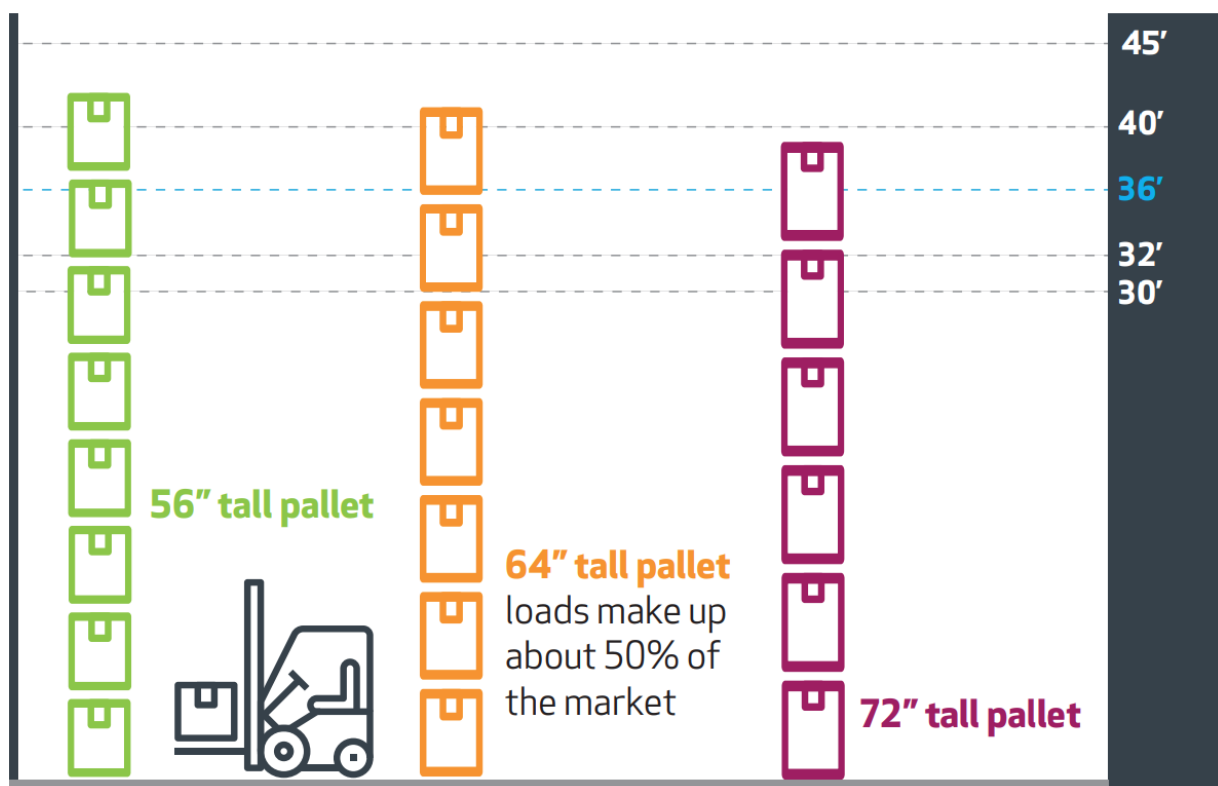


Source: NELSON Worldwide. 2023.

Another notable physical difference between traditional warehouses and modern e-commerce facilities is building clear height. In industrial real estate, building clear height is defined as the height of a building from the floor to the bottom of the lowest hanging item on the ceiling (i.e., sprinklers, lights, etc.). Building clear height dictates the height to which inventory can be safely stored. CBRE Group, Inc, one of the world's largest commercial real estate services and investment firms, noted that e-commerce trends have resulted in an ongoing shift towards increased building clear heights for warehouses and distribution centers. Between 2010 and 2016, the average clear height for all warehouses built by CBRE rose from 30.19 feet to 32.95 feet.<sup>15</sup> Other research indicates that at the national level, the industrial market is moving toward a 36-foot clear height standard for new developments. In comparison, traditional warehouses often have a clear height well under 30 feet. As illustrated in **Figure 2**, taller clear heights allow tenants to store more palletized product, which translates to lower occupancy costs per square foot<sup>16</sup>.

In addition to higher clear height, e-commerce facilities have more space for staging and queuing as a result of the operational characteristics, which will be discussed in the subsequent section.

**Figure 2: Warehousing Capacity Based on Clear Height**



Source: Modern Architecture. 2020.

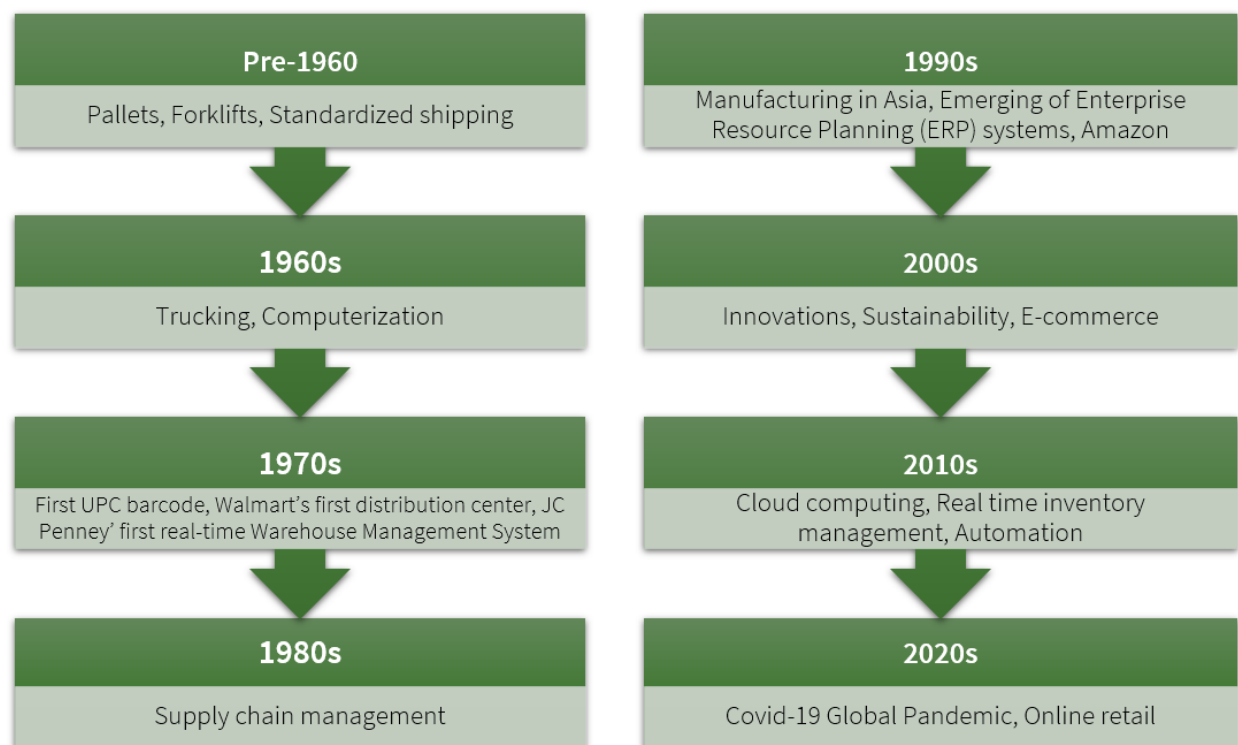
<sup>15</sup> [RoofLifters. As e-commerce grows, so does the clear height of warehouses. 2020](#)

<sup>16</sup> [Method Architecture. 36 is the new 32: Increasing Clear Height for Maximum Efficiency. 2020](#)

## Operational Characteristics

Warehousing has undergone operational evolution over the past decades, leveraging technology and adapting to trends as depicted in **Figure 3**. Recent improvements in technology have resulted in increasingly efficient use of warehouse space resulting in an increased consolidation of facilities. Technology, such as barcoding and radio-frequency identification (RFID), coupled with automated warehouse inventory and sortation practices, has resulted in significant efficiency gains and cost savings. In addition to better managing inventory, these systems make it possible to store more goods under one roof, improve safety, and reduce the number of automobile trips and parking demand. As a result of warehouse automation, these new facilities require fewer unskilled workers to drive forklifts and manage inventory and create high-tech jobs to operate and maintain the automated systems, as well as value-added services that are occurring in some facilities.

**Figure 3: Evolution of Warehousing**



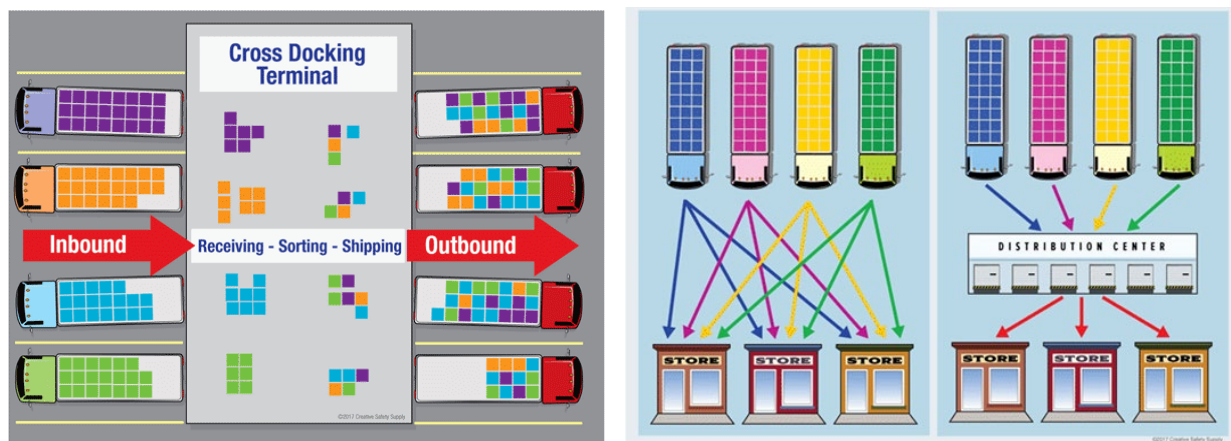
As a result of the advances in logistics operations to support e-commerce and advances in business-to-business supply chains, modern warehouses operate differently than traditional warehouses, particularly regarding hours of operation, the flow of goods, types of vehicles utilized, vehicle trips generated, and related traffic operations.

E-commerce facilities are intended for streamlined and efficient logistics services with typical hours of operation spanning 24 hours a day, seven days per week. The non-stop activity in modern warehouses is made possible by shift workers and automation. Automation has replaced outdated processes, such as

digital bills of lading versus handwritten, use of RFID versus manual paperwork by gate attendants, automated stacking, and retrieval systems instead of forklifts. These modern innovations benefit all industrial and retail sectors because they allow beneficial cargo owners to meet customer (both consumers and businesses) expectations for quick delivery of goods either purchased online, purchased by a retail store, or required as an input to production. To meet those demands, warehouses must operate around the clock.<sup>17</sup> In contrast, hours of operation at traditional warehouses with slower turnover of inventory are typically limited to normal business hours, i.e., 8-hour shifts, five days per week. The noted differences are directly linked to the flow of goods and storage duration.

As described in previous sections, there are several industrial warehouse typologies including distribution centers and fulfillment centers among others. These facilities typically focus less on long-term storage and more on flow of goods and services compared to traditional warehouses. Another key difference is that operations at modern industrial warehouse facilities are often driven by demand, compared to traditional warehouses, where operations are related to storing the largest amount of goods possible. Typical operations at a distribution center, including the combination of similar sized goods with similar destinations, are depicted in **Figure 4**. While the figure depicts distribution to stores, e-commerce has altered supply chains whereby goods flow to fulfillment centers by truck to be moved into a delivery van and delivered directly to the consumer. Transload facilities and distribution centers often both participate in the sorting and combining of truckloads of goods to reduce travel time, vehicle miles of travel, and fuel consumption.

**Figure 4: Visual Depiction of Cross Docking at a Fulfillment Center and Operations at a Distribution Center**



Source: Creative Safety Supply.

<sup>17</sup> [Multibriefs. Do warehouses still need 8-hour work shifts? 2014](#)

## Traffic Impacts

Efficient logistics in warehousing facilities entail higher vehicle activity than traditional warehouses. The Institute of Transportation Engineers (ITE) Trip Generation Manual offers trip generation estimates associated with land use developments and the database includes a breakdown of vehicle types. **Table 2** presents trips generation estimates for warehouse developments per 1,000 square foot of gross floor area. In practice, traditional warehouse developments are assumed to be ITE land use code 150 and e-commerce facilities range from ITE land use codes 154 to 155 and 130 is used for industrial parks. As shown in **Table 2**, e-commerce facilities generate more daily vehicles particularly for fulfillment centers that require extensive sorting (ITE land use code 155). These are estimated to generate almost four times the number of vehicle trips than traditional warehouses.

Because ITE trip generation data is limited regarding the breakdown between vehicle types, the project team relied on an assessment of recently collected data to provide insight into this<sup>18</sup>. As highlighted in **Table 3** and **Table 4**, e-commerce facilities such as Amazon generate more medium-duty and heavy-duty truck trips as compared to passenger cars, but these trends are not universal. Notably, the magnitude of trips at an Amazon facility is substantially higher than those at a UPS facility. This illustrates the variation in trip generation at e-commerce facilities. It is also important to note that while the collected data provides general insights, the data are from sites in California. Therefore, reviewing local warehouse developments sites in the Vancouver/Portland region may help inform more representative trends.

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<sup>18</sup> Based on extensive comparisons between ITE trip generation estimates and observed traffic data, ITE is limited in capturing the breakdown in vehicle types. Because of this, the team opted for previously collected empirical warehouse traffic data from California which is assumed to provide general insights. Local data would need to be collected to provide context sensitive insights.



**Table 2: Warehousing Trip Rate Comparison (Trips per 1,000 square feet of GFA)**

| Warehouse Type                                                                             | Daily Average Rate |                | AM Peak Hour Average Rate |                | PM Peak Hour Average Rate |                |
|--------------------------------------------------------------------------------------------|--------------------|----------------|---------------------------|----------------|---------------------------|----------------|
|                                                                                            | Truck              | Total Vehicles | Truck                     | Total Vehicles | Truck                     | Total Vehicles |
| ITE Land Use: 130 Industrial Park                                                          | 0.57               | 3.37           | 0.03                      | 0.41           | 0.05                      | 0.40           |
| ITE Land Use: 150 Warehousing                                                              | 0.60               | 1.71           | 0.02                      | 0.17           | 0.03                      | 0.18           |
| ITE Land Use: 154 High-Cube Transload and Short-Term Storage Warehouse                     | 0.22               | 1.40           | 0.02                      | 0.08           | 0.01                      | 0.10           |
| ITE Land Use: 155 High-Cube Transload and Short-Term Storage Warehouse (Non-sort Facility) | 0.23               | 1.81           | 0.02                      | 0.15           | 0.01                      | 0.16           |
| ITE Land Use: 155 High-Cube Transload and Short-Term Storage Warehouse (Sort Facility)     | 0.19               | 6.44           | 0.02                      | 0.87           | 0.02                      | 1.20           |
| ITE Land Use: 156 High-Cube Parcel Hub Warehouse                                           | 0.58               | 4.63           | 0.09                      | 0.70           | 0.06                      | 0.64           |
| ITE Land Use: 157 High-Cube Cold Storage Warehouse                                         | 0.75               | 2.12           | 0.03                      | 0.11           | 0.03                      | 0.12           |

Source: ITE Trip Generation Manual, 11th Edition.

Notes:

ITE Trip Generation provides the following definitions for the tabulated warehouse types:

- An industrial park contains several individual industrial or related facilities. It is characterized by a mix of manufacturing, service, and warehouse facilities with a wide variation in the proportion of each type of use from one location to another. Many industrial parks contain highly diversified facilities.
- A warehouse is primarily devoted to the storage of materials, but it may also include office and maintenance areas.
- A high-cube warehouse (HCW) is a building that typically has at least 200,000 gross square feet of floor area, has a ceiling height of 24 feet or more, and is used primarily for the storage and/or consolidation of manufactured goods (and to a lesser extent, raw materials) prior to their distribution to retail locations or other warehouses.
- A high-cube fulfillment center warehouse is subcategorized into sort or non-sort. A sort facility is a fulfillment center that ships out smaller items, requiring extensive sorting, typically by manual means. A non-sort facility is a fulfillment center that ships large box items that are processed primarily with automation rather than through manual means.
- A high-cube parcel hub warehouse typically serves as a regional and local freight-forwarder facility for time sensitive shipments via airfreight and ground carriers. A site can also include truck maintenance, wash, or fueling facilities. Some limited assembly and repackaging may occur within the facility.
- A high-cube cold store warehouse has substantial temperature-controlled environments for frozen food and other perishable products.





**Table 3: Observed Trip Activity at Comparable Sites in California (Distribution by Vehicle Type per Time Period)**

| Customer                         | Building Size (sf) | Daily         |                    |                   | AM Peak Hour  |                    |                   | PM Peak Hour  |                    |                   |
|----------------------------------|--------------------|---------------|--------------------|-------------------|---------------|--------------------|-------------------|---------------|--------------------|-------------------|
|                                  |                    | Passenger Car | Medium-duty Trucks | Heavy-duty Trucks | Passenger Car | Medium-duty Trucks | Heavy-duty Trucks | Passenger Car | Medium-duty Trucks | Heavy-duty Trucks |
| Pratt Corrugated Holdings        | 350,892            | 309           | 13                 | 216               | 21            | 1                  | 15                | 47            | 2                  | 21                |
| <b>HJ Heinz</b>                  | <b>500,199</b>     | <b>208</b>    | <b>13</b>          | <b>155</b>        | <b>25</b>     | <b>0</b>           | <b>2</b>          | <b>48</b>     | <b>1</b>           | <b>13</b>         |
| Prism Team Services, Inc.        | 443,640            | 113           | 15                 | 142               | 4             | 2                  | 15                | 14            | 3                  | 12                |
| Orchard Supply Company           | 346,524            | 113           | 54                 | 22                | 13            | 2                  | 1                 | 9             | 1                  | 1                 |
| Fox Head, Inc.                   | 388,000            | 183           | 19                 | 15                | 34            | 0                  | 0                 | 49            | 2                  | 0                 |
| <b>Amazon.com Services, Inc.</b> | <b>388,183</b>     | <b>69</b>     | <b>214</b>         | <b>241</b>        | <b>9</b>      | <b>5</b>           | <b>12</b>         | <b>12</b>     | <b>5</b>           | <b>11</b>         |
| Niagara Bottling, LLC            | 512,000            | 59            | 5                  | 153               | 7             | 0                  | 5                 | 18            | 0                  | 7                 |
| Kraft Foods Group, Inc.          | 351,788            | 117           | 7                  | 169               | 4             | 2                  | 11                | 32            | 1                  | 13                |
| <b>Coastal Pacific Food</b>      | <b>500,004</b>     | <b>581</b>    | <b>37</b>          | <b>283</b>        | <b>66</b>     | <b>1</b>           | <b>21</b>         | <b>76</b>     | <b>1</b>           | <b>7</b>          |
| Restoration Hardware             | 283,712            | 540           | 16                 | 42                | 47            | 1                  | 6                 | 60            | 1                  | 2                 |
| Dart Container                   | 340,000            | 200           | 13                 | 50                | 21            | 2                  | 4                 | 30            | 1                  | 2                 |
| Lowe's                           | 570,000            | 277           | 11                 | 164               | 36            | 0                  | 6                 | 78            | 0                  | 16                |
| <b>UPS</b>                       | <b>560,000</b>     | <b>70</b>     | <b>10</b>          | <b>11</b>         | <b>8</b>      | <b>2</b>           | <b>1</b>          | <b>9</b>      | <b>0</b>           | <b>0</b>          |
| Cargill Food                     | 350,000            | 457           | 19                 | 311               | 39            | 0                  | 17                | 44            | 2                  | 19                |
| International Paper              | 375,000            | 312           | 16                 | 133               | 70            | 0                  | 10                | 75            | 0                  | 5                 |
| IPC Smucker's                    | 403,560            | 205           | 12                 | 149               | 25            | 0                  | 10                | 39            | 4                  | 10                |

Source: Fehr & Peers. 2022.

Notes: Sites with bold text inform the trip activity comparison discussion.

**Table 4: Observed Trip Activity at Comparable Sites in California (% Distribution by Vehicle Type per Time Period)**

| Customer                         | Building Size (sf) | Daily         |                    |                   | AM Peak Hour  |                    |                   | PM Peak Hour  |                    |                   |
|----------------------------------|--------------------|---------------|--------------------|-------------------|---------------|--------------------|-------------------|---------------|--------------------|-------------------|
|                                  |                    | Passenger Car | Medium-duty Trucks | Heavy-duty Trucks | Passenger Car | Medium-duty Trucks | Heavy-duty Trucks | Passenger Car | Medium-duty Trucks | Heavy-duty Trucks |
| Pratt Corrugated Holdings        | 350,892            | 57%           | 3%                 | 40%               | 58%           | 2%                 | 40%               | 68%           | 2%                 | 30%               |
| <b>HJ Heinz</b>                  | <b>500,199</b>     | <b>55%</b>    | <b>3%</b>          | <b>41%</b>        | <b>92%</b>    | <b>0%</b>          | <b>8%</b>         | <b>78%</b>    | <b>2%</b>          | <b>20%</b>        |
| Prism Team Services, Inc.        | 443,640            | 42%           | 5%                 | 53%               | 21%           | 8%                 | 71%               | 49%           | 9%                 | 41%               |
| Orchard Supply Company           | 346,524            | 60%           | 29%                | 12%               | 81%           | 15%                | 4%                | 82%           | 6%                 | 12%               |
| Fox Head, Inc.                   | 388,000            | 84%           | 9%                 | 7%                | 98%           | 1%                 | 1%                | 97%           | 3%                 | 0%                |
| <b>Amazon.com Services, Inc.</b> | <b>388,183</b>     | <b>13%</b>    | <b>41%</b>         | <b>46%</b>        | <b>35%</b>    | <b>18%</b>         | <b>47%</b>        | <b>43%</b>    | <b>18%</b>         | <b>39%</b>        |
| Niagara Bottling, LLC            | 512,000            | 27%           | 2%                 | 70%               | 58%           | 0%                 | 42%               | 71%           | 0%                 | 29%               |
| Kraft Foods Group, Inc.          | 351,788            | 40%           | 2%                 | 58%               | 24%           | 10%                | 65%               | 69%           | 3%                 | 28%               |
| <b>Coastal Pacific Food</b>      | <b>500,004</b>     | <b>65%</b>    | <b>4%</b>          | <b>31%</b>        | <b>76%</b>    | <b>1%</b>          | <b>24%</b>        | <b>91%</b>    | <b>1%</b>          | <b>8%</b>         |
| Restoration Hardware             | 283,712            | 90%           | 3%                 | 7%                | 87%           | 1%                 | 12%               | 95%           | 2%                 | 3%                |
| Dart Container                   | 340,000            | 76%           | 5%                 | 19%               | 78%           | 9%                 | 13%               | 89%           | 4%                 | 7%                |
| Lowes                            | 570,000            | 61%           | 2%                 | 36%               | 85%           | 0%                 | 15%               | 83%           | 0%                 | 17%               |
| <b>UPS</b>                       | <b>560,000</b>     | <b>77%</b>    | <b>11%</b>         | <b>12%</b>        | <b>73%</b>    | <b>15%</b>         | <b>12%</b>        | <b>97%</b>    | <b>0%</b>          | <b>3%</b>         |
| Cargill Food                     | 350,000            | 58%           | 2%                 | 40%               | 69%           | 0%                 | 31%               | 68%           | 3%                 | 30%               |
| International Paper              | 375,000            | 68%           | 3%                 | 29%               | 87%           | 0%                 | 13%               | 94%           | 0%                 | 6%                |
| IPC Smucker's                    | 403,560            | 56%           | 3%                 | 41%               | 71%           | 0%                 | 29%               | 74%           | 8%                 | 18%               |

Source: Fehr & Peers. 2022.

Notes: Sites with bold text inform the trip activity comparison discussion.

On a vehicle-type basis, medium-duty and heavy-duty trucks tend to be the main mode of transportation for goods in and out of traditional warehouses. Whereas, in today's logistics operations, light-duty trucks and vans play a substantial role in goods transportation via e-commerce facilities. Based on the collected data from warehouse sites in California tabulated in **Table 4**, peak activity of these trucks is generally observed between 4 am to 7 am and around 12 pm to 1 pm. This is also indicated by the magnitude of peak hour trips in comparison to daily trips reported in **Table 4**.

#### *Summary of Proposed Development Traffic Impact Analyses*

One of the most challenging issues associated with analyzing impacts of industrial land uses is understanding their operations. The National Academies of Science's Transportation Research Board and the Institute of Transportation Engineers have attempted to standardize trip generation rates (**Table 2**) associated with a variety of land uses, including industrial uses, for over 50 years. Unlike many land uses, such as residential and retail uses, the big box design of industrial warehouses makes them flexible, meaning the trip generation is difficult to estimate. For example, two common reuses are mega-churches and indoor trampoline parks. For this reason, many cities are using the conditional use permit (CUP) mechanism for requiring operational data, dictating assumptions for use in traffic impact analysis, and identifying conditions of approval to mitigate potential impacts. In the 11th Edition of the ITE Trip Generation Manual, there are currently ten categories that an industrial warehouse could fit into, and the categories most closely related to the proposed facilities in Vancouver are defined in the industrial trip generation assumptions section. A cursory review of the intersections that have been analyzed in the traffic studies for four of the proposed projects is described herein, as well.

In reviewing the ITE industrial trip generation rates, the variance in size and footprints do not easily translate to the amount of auto, van, and truck traffic that is generated by these facilities. What is needed is more information about the intended operations of the facilities. This can be challenging to obtain, especially when buildings are constructed without knowledge of who the future tenant may be (e.g., spec buildings). In the absence of the necessary information to discern operations of the proposed development, assuming the highest trip generation (ITE land use code 550) presents a conservative approach to address potential traffic impacts.

**Table 5** contains data that was abstracted from the traffic studies associated with the proposed projects, as well as trip generation estimates calculated using the ITE Trip Generation web-based app (based on the 11th Edition). ITE provides both average rates and fitted curve rates. And for AM and PM peak rates, analysts are provided with two more options: peak of the site or peak of the adjacent street. It is common to perform impact analysis using data for the peak of the adjacent street, but in the case of major industrial facilities that generate large volumes of trips and could overwhelm the local system, considering peak trip generation of the site may be the more appropriate rate to use. In addition to the effects of these two assumptions on trip generation rates, the validity of the rates in 2023 is questionable considering the small sample of sites that this data is based on and the old age of some of the surveys. More recent, empirical data should be used when available and feasible.





**Table 5: Estimated Trip Activity related to Proposed Industrial Warehouse Developments**

| Development                                              | Building Size (sf) | ITE Trip Generation Code | Daily Truck Trips    | Daily Total Trips    | AM Peak Hour Truck Trips | AM Peak Total Trips | PM Peak Hour Truck Trips | PM Peak Total Trips |
|----------------------------------------------------------|--------------------|--------------------------|----------------------|----------------------|--------------------------|---------------------|--------------------------|---------------------|
| Panattoni Fruit Valley Rd<br>PDC Seattle LPIV BB/TH, LLC | 60,050             | 150                      | 36*<br>40**          | 103*<br><b>134**</b> | 4*<br>5**                | 13*<br><b>35**</b>  | 2                        | 34                  |
| Harmony<br>Industrial project                            | 460,000            | 150                      | <b>787*</b><br>765** | 787*<br><b>765**</b> | 28*<br>29**              | 97*<br><b>79**</b>  | 28*<br>24**              | 106*<br><b>89**</b> |
| Vancouver Wellons<br>Prologis, Inc.                      | 566,527            | 130                      | 323*                 | 1909*<br>2134**      | 17*                      | 232*                | 28*                      | 227*                |
| Vancouver Innovation Center<br>Building North            | 200,700            | 110                      | 50*                  | 977*<br>805**        | 6*                       | 183*<br>153**       | 10*                      | 161*<br>137**       |

\* Average Rate

\*\* Fitted Curve Rate

Notes:

Tabulated rates are based on the ITE Trip Generation data on AM/PM peak of adjacent streets

Numbers in bold are assumed rates provided in the traffic studies. None of the traffic impact studies used Passenger Car Equivalents (PCE) factors to assess the potential impacts of trucks at intersections. In general, trucks are assumed to equal 1.5 to 3 passenger cars for the purposes of intersection analysis due to their lengths and slower starting and stopping abilities. None of the four studies appeared to consider this in their analysis. The following section identifies the intersections analyzed by each of the studies.



## Intersection Analysis

A list of the analyzed intersections for each of the proposed industrial developments is provided in this section. There is only one identified intersection that is shared by two of the proposed developments, the intersection of Fruit Valley Road and W. 39th Street. Both studies indicate that this intersection will operate at Level of Service (LOS) C in the future. It is unclear if the projects assumed each other as related projects in the analysis, however, the City does have a preproposal process that it could use to collect additional data about the proposed facilities, confirm trip generation rates to use, and identify related projects to consider.

### Panattoni Fruit Valley Project

1. NW Lakeshore Ave/NW 78th Street
2. NW Whitney Rd/NW 61st Street
3. Fruit Valley Rd/NW 61st Street
- 4. Fruit Valley Rd/W 39th Street**

### Vancouver Innovation Center

1. SR-14/SE 192nd Avenue
2. SE 176th Avenue/SE 20th Street
3. SE 34th Street/SE 192nd Avenue

### Harmony

1. 137th Ave – 49th St to Fourth Plain Blvd
2. 192nd Ave & SR 14 Ramps
3. Fourth Plain Blvd & 152nd Ave
4. Lieser/St. Helens/MacArthur
5. 192nd Ave & NE 13th Street
6. 192nd Ave & SE 34th Street
7. 176th Ave & SE 20th Street
8. Grove St/Columbia House Blvd/SR-14 WB Off-Ramp
9. NE 172nd Ave/NE 18th Street
10. NE 179th Place/NE 18th Street
11. NE 187th Ave/NE 18th Street
12. NE 172nd Ave/NE 9th Street
13. NE 9th Street/NE 162nd Ave
14. NE 192nd Ave/NE 9th Street
15. NE 187th Ave/SE 1st Street
16. SE 192nd Ave/Mill Plain Blvd

### Prologis

1. 32nd Avenue/La Frambois Road

2. 32nd Avenue/Lower River Road
3. **Fruit Valley Road/39th Street**
4. Fruit Valley Road/Firestone Lane

As discussed in the subsequent sections, warehouse facilities generate truck and passenger car traffic which results in wear and tear of roads, noise pollution, light pollution, and safety concerns. Examples of measures to mitigate the resulting impacts are summarized in **Table 6**.

**Table 6: Potential Mitigation Measures<sup>19</sup>**

| Impact                | Measure                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Truck traffic impacts | <ul style="list-style-type: none"> <li>Design, construct, and clearly mark truck routes that provide direct access to freight-served facilities and avoid residential neighborhoods and other sensitive receptors (schools, hospitals, etc.).</li> </ul>                                                                                                                                                                                                                                                                      |
| Truck parking demand  | <ul style="list-style-type: none"> <li>Review and update zoning that is consistent with the state of industry operations, such as performance zoning that customizes loading, parking, curb returns, on-site recycling, etc., based on the intended operations of the facility.</li> <li>Require the provision of adequate areas for on-site parking, on-site queuing or staging, and truck check-in to avoid trucks queuing in travel lanes or parking in undesignated areas.</li> </ul>                                     |
| Truck emissions       | <ul style="list-style-type: none"> <li>Promote fleet electrification by requiring electric charging stations at each warehouse development, so trucks can get recharged while loading/unloading and incentivizing zero-emission vehicles in business operations.</li> <li>Encourage tenants to enroll in the US Environmental Protection Agency's SmartWay<sup>20</sup> program to help companies advance supply chain sustainability by measuring, benchmarking, and improving freight transportation efficiency.</li> </ul> |
| Congestion management | <ul style="list-style-type: none"> <li>Nexus impact fee to support funding for capacity expansion projects.</li> <li>Incentives for off-peak delivery; an example is the Off-Hour Deliveries program in New York City that offers participants financial incentives.<sup>21</sup></li> <li>Right-size on-site employee parking and encourage alternative modes of transportation for employees (e.g., bicycle parking, transit passes, carpool spaces).</li> </ul>                                                            |

<sup>19</sup> [Department of Justice, State of California. Warehouse Projects: Best Practices and Mitigation Measures to Comply with the California Environmental Quality Act, 2022](#)

<sup>20</sup> SmartWay is an EPA program that helps the freight transportation sector improve supply chain efficiency.

SmartWay reduces transportation-related emissions by accelerating the use of advanced fuel-saving technologies.

<sup>21</sup> [New York City. Off-Hour Deliveries.](#)

| Impact                | Measure                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Noise pollution       | <ul style="list-style-type: none"> <li>• Face dock doors and trash receptacles away from residential uses and sensitive receptors.</li> <li>• Limit hours of operations if a facility is within one-quarter mile of a sensitive receptor.</li> <li>• Require all combustion-powered construction equipment to be surrounded by a noise protection barrier.</li> <li>• Paving roads where high truck traffic is anticipated with low-noise asphalt.</li> </ul>                                                                                                                                                 |
| Roadway wear and tear | <ul style="list-style-type: none"> <li>• Require the siting of warehouse developments to be within a mile of the City's designated freight routes. These routes are typically well designed to accommodate truck traffic.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                          |
| Safety                | <ul style="list-style-type: none"> <li>• Provide off-street or buffered bikeways on shared truck routes to ensure employees working in the industrial areas can safely bike to work.</li> <li>• Provide adequate curb return radii at intersections and driveways into freight generators to avoid trucks overtaking the curb/sidewalk.</li> <li>• Review truck routes designation periodically and modify as needed. Ideally, truck routes should not conflict with major transit and bicycle and pedestrian corridors unless properly designed to serve employees working at freight generators.</li> </ul> |
| Visual impacts        | <ul style="list-style-type: none"> <li>• Require buildings to be dark colored</li> <li>• Provide vegetative buffers</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

Source: Department of Justice, State of California. 2022.

## Economic Characteristics

### Warehousing Trends

#### *Global and National Supply Chain System Trends*

A range of supply chain logistics system factors influence changes that we are experiencing today. These factors are important to understand as they impact local economics, such as tax revenue and employment rates, and worker salaries. Below is a summarized list of global supply chain trends that are contributing to industrial warehouse development demand in Vancouver:

- **E-commerce:** The emergence of the e-commerce sector from its inception in the 1990s to a major factor in global supply chain management and industrial property development. The e-commerce supply chain requires up to three times more warehouse space than a traditional brick and mortar retail facility. For example, for every \$1 billion in incremental e-commerce growth, 1.2 million square feet of facility demand is generated. Based on this, the U.S. will need up to 330 million square feet of additional space to support e-commerce growth through 2025.
- **Market need:** Sites near logistics hubs, such as intermodal rail yards, airports and seaports are in high-demand. As a City surrounded a major airport and seaport, and population center, there is a market need for warehouse developments in Vancouver to support e-commerce and online shopping. Due to the absence of e-commerce facilities within City limits, households and businesses currently rely on facilities/warehouses in surrounding jurisdictions such as Portland.
- **Just-in-Time (JIT) versus Just-in-Case (JIC) inventory management** played a significant role in the shortages for basic household goods, such as toilet paper and cleaning supplies. JIT offered cost savings because less space was needed for storage, but JIC is trending back due to the hardships the lack of inventory created for many companies.
- **Trucking and equipment shortages** have resulted in more food product production moving nearer to consumption markets.
- **Sector-specific competitive factors**, such as the Apparel sector's focus on fast fashion (e.g., Shein).
- **Highly developed integrated technologies** in support of supply chain efficiencies allow for more products to be stored, retrieved, and sold expeditiously. Large advances like in-building automation, yard automation and expected point-to-point location automation improve storage and retrieval reducing time to market. Integrated inventory tracking systems connecting in-warehouse robotic cargo handling/inventory management equipment, warehouse staff, trucking services, terminal operators, ocean carriers and shippers support same-day shipping to e-commerce consumers, as well as other customers, such as manufacturers. More recent and expected advances in zero emission vehicle and equipment powertrains; in some cases, requiring new distance intervals between inventory and shipment points.



- **Facility Trends:** The size, design, and function of warehouses has evolved considerably in past two decades – so much so that the Institute of Transportation Engineers (ITE) embarked on a study of warehouse trip generation characteristics to add to its Trip Generation Handbook (as shown in **Table 2**). Not only have the size and design of warehouses changed, but the locations for developing new facilities has also changed. In general, warehouse operators need sites closer to consumers, such as in some high-value markets like Seattle. In high-cost urban areas, these facilities are going vertical when land becomes expensive and scarce requiring more sophistication and a smaller footprint on multiple floors. In markets like Vancouver and Portland, region-specific sites may be required. These include small- to mid-sized facilities within the urban areas and larger facilities on the outskirts to serve primary markets.

## Warehousing Jobs

Industrial warehouses typically generate both jobs and tax revenue. Warehousing jobs, while often perceived as inferior to manufacturing jobs, provide two important community benefits: 1) pay rates that start above minimum wage, 2) and on-the-job-training that provide opportunities for employees with no college education to make over \$80,000 a year. The salary for automation engineers (a job associated with highly automated warehouses) starts in the high \$80,000s and pay on average over \$100,000 a year with experienced engineers earning closer to \$140,000 annually. US Census County Business Patterns (CBP) provides subnational economic data by industry, including the number of establishments, employment, and annual payroll. This provides insight into the average wage and employees per establishment for "Warehousing and Storage" sector in Clark County and other surrounding or comparable counties in the region (**Table 8** through **Table 13**)<sup>22</sup>:

- At a high-level, Clark County's industrial sector average number of jobs per establishment is up by 50% and average annual wage has increased by 10% over the past six years. This is considerably higher than comparable counties, where jobs per establishment increased by only 17%.
- As of 2021, in Clark County, there are more employees per establishment (approx. 42) for "Warehousing and Storage" than other industrial types of employment: "Manufacturing" (approx. 31) and "Scientific Research and Development Services" (approx. 21). At a high-level this is also consistent with other comparable counties in the region. The limitation of this dataset is that it doesn't provide establishment acreage, however, at a high-level, warehouses generate more jobs per establishment than competing uses (**Table 8**, **Table 9**, and **Table 10**). From conversations with warehouse developers, jobs per acre vary depending on the specific use, i.e., distribution center versus sorting, or consolidation versus fulfillment center.
- The average annual wages per employee in 2021 for "Warehousing and Storage" is less than those for "Manufacturing" and both are outpaced by "Scientific Research and Development

<sup>22</sup> Data from US Census County Business Patterns (CBP) reports aggregated and averaged data for all warehouse and storage types. Therefore, the warehousing and storage jobs and salaries reported will not highlight any specific warehouse facilities with high employment or high paying jobs.

Services". It is worth noting that this average bundle up management and non-management staff (**Table 11**, **Table 12**, and **Table 13**).

### *Types of Warehouse Jobs*

**Safety Manager:** This person's responsibilities include oversight of a safety-minded culture in the warehouse through OSHA training and education, investigating onsite accidents to determine the cause and recommend preventative measures, managing the employee health and safety guidelines set forth by both the company and local/state/federal laws, and implementing and creating programs that promote safety and security of warehouse employees.

**Warehouse Supervisors:** This role supervises, organizes, and monitors inventory receiving, storage, and distribution. They oversee the facility workforce, with management of performance metrics and train new employees.

**Operations/Warehouse Manager:** The warehouse manager position monitors all day-to-day warehouse activities, including receiving, order filling, shipping, and inventory control. Their responsibilities involve scheduling tasks for personnel, helping negotiate rates with carriers, creating daily work logs, collecting actionable data related to labor, shrinkage, fill rate, etc., planning more efficient operations, and supervising and training warehouse employees and their supervisors.

**Inventory Clerk:** The inventory clerk is responsible for various clerical duties for warehousing, receiving, and shipping materials. In most cases, this person handles relationships with vendors and/or suppliers and is responsible for monitoring inventory performance and assists in creating purchase orders to replenish stock before it runs out. They are also heavily involved with keeping inventory counts in check.

**Material Handlers:** Depending on the size of the operation and operator, a fulfillment center may have employees who do only one job or are cross-trained for multiple jobs, as follows:

- Pickers – this role receives orders that drop to the warehouse floor, then collect the item(s) for each order to prepare for shipment.
- Packers – this role takes the picked orders, scan them in as 'ordered', then pack them into appropriate packaging for shipment. They also include any package inserts, custom packaging, and the packing slip in the order.
- Receivers – this role unloads inbound freight from carrier trucks, processing it into inventory.
- Stockers (replenishment) – this role takes inventoried items from receiving and move them to either a storage area or to the warehouse floor. They are also responsible for replenishing products that are out or low.
- Assemblers or value-adders – this role pieces kits of items together, wrap gifts, and personalize orders.

- Returns – this role processes inbound returned orders, removes items from packaging, and conducts visual inspections. They document returns, then refurbish or return it to replenishment for restocking or work with the retailer/manufacturer to have the product returned to them.

**Emerging Tech-elated Positions:** Highly automated warehousing facilities require skilled labor such as automation engineers to monitor and repair control systems and sensors within a building to ensure efficient handling of goods. These jobs entail average salaries over \$100,000 annually.

Based upon the manner in which the US Bureau of Labor Statistics compiles their data, there are four kinds of employees that work in warehouse/storage positions. In the Portland-Vancouver-Hillsboro MSA there are 47,480 people employed in these positions with 97% of them being in categories A and D, as listed below.

- Laborers and freight, stock, and material movers – manually move freight, stock, luggage, or other materials, or perform other general labor. There are 16,960 people employed in this position in the MSA, with an average mean wage of \$41,260.
- Machine feeders and off bearers – feed materials into or remove materials from machines or equipment that is automatic or tended by other workers. There are 640 people employed in this position in the MSA with an average mean wage of \$41,890.
- Packers and packagers – pack or package by hand a wide variety of products and materials. There are 330 people employed in this position in the MSA with an average mean salary of \$37,120.
- Stock and order fillers – receive, store, and issue merchandise, materials, equipment, and other items from stockroom, warehouse, or storage yard to fill shelves, racks, tables, or customers' orders. May operate power equipment to fill orders. May mark prices on merchandise and set up sales displays. There are 29,880 people employed in this position with an average mean salary of \$38,710.

## Warehousing Regional Economic Impacts

The modern distribution centers discussed herein generate more than direct jobs. These facilities also generate and support a number of other industries in a region, such as food and supplies for restaurants and grocery stores, retail goods for brick-and-mortar retail stores, third-party vendors (e.g., Etsy producers), and inputs to local manufacturing and service providers (e.g., auto repair, beauty salons, etc.).

For the purposes of comparison, the following provides detailed employment figures, salary information, cost of new construction (another indirect economic benefit), tax revenue, and the indirect benefits of various existing Amazon facility types and a food redistribution warehouse which is assumed to be representative of traditional warehouses.<sup>23</sup> The comparison highlights that e-commerce facilities typically entail more local and regional economic impacts (tax revenue, indirect jobs, and new dollars circulating in the economy) than traditional warehouses.

### *Sortable fulfillment centers*

These facilities are approximately 800,000 square-feet in size and employ about 1,500 full-time associates. In these buildings, employees pick, pack, and ship customer orders. Depending on the location, facilities are partly automated, with workers and robots working alongside each other. Facilities employ approximately one employee per 1,000 square feet over a multi-shift workday.

- 800,000 sq ft
- 1500 full time employees at an average wage of \$39,980 annually = annual payroll of \$59,970,000
- Average cost per sq ft of new construction: \$175/ sq ft
- Estimated valuation of development = \$140,000,000
- Property tax in the MSA at \$2.06 per \$1000 of valuation = \$288,400 annually
- Multiplier for the total change in number of jobs in all industries within the MSA for each additional job in the warehouse/storage industry = 1.4082.  $1,500 \times 1.4082 = 2,112$  new jobs will be created in the regional economy
- Multiplier for the total dollar change in earnings of all households in the MSA for each additional dollar of earnings paid directly to households employed by the warehouse/storage industry = 1.5080.  $\$39,980 \times 1.5080 = \$60,290$ . Each new job in the MSA created by the warehouse/storage sector creates \$60,290 in the regional economy for a total of \$90,434,760 annually ( $1,500 \times \$60,290$ )

### *Non-sortable fulfillment centers*

With sizes ranging from 600,000 to 1 million SF, these facilities employ more than 1,000 full-time workers. In these centers, associates pick, pack, and ship bulky or larger-sized customer items such as patio

<sup>23</sup> The analysis was conducted using U.S. Bureau of Economic Analysis (BEA) RIMS II multipliers. The multipliers estimate the impact from changes in final demand on one or more regional industries in terms of output, employment, and labor earnings. These multipliers are based on estimates of local area personal income and on the national input-output (I-O) accounts.

furniture, outdoor equipment, or rugs. Approximately 1500/sq ft per employee over a multi-shift workday.

- 1,000,000 sq ft
- 675 fulltime employees at an average wage of \$39,980 annually = \$26,986,500 annual payroll
- Average cost per sq ft of new construction: \$175/sq ft
- Estimated valuation of development = \$175,000,000
- Property tax at \$2.06 per \$1000 of valuation = \$360,500 annually
- Multiplier for new job creation creates 951 new jobs
- Each new job in the MSA created by the warehouse/storage sector adds \$60,290 to the regional economy for a total of \$40,695,642 annually

#### *Receive centers*

Amazon's receive centers support customer fulfillment by taking in large orders of the types of inventories that are expected to quickly sell and allocating it to fulfillment centers within the network. They also receive and consolidate items from vendors. These buildings are about 600,000 square feet in size. Approximately 1500 SF/employee

- 600,000 sq ft
- 400 full time employees at an average wage of \$39,980 annually = \$15,992,000 annual payroll
- Average cost per sq ft: \$175/sq ft
- Estimated valuation of development = \$105,000,000
- Property tax at \$2.06 per \$1000 of valuation = \$216,300 annually
- Multiplier for new job creation creates 563 new jobs
- Each new job in the MSA created by the warehouse/storage sector adds \$60,290 to the regional economy for a total of \$24,115,936

#### *Last mile delivery centers*

These facilities operate 24/7. Tractor trailers arrive from fulfillment centers; orders are processed and loaded onto delivery vans. The vans leave the warehouses outside of peak hours with the departure times scheduled in waves. If demand is especially high third-party partners/drivers can make deliveries in their personal vehicles. These facilities generate a large amount of new traffic activity.

- 100,000 sq ft
- 100 full time employees at an average wage of \$39,980 annually = \$3,998,000 annual payroll
- Average cost per sq ft: \$92/sq ft
- Estimated valuation of development = \$9,200,000
- Property tax at \$2.06 per \$1000 of valuation = \$18,952 annually
- Multiplier for new job creation creates 141 new jobs
- Each new job in the MSA created by the warehouse/storage sector adds \$60,290 to the regional economy for a total of \$6,028,984 annually



### *Food service redistribution warehouse*

A food service redistribution company, which offers over 112,000 products from over 800 food industry manufacturers built a new distribution center to serve Southern California, Arizona, New Mexico, Southern Nevada, and Utah. The company consolidates these products and delivers them in less than truckload quantities to distributors on a weekly basis. They have 11 distribution centers nationally.

- 165,000 sq ft distribution center space which includes 20,000 sq ft of refrigerated space
- 126 full time employees at an average of \$39,980 annually = \$5,037,480 payroll
- \$45,000,000 of project costs which includes refrigerated and dry storage areas, installation of new equipment and infrastructure improvements
- City property tax of \$2.06 per \$1,000 valuation = \$92,700 annually
- With a multiplier of 1.4082, the 126 jobs will create 177 new jobs in the MSA
- With a multiplier of 1.5080, each new job in the MSA created by the warehouse/storage sector adds \$60,290 to the regional economy for a total of \$7,596,519 annually

### **Background Economic Data Specific to Vancouver**

The Portland/Vancouver/Hillsboro Metropolitan Statistical Area (MSA) saw an increase of 4.8 percent in Warehouse/Storage employment from September 2021 to 2022. The average weekly wage in that period was \$1,315, which ranked 66th in MSAs in the nation out of 395 MSAs. During the same period of time, Washington State was second in the nation for weekly wages paid to the Warehousing/Storage sector at \$1,657 while Oregon's was \$1,301. This difference is in part due to the higher cost of living in the Seattle region, which requires higher wages to attract and retain warehouse workers. The top five states for highest warehousing job wages include District of Columbia, Washington, Massachusetts, New York, and California. The cost of living in these states ranks equally high.

Based upon 2022 year-end employment numbers in the Warehousing/Storage sector in the MSA:

- 47,830 employees in the Portland, Vancouver, Hillsboro MSA
- 121,950 employees in Washington State
- 80,610 employees in Oregon

In 2022, overall statewide employment growth was 1.1 percent in Oregon (lowest nationally) and 4.4 percent in Washington. Applicable taxes in Vancouver consist of property tax, sales and use tax, and utility taxes. Vancouver property tax levy rate is \$2.06 per \$1,000 assessed value. Washington State law requires that county assessors appraise all property at its true market value in dollars, according to the highest and best use of the property. Washington State sales and use tax is 6.5 percent, whereas Vancouver's sales and use tax is 2.2 percent. Washington State uses a Destination Sales Tax system which means that the sales tax is applied at the destination. A Washington State Department of Revenue exemption is available for warehouses of 200,000 or more square feet. Sales tax on the construction costs for new warehouses (or an expansion of an existing warehouse that meets the 200,000 square feet requirement) qualify for 100 percent exemption. Material-handling equipment and racking equipment in warehouses are eligible for a 50 percent exemption. This applies to the state portion of the tax.

## Sustainable Practices

With the significant post-pandemic increase in e-commerce and recent near-shoring and reshoring of manufacturing, the demand for industrial warehousing has grown significantly and shows little signs of waning despite capitalization concerns related to interest rate hikes. This creates both challenges and opportunities for Vancouver to ensure that the development is sustainable – both from an environmental perspective, as well as long-term economic perspective. This section discusses opportunities for applying sustainable building and operations practices to the freight industry to reduce energy and water consumption, as well as emissions, landfill waste, and urban stormwater runoff.<sup>24</sup> This section will also discuss flexible re-use designs that support long-term, productive use of large industrial structures.

### Environmental Sustainability

As part of the trend toward greener warehouses, businesses are seeking not only energy savings but also more efficient materials handling. Automated storage and retrieval systems (AS/RS), the robotic handling system, and warehouse management systems (WMS), help achieve significant efficiencies by maximizing storage space while reducing operating costs. The WMS has the added benefit of increasing the speed of delivery and deployment of goods, which reduces truck queues and idling, particularly during peak seasons or immediately following a supply chain disruption. Flexible, hybrid AS/RS designs use one or more cranes in an aisle that only need to be as wide as the largest commodities – a substantial space saving in comparison with forklift-operated facilities. Automated racking systems can store products single-deep, double-deep, or up to 12 loads deep in the rack structure. AS/RS systems can be customized based on the warehouse's inventory mix of high, intermediate, and slow-moving products to minimize the cubic space required for storage and handling. Unmanned rack entry vehicles quickly, smoothly, and accurately transport pallets and containers in and out of the storage rack, resulting in faster throughput. These systems benefit small and large warehouses alike. Although the following example focuses on a very large-scale warehouse, it demonstrates the ability of systems like this to perform a vast amount of work in a very small space – a potential opportunity for Vancouver.

Automated systems also deliver the following environmental benefits:

1. Less land usage: A warehouse with an AS/RS uses up to 40 percent less space than a conventional warehouse to store the same number of products.

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<sup>24</sup> Green building is the practice of creating structures and using processes that are environmentally responsible and resource- efficient throughout a building's life cycle from siting to design, construction, operation, maintenance, renovation, and deconstruction. This practice expands and complements the classical building design concerns of economy, utility, durability, and comfort. Green building is also known as a sustainable or high-performance building. <http://www.epa.gov/greenbuilding/>

2. Less energy consumption: Automated warehouses require less lighting and cooling; regenerative braking on storage/ retrieval machines produce energy for assisting with powering the system; the warehouse maintenance system controls all product flows and optimizes product movements.
3. Less product waste: Automated warehouses reduce product damage caused by human error; require less shrink wrapping to secure pallets; improve accuracy of fulfillment through technology like RFID.
4. Reduced maintenance: Maintenance costs for AS/RS are lower than for forklift operations; automated facilities require less space resulting in facility leasing savings.
5. Safety benefits: Automated facilities have fewer workers moving goods, thus resulting in fewer injuries that are typically inherent in warehouses, such as back and neck injuries and forklift accidents.
6. Result in fewer employees on site and therefore require fewer parking spaces (typically 40 percent less employee parking demand than a typical warehouse).

One of the challenges with AS/RS is the cost and return on investment. AS/RS is most commonly used by tenants who intend to operate a facility for a minimum of ten years. AS/RS also requires minimum ceiling height of 40 feet and perfectly level floors.

### **Adaptive Re-use Feasibility**

The growth rate for warehousing space is flattening due to changing economic trends and optimization of available space (e.g., automation). Therefore, it is important that warehousing properties are adaptive to reuse for different tenants with varying purposes. Over the years, warehouses in several parts of the country have been successfully reused for the following:

- Commercial kitchens to support local food trucks, segmented artist studios, or start-up office space for entrepreneurs or small businesses. Properties with high ceilings and abundant natural light can be converted into attractive office space.
- Production or testing facilities for a range of technology, such as biotech industries, automobile parts, aviation, and 3D printing.
- Gyms and indoor sports spaces.

As an example, St. Ann's warehouse in New York which was initially utilized for tobacco processing was repurposed into a theater for live performances in 2015.<sup>25</sup>

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<sup>25</sup> BIM Smith. Functional and Creative: 5 Inspiring Adaptive Reuse Projects. 2022

The feasibility of reuse or multi-use of warehouses is highly dependent on the design nature of a development:

- Warehouse developments that typically work for both warehousing and manufacturing include flexible, dock-high, high-clear height buildings with provisions to expand power in the future, including under slab conduits so that power can be delivered to different ends of a building.
- To accommodate a use that may have more trucking, 185 ft truck courts may be necessary to accommodate trailer storage or truck courts that are 135 ft deep if no trailer storage is anticipated.

The multi-story warehouse concept, centered on building vertically rather than horizontally, is garnering traction. Building vertically helps overcome the limits of property lot sizes. Small trucks are able to easily navigate ramps to upper floors, while the main loading dock accommodates the conventional 53-foot trailers typically used in the US. This concept offers developers and property owners the ability to maximize profit potential. However, multi-story warehouses can be substantially more expensive to build than a standard warehouse.<sup>26</sup> An example warehouse is the 590 KSF multi-story warehouse in the Georgetown Crossroads district of south Seattle near the Port of Seattle.

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<sup>26</sup> [Prologis. The Future is Multistory. 2021](#)

# Recommendations

As demonstrated in this report, industrial warehouses can vary significantly based on the types of activities occurring within them. Recent best practices that our team has identified focus on understanding the operations of industrial warehousing and taking a performance-based zoning approach. This type of zoning fosters the creation of a set of conditions of approval that best address the potential impacts of their operations. The following provides some potential conditions of approval for the City's consideration.

## Potential Conditional Use Permit (CUP) Requirements

The City could consider updating CUP requirements to require applications for new warehouses or distribution centers to describe the proposed operations, such as hours of operation, number of employees per shift, number of shifts, hours of shifts, daily and AM/PM peak hour medium- and heavy-duty truck volumes, number of dock doors, number of parking spaces for employees, trailers, tractor-trailers, and/or tractors, and anticipated water/sewer usage in volume, and power requirements in megawatts.

## Transportation and Parking Analysis

### *Traffic Impact Review Guidelines and Process*

The City may want to consider developing a traffic impact assessment/analysis (TIA) template to guide the assumptions to use in preparing TIAs. As a starting point, the City could request that the following information be submitted by the applicant and approved by the City prior to collecting traffic data and initiating the TIA:

- Trip generation rate (ITE-based rates for both peak hour generator and peak hour of adjacent streets, or other based on empirical evidence)
- Trip distribution
- Parking demand (ITE or other based on empirical evidence)
- Study intersections
- Annual ambient traffic growth rate
- Related projects

### *Off-Street Parking and Site Access*

The City's parking and circulation regulations were adopted before the advent of modern warehouses and distribution centers, which are now serviced by larger trucks. Specifications and design of truck parking for long duration or overnight parking, trailer storage, as well as dock spaces in length and width, should accommodate the largest commercial motor vehicle. In addition, sufficient truck parking spaces or designated areas for staging may be needed to prevent queuing onto public streets. The number of spaces and dimensions should be consistent with the proposed use and potential future re-uses of the



site. Today's standard over-the-road heavy-duty trucks carry 53-foot trailers with a total length (tractor and trailer) of 65 feet. These trucks are typically 8.5 feet wide and 13.5 feet tall. Below are some examples of off-street truck parking provisions developed to reflect the increase in truck sizes and changing parking uses:

- **Staging Spaces:** Two 12-foot-by-75-foot truck staging spaces for each loading dock. A minimum of five percent of required truck staging spaces shall be reserved for outbound trucks which are required to layover or rest due to hours-of-service regulations. Such spaces must be accessible during and after the facility's operating hours as necessary.
- **Loading Spaces:** One 12-foot-by-75-foot truck loading space for each loading dock.
- **Loading Docks:** The minimum number of loading docks shall be determined using the following calculation: *Number of trucks per hour* (at the peak hour of the use) multiplied by the *turnaround time per truck* (in hours). The number of docks determined by the above formula shall be rounded up to the next whole number. For example: 17 trucks are required to be serviced during the peak hour of use, each requiring 45 minutes (0.75 hours) to service. This equates to 17 trucks per hour multiplied 0.75 hours per truck, resulting in the need for 12.75 docks, which would be rounded up to 13 docks. If a particular tenant has not been identified for the facility, a minimum of one loading dock shall be provided per 5,000 square feet of building gross floor area.
- **Reserved Spaces:** Reserve a minimum of 5% of the proposed total tractor-trailer parking spaces for trucks that are required to arrive early or to layover or rest due to hours-of-service regulations. Such spaces must be made available to tractor-trailers 24 hours a day, seven days a week.

### *Dimensional Requirements and Emergency Response*

Industrial warehouses are often characterized by their substantial size relative to other buildings in a community. Today, regional freight facilities typically range between 400 KSF and 1 million square feet. These facilities are often greater than four stories tall, to provide as much space as possible to store goods prior to movement. The combination of square footage and building height can pose visual impacts and potential challenges to emergency responders. Examples of codes from other jurisdictions to address height and building coverage and emergency access:

- Structures higher than a certain height may be permitted as a conditional use, provided that fire protection measures above and beyond those normally required would be provided as the Supervisors determine are necessary, after providing the Township Fire Commissioner with an opportunity for a review.
- Total Impervious Coverage — 50% (At least 30% of the total lot area shall be lawns and/ or vegetation land cover).
- An exterior access stair tower shall be provided to allow public safety personnel direct emergency access to the roof of the building from the ground level. Steps, guiderails, handrails, brackets, gates, and other components shall meet or exceed applicable Uniform Construction Code and Occupational Safety and Health Administration (OSHA) standards. The final location and

specifications for the exterior access stair tower shall be subject to review and approval by the Emergency Services Coordinator and/or Fire Marshall.

- Commercial Knox Boxes<sup>27</sup> are required to provide public safety personnel access to any secured areas of the site, the principal building structure, and any accessory structures. The final location(s) and specifications for Knox Boxes shall be subject to review and approval by the Emergency Services Coordinator and/or Fire Marshall.
- Plans that accompany special exception or conditional use applications, or subdivision or land development applications, should clearly identify the location, design, and capacity of water storage facilities intended for fire suppression.
- Municipalities should require requests for special exceptions and conditional uses, as well as all subdivision and land development applications for freight-based development, be submitted to emergency service providers for their comment and review. Thresholds for review, such as a minimum square footage of principal building and trip generation rate, can be used to determine which applications should be reviewed.

### *Driver and Facility Amenities*

Land development plans for freight centric or freight movement dependent operations need to provide accommodations at their facilities to enable the truck drivers essential to their operations to comply with federal laws regulating the hours a driver may operate a commercial vehicle. At federal level, the Federal Motor Carrier Safety Administration (FMCSA) regulates the maximum amount of time drivers are permitted to be on duty including driving time, and specifies number and length of rest periods, to help ensure that drivers stay awake and alert.<sup>28</sup> Freight land uses and facilities should incorporate onsite parking for the commercial vehicles that are essential to the operations of the building or use.

It should be noted that drivers of a commercial motor vehicle (CMV) or commercial trucks that fall under the hours of service (HOS) regulations are defined as being used as part of a business, is involved in interstate commerce, and fits any of the following descriptions:

- Weighs 10,001 pounds or more
- Has a gross vehicle weight rating or gross combination weight rating of 10,001 pounds or more
- Is designed or used to transport 16 or more passengers (including the driver) not for compensation
- Is designed or used to transport nine or more passengers (including the driver) for compensation
- Is transporting hazardous materials in a quantity requiring placards. There are special exemptions from these HOS requirements such as:
  - Short-Haul: Driving within 150 miles of the origin and destination and must start and end within 14 hours at the same starting location.

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<sup>27</sup> Knox Emergency Boxes provide onsite, high security storage for pre-fire plans, key storage, elevator drop keys, Haz-Mat data and other emergency items.

<sup>28</sup> Code of Federal Regulations (CFR). Title 49 – CFR 395.3

- Adverse Driving Conditions: Drivers can extend their duty day and driving time by up to two hours when adverse driving conditions are encountered. Adverse driving conditions include snow, ice, sleet, fog, or other weather conditions or unusual road or traffic conditions that were not known, or could not reasonably be known, to:
  - A driver immediately beginning the duty day or immediately before driving after a qualifying rest break or sleeper berth period, or:
  - A motor carrier immediately before dispatching a driver

Long-term or overnight truck parking amenities should provide or enable trucks to:

- Have easy access to trash receptacles
- Adequate lighting to provide security for drivers while sleeping or resting
- Directional signage to major interstates or common freight destinations

Additionally, it is important that the freight-based land use also provide amenities for the driver to utilize while restricted from driving. These amenities may include:

- Driver Lounges with vending machines
- Rest Rooms
- Showers
- Wi-Fi Internet access
- Dog walking
- Multimodal trails

### *Multimodal Access*

Municipalities should plan for the availability of trails, sidewalks, and access to transit facilities when planning for the location of freight-based operations. This infrastructure serves both drivers accessing the site as well as providing employees options for commute trips. The subdivision and land development approval process should require consultation with transit providers on the optimal location for transit stops. Sidewalks and trails should also be required to connect with existing and proposed trail and sidewalk systems.

Dedicated parking spaces for alternative modes of transportation encourage choices that support the City's greenhouse gas (GHG) reduction goals and promote health and well-being. In addition, the City may require tenants to establish and promote a rideshare program that discourages single-occupancy vehicle trips and provides financial incentives for alternate modes of transportation, including carpooling, public transit, and biking.

## Possible Project Conditions or Standards to Address Climate Action Goals

Warehouse developments offer opportunities to further the City's Climate Action Plan by providing incentives or codifying sustainable design features or business practices, where applicable. Generally, there are industry efforts to address climate change. From fleet owners to policymakers, various stakeholders are taking the initiative to reduce the impact of e-commerce on GHG emissions. Examples of e-commerce platforms and shippers with climate-related commitments to ensure zero emission deliveries include Amazon, IKEA, Nestle, and Walmart.<sup>29</sup> Additionally, developers are also incorporating sustainable design features in their warehouse developments. **Figure 5** illustrates how Prologis developers are incorporating sustainable practices in warehouse developments. The design features the City can incorporate to address climate action goals include the following<sup>30</sup>:

### Energy Provisions & Conservation

**Power Requirements:** The City should consider requiring the installation of adequate electric infrastructure for charging electric vehicles, charging trucks at loading docks, powering refrigeration units of temperature-controlled trailers, and providing auxiliary power for diesel trucks to allow climate control and use of in-cab electronics without idling.

**Auxiliary power/ electric truck charging:** Locate plug-ins at dock doors.<sup>31</sup>

**Solar, storage, and wind power:** Warehouses are viable candidates for alternative energy systems, including photovoltaic solar cells and battery storage. In particular, warehouses have huge, flat, unobstructed roofs that are ideal for solar arrays capable of pumping out torrents of clean, renewable energy. The City should consider requiring warehouse developers and tenants to install alternative energy systems.

As an example, the City of Seattle regulates renewable energy and solar-ready roofs for commercial buildings as outlined in the 2018 Seattle Energy Code (Section C411 and Section C412).<sup>32, 33</sup> The regulatory requirements centered around solar readiness are based on roof area and electrical service as indicated below. As a general requirement for on-site renewable energy systems, each new building larger than 5,000 sf of gross conditioned floor area is required to include a renewable energy generation system consisting of not less than 0.25 watts rated peak photovoltaic energy production per square foot of conditioned space.<sup>33</sup>

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<sup>29</sup> [Nowlan, A., and Usmani, S. Accelerating Zero-Emissions Delivery: An innovative approach to transforming the last mile. Environmental Defense Fund, 2021](#)

<sup>30</sup> [Prologis. Sustainable Design Features & Benefits. 2023](#)

<sup>31</sup> [SafeConnect. Docking Stations.](#)

<sup>32</sup> [City of Seattle. Renewable Energy and Solar-Ready Roofs for Commercial Buildings. 2021](#)

<sup>33</sup> [City of Seattle. 2018 Seattle Energy Code. 2021](#)

### *Solar Readiness Example*

**Example:** A building with a 10,000 SF total roof area, 1,000 SF skylight area, and a 400 Amp, 240-volt single phase electrical service is required to provide a solar zone area of the smaller of the following:

1.  $[40\% \times (10,000 \text{ SF roof area} - 1,000 \text{ SF skylights})] = 3,600 \text{ SF}$ ; or
2.  $[400 \text{ Amp} \times 240 \text{ Volts} \times 20\% / 10 \text{ watts per SF}] = 1,920 \text{ SF}$

Therefore, a *solar zone* of 1,920 square feet is required.

Source: 2018 Seattle Energy Code (Section C411)

**Motion sensors:** Use of motion sensors to turn on lights for workers when natural light is not sufficient.

**Skylights and clerestory windows:** Utilize natural light to lower electricity use and associated greenhouse gas emissions and improve indoor environmental quality for warehouse personnel.

**High-reflectance roof membranes:** Traditionally, warehouse roofing has black ethylene propylene diene terpolymer (EPDM) rubber membranes that absorb heat from sunlight. White thermoplastic polyolefin (TPO) roofing, also known as "cool roofs," offers equal performance at similar costs while comparatively reducing heat absorption and often providing a more comfortable work environment. This design feature can also lower operating costs by reducing energy use in air-conditioned spaces.

**Climate control:** Ventilation system that utilizes outside air drawn through louvers facing the prevailing winds, supplemented by energy efficient heating and cooling systems.

### **Water Conservation & Waste Management**

**Water conservation measures:** Exterior landscaping, motion-activated faucets, low-flow toilets, waterless urinals, and captured rainwater for irrigation all reduce the use of fresh water. Use native plant species and drip irrigation.

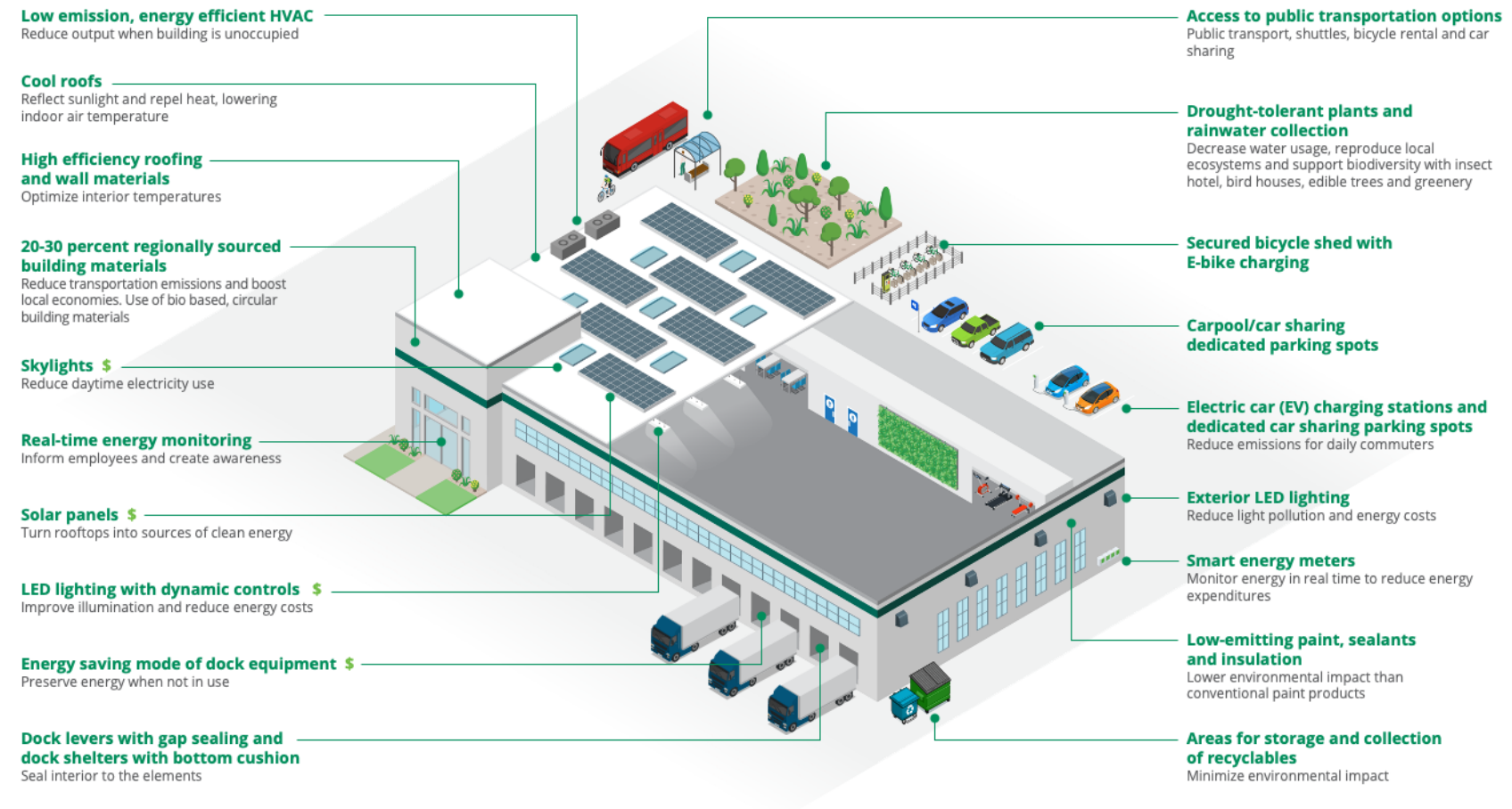
**Dedicated area for onsite recycling:** Support water and waste recycling efforts, such as onsite shredding and compaction of recyclable cardboard and other materials on site.

**Physical, structural, and/or vegetative buffers** that adequately prevent or substantially reduce pollutant dispersal between warehouses and any areas such as homes, schools, daycare centers, hospitals, community centers, and parks.

**Environmentally Friendly Building Materials:** Use low emitting VOC materials, such as glues, adhesives, paints etc.; use recycled construction materials to construct buildings.



**Figure 5: An Example Warehouse Development that Advances Sustainability**



\$ = Direct occupational cost savings



BREEAM®

CASBEE®



**BUILDING CERTIFICATIONS**

Demonstrate that we build to the top sustainability standards



**PROJECT MANAGEMENT CERTIFIED**

ISO 14001

Source: Prologis, Prologis Buildings, A Story of Sustainability. 2023.

# Appendix A

**Table 7: Differences between Traditional Warehouses and E-commerce Facilities**

| Characteristics | Traditional Warehouse                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | E-commerce Facilities                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Physical        | <ul style="list-style-type: none"> <li>• Smaller building footprint</li> <li>• Lower clear heights<sup>34</sup> under 30 feet</li> <li>• Fewer dock doors</li> <li>• Typically located close to other industrial uses (targeted clients)</li> </ul>                                                                                                                                                                                                                                                                           | <ul style="list-style-type: none"> <li>• Variation in building footprint; emphasis is on space utilization</li> <li>• Higher clear heights (over 36 feet) to allow for storing multiple stock keeping unit (SKUs)</li> <li>• More dock doors, especially at transload facilities</li> <li>• Near population centers, ports, and/or intermodal railyards with easy freeway access to serve consumers (front porch)</li> </ul>                                                                                                                                                                                                                  |
| Operational     | <ul style="list-style-type: none"> <li>• Slower turnover of stored goods</li> <li>• Goods are stored in bulk for usually more than a day then distributed</li> <li>• Operations are typically limited to normal business hours, i.e., 8-hour day shifts, five days per week</li> <li>• Fewer employees, primarily unskilled labor</li> <li>• Fewer daily vehicle trips, (includes medium- and heavy-duty truck trips) - limited to less than two total vehicles per 1,000 square feet of building gross floor area</li> </ul> | <ul style="list-style-type: none"> <li>• High turnover of goods</li> <li>• Goods may be sorted, consolidated, and repackaged in less than a day before distribution</li> <li>• More likely to have automation, such as Radio Frequency Identification (RFID) to manage inventory and fully automated sortation, stocking and retrieval</li> <li>• Around-the-clock operations</li> <li>• Fewer unskilled workers; creates high-tech jobs</li> <li>• More daily vehicle trips (ranges from 1.40 to 6.44 total vehicles per 1,000 square feet of building gross floor area)</li> <li>• More van trips for first/last mile deliveries</li> </ul> |
| Economic        | <ul style="list-style-type: none"> <li>• Limited to unskilled labor and managerial jobs with lesser earnings than in high-tech warehouses</li> <li>• Generates less indirect jobs</li> <li>• Less local and regional economic impacts</li> </ul>                                                                                                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>• May entail some high paying jobs such as automation engineers with average salaries over \$100,000 a year</li> <li>• Generates more indirect jobs as these facilities support several other industries</li> <li>• More local and regional economic impacts</li> </ul>                                                                                                                                                                                                                                                                                                                                |

Source: Fehr &amp; Peers. 2023

<sup>34</sup> In industrial real estate, building clear height dictates the height to which inventory can be safely stored.

# Appendix B

## County Business Patterns Data

**Table 8: Average Employees per Establishment for Warehousing and Storage**

| Counties                   | Employees per Establishment |      |      |      |      |      | Change    |
|----------------------------|-----------------------------|------|------|------|------|------|-----------|
|                            | 2016                        | 2017 | 2018 | 2019 | 2020 | 2021 | 2016-2021 |
| Clark County, Washington   | 28                          | 24   | 27   | 33   | 38   | 42   | 50%       |
| Yakima County, Washington  | 91                          | 89   | 86   | 81   | 80   | 82   | -10%      |
| Lewis County, Washington   | 97                          | 100  | 107  | 108  | 105  | 109  | 12%       |
| Multnomah County, Oregon   | 34                          | 37   | 35   | 36   | 46   | 43   | 26%       |
| Washington County, Oregon  | 13                          | 36   | 31   | 35   | 59   | 66   | 408%      |
| Clackamas County, Oregon   | 36                          | 41   | 22   | 16   | 16   | 43   | 19%       |
| Spokane County, Washington | 24                          | 26   | 29   | 25   | 24   | 25   | 4%        |
| Pierce County, Washington  | 75                          | 50   | 49   | 50   | 57   | 49   | -35%      |
| King County, Washington    | 35                          | 41   | 42   | 43   | 50   | 49   | 40%       |
| Average                    | 48                          | 49   | 48   | 47   | 53   | 56   | 17%       |

Source: US Census Bureau, 2016 – 2021. Fehr & Peers, 2023.

**Table 9: Average Employees per Establishment for Manufacturing**

| Counties                   | Employees per Establishment |      |      |      |      |      | Change    |
|----------------------------|-----------------------------|------|------|------|------|------|-----------|
|                            | 2016                        | 2017 | 2018 | 2019 | 2020 | 2021 | 2016-2021 |
| Clark County, Washington   | 33                          | 33   | 32   | 34   | 33   | 31   | -6%       |
| Yakima County, Washington  | 39                          | 41   | 42   | 39   | 37   | 36   | -8%       |
| Lewis County, Washington   | 28                          | 30   | 31   | 34   | 34   | 32   | 14%       |
| Multnomah County, Oregon   | 29                          | 28   | 30   | 31   | 31   | 27   | -7%       |
| Washington County, Oregon  | 40                          | 55   | 54   | 58   | 59   | 55   | 38%       |
| Clackamas County, Oregon   | 33                          | 30   | 29   | 29   | 30   | 30   | -9%       |
| Spokane County, Washington | 29                          | 28   | 29   | 30   | 31   | 29   | 0%        |
| Pierce County, Washington  | 32                          | 32   | 33   | 33   | 35   | 33   | 3%        |
| King County, Washington    | 39                          | 39   | 39   | 41   | 41   | 38   | -3%       |
| Average                    | 34                          | 35   | 35   | 37   | 37   | 35   | 3%        |

Source: US Census Bureau, 2016 – 2021. Fehr & Peers, 2023.



**Table 10: Employees per Establishment for Scientific Research and Development Services**

| Counties                   | Employees per Establishment |      |      |      |      |      | Change<br>2016-2021 |
|----------------------------|-----------------------------|------|------|------|------|------|---------------------|
|                            | 2016                        | 2017 | 2018 | 2019 | 2020 | 2021 |                     |
| Clark County, Washington   | 14                          | 17   | 20   | 20   | 17   | 21   | 50%                 |
| Yakima County, Washington  | -                           | -    | -    | -    | -    | -    | -                   |
| Lewis County, Washington   | -                           | -    | -    | -    | -    | -    | -                   |
| Multnomah County, Oregon   | 14                          | 10   | 12   | 13   | 13   | 15   | 7%                  |
| Washington County, Oregon  | 140                         | -*   | 162  | 165  | 143  | 138  | -1%                 |
| Clackamas County, Oregon   | 6                           | 3    | 4    | 3    | 3    | 3    | -50%                |
| Spokane County, Washington | 4                           | 5    | 5    | 6    | 7    | 7    | 75%                 |
| Pierce County, Washington  | 30                          | 39   | 38   | 28   | 30   | 37   | 23%                 |
| King County, Washington    | 32                          | 33   | 37   | 37   | 37   | 38   | 19%                 |
| Average                    | 34                          | 18   | 40   | 39   | 36   | 37   | 8%                  |

Source: US Census Bureau, 2016 – 2021. Fehr & Peers, 2023.

Notes:

"-"No available data

**Table 11: Average Annual Wage for Warehousing and Storage**

| Counties                                  | Average Annual Wage |           |           |           |           |          | Change<br>2016-2021 |
|-------------------------------------------|---------------------|-----------|-----------|-----------|-----------|----------|---------------------|
|                                           | 2016                | 2017      | 2018      | 2019      | 2020      | 2021     |                     |
| Clark County, Washington                  | \$52,774            | \$42,494  | \$50,093  | \$55,299  | \$58,491  | \$58,146 | 10%                 |
| Yakima County, Washington                 | \$40,470            | \$40,167  | \$42,877  | \$46,486  | \$45,682  | \$47,851 | 18%                 |
| Lewis County, Washington                  | \$43,390            | \$37,655  | \$38,493  | \$40,248  | \$42,177  | \$43,615 | 1%                  |
| Multnomah County, Oregon                  | \$59,454            | \$56,566  | \$58,630  | \$56,863  | \$53,792  | \$55,249 | -7%                 |
| Washington County, Oregon                 | \$50,743            | \$35,884  | \$44,432  | \$35,778  | \$22,358  | \$24,441 | -52%                |
| Clackamas County, Oregon                  | \$49,618            | \$48,033  | \$37,162  | \$42,837  | \$46,170  | \$55,070 | 11%                 |
| Spokane County, Washington                | \$47,417            | \$49,716  | \$56,143  | \$51,159  | \$49,452  | \$52,692 | 11%                 |
| Pierce County, Washington                 | \$47,458            | \$46,965  | \$50,019  | \$55,488  | \$52,580  | \$48,903 | 3%                  |
| King County, Washington                   | \$60,198            | \$54,053  | \$54,934  | \$58,092  | \$55,381  | \$59,708 | -1%                 |
| Average (excluding<br>Washington, Oregon) | \$ 50,097           | \$ 46,956 | \$ 48,544 | \$ 50,809 | \$ 50,466 | \$52,654 | 5%                  |

Source: US Census Bureau, 2016 – 2021. Fehr & Peers, 2023.

**Table 12: Average Annual Wage for Manufacturing**

| Counties                   | Average Annual Wage |          |          |           |          |           | Change<br>2016-2021 |
|----------------------------|---------------------|----------|----------|-----------|----------|-----------|---------------------|
|                            | 2016                | 2017     | 2018     | 2019      | 2020     | 2021      |                     |
| Clark County, Washington   | \$57,339            | \$58,211 | \$60,167 | \$59,664  | \$62,305 | \$67,683  | 18%                 |
| Yakima County, Washington  | \$46,421            | \$45,401 | \$46,602 | \$52,751  | \$56,223 | \$52,461  | 13%                 |
| Lewis County, Washington   | \$47,506            | \$51,955 | \$53,442 | \$55,593  | \$55,101 | \$61,710  | 30%                 |
| Multnomah County, Oregon   | \$52,737            | \$56,749 | \$61,720 | \$61,337  | \$57,421 | \$64,269  | 22%                 |
| Washington County, Oregon  | \$67,890            | \$93,612 | \$95,915 | \$100,181 | \$98,181 | \$112,930 | 66%                 |
| Clackamas County, Oregon   | \$60,528            | \$60,813 | \$61,615 | \$63,875  | \$63,122 | \$70,637  | 17%                 |
| Spokane County, Washington | \$51,858            | \$51,936 | \$52,285 | \$54,265  | \$53,598 | \$57,287  | 10%                 |
| Pierce County, Washington  | \$54,729            | \$55,551 | \$57,429 | \$59,635  | \$56,289 | \$62,867  | 15%                 |
| King County, Washington    | \$70,054            | \$74,031 | \$75,578 | \$81,671  | \$77,961 | \$84,535  | 21%                 |
| Average                    | \$56,562            | \$60,918 | \$62,750 | \$65,441  | \$64,467 | \$70,487  | 25%                 |

Source: US Census Bureau, 2016 – 2021. Fehr & Peers, 2023.

**Table 13: Average Annual Wage for Scientific Research and Development Services**

| Counties                   | Average Annual Wage |           |           |           |           |           | Change<br>2016-2021 |
|----------------------------|---------------------|-----------|-----------|-----------|-----------|-----------|---------------------|
|                            | 2016                | 2017      | 2018      | 2019      | 2020      | 2021      |                     |
| Clark County, Washington   | \$99,175            | \$88,833  | \$85,088  | \$100,811 | \$262,809 | \$154,401 | 56%                 |
| Yakima County, Washington  | -                   | -         | -         | -         | -         | -         |                     |
| Lewis County, Washington   | -                   | -         | -         | -         | -         | -         |                     |
| Multnomah County, Oregon   | \$80,865            | \$79,689  | \$83,813  | \$88,613  | \$94,260  | \$96,140  | 19%                 |
| Washington County, Oregon  | \$156,485           | -         | \$172,566 | \$185,406 | \$187,757 | \$184,753 | 18%                 |
| Clackamas County, Oregon   | \$107,356           | \$62,833  | \$44,300  | \$61,452  | \$98,972  | \$103,028 | -4%                 |
| Spokane County, Washington | \$82,134            | \$71,500  | \$87,275  | \$80,366  | \$89,741  | \$91,474  | 11%                 |
| Pierce County, Washington  | \$64,474            | \$69,053  | \$70,543  | \$72,708  | \$78,525  | \$69,384  | 8%                  |
| King County, Washington    | \$107,026           | \$110,600 | \$114,221 | \$132,973 | \$142,585 | \$154,854 | 45%                 |
| Average                    | \$99,645            | \$80,418  | \$93,972  | \$103,190 | \$136,378 | \$122,005 | 22%                 |

Source: US Census Bureau, 2016 – 2021. Fehr & Peers, 2023.

Notes:

"-"No available data

**From:** [Mike Bomar](#)  
**To:** [Planning Commission](#)  
**Cc:** [Eiken, Chad](#)  
**Subject:** Port of Vancouver - Warehouse Ordinance Amendments Comment Letter  
**Date:** Friday, October 13, 2023 11:33:47 AM  
**Attachments:** [image001.png](#)  
[231013POVPlanningCommissionCommentsonCOVWarehouseMoratorium.pdf](#)

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**CAUTION:** This email originated from outside of the City of Vancouver. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Chair Ledell and Vancouver Planning Commission members,

Please see attached comments from the Port of Vancouver regarding the proposed warehouse ordinance amendments proposed for the upcoming hearing on October 24<sup>th</sup>. I'm available if you have any questions and will plan to attend the upcoming Planning Commission meeting and Council hearing as well.

Thank you for your consideration and for your service to this community.

Sincerely,

**Mike Bomar**  
*Director of Economic Development*  
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(C) 360.839.3577; (Internal) 5300  
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Friday, October 13th, 2023

City of Vancouver Planning Commission  
Attn: Chair Ledell and Vancouver Planning Commission Members  
415 W 6<sup>th</sup> Street  
Vancouver, WA 98660

**Subject: Proposed Warehouse Code Amendments**

Dear Chair Ledell and Planning Commission members:

Thank you for the opportunity to comment on the City's proposed warehouse code amendments in response to the original moratorium enacted on December 12<sup>th</sup>, 2022, and extended in June of 2023. The Port of Vancouver USA has appreciated the opportunity to talk with City staff to better understand the purpose of the moratorium and to provide input into workable solutions to address staff and Council's concerns. Regarding the staff's proposed recommendations listed in the September 12<sup>th</sup>, 2023, Planning Commission memorandum, the port has the following comments:

**1. Allowance of warehouses larger than 250,000 square feet only in Heavy Industrial (IH) zoning as a limited use.**

**Recommendation:** While most of the port's land is already zoned IH, the port requests to retain flexibility in its Light Industrial (IL) zoned properties that are not adjacent to residential zoned land and that are within one mile of a state or interstate highway. The port's marine / industrial area is focused on receiving, staging and transloading cargo from one mode to another. It is conceivable that future development could require a warehouse facility exceeding 250,000 square feet.

The port appreciates the recognition that a limited use process is more appropriate than a conditional use in IH zones for the type of project under consideration. There are, however, few parcels, such as the port's Parcel 7, which are appropriately zoned as IL and could accommodate a large warehouse without generating the negative impacts of concern in the moratorium. Without favoring the port specifically, the city may consider requiring large warehouses in the IL zones to be located within a certain distance to a state or interstate highway and to be a certain distance away from residential or other zones of concern.

## 2. Clarification on “warehouse” versus “Warehouse / Freight Movement”

**Recommendation:** The memo refers to both “warehouses” and “Warehouse / Freight movement.” This should be clarified by referring only to “Warehouse / Freight Movement” as outlined in the current VMC (Vancouver Municipal Code). There are different warehouses defined in the VMC, but the focus is on one warehouse class (“Warehouse / Freight Movement”).

VMC 20.160.D. Industrial Uses classifies “Warehouse/Freight Movement” as:

*“5. Warehouse/Freight Movement. Uses involved in the storage and movement of large quantities of materials or products indoors and/or outdoors; associated with significant truck and/or rail traffic. Examples include freestanding warehouses associated with retail furniture or appliance outlets; household moving and general freight storage; food banks; cold storage plants/frozen food lockers; weapon and ammunition storage; major wholesale distribution centers; truck, marine and air freight terminals and dispatch centers; bus barns; grain terminals; and stockpiling of sand, gravel, bark dust or other aggregate and landscaping materials.”*

Defining code changes only to the “Warehouse/Freight Movement” use defined above focuses the proposed code changes to developments that results in “significant truck” traffic. Additionally, ensuring that code changes are specific to “Warehouse / Freight Movement” would still allow “Manufacturing and Production Facilities” to be developed in both light and heavy zones areas.

VMC 20.160D defines “Manufacturing and Production” development separately from “Warehouse / Freight Movement”:

*Manufacturing and Production. Includes production, processing, assembling, packaging or treatment of semifinished or finished products from raw materials or previously prepared materials or components. Manufacturing production is intended for the wholesale market rather than for direct sales.”*

## 3. Limitation of truck traffic from Warehouse / Freight Movement to Designated Freight Corridors

**Recommendation:** Change the proposed wording in 20.895.120.B. Traffic (Page 5 of Memo) to the below:

*Tractor trailers delivering goods to or from “Warehouse / Freight Movement” covered by this section shall only travel on designated freight corridors.*

This recommendation removes the specific reference to named roads and allows the City the opportunity to designate freight corridor restrictions (which could include Fruit Valley Road) throughout the city as necessary, which may change over time.

#### **4. Buffer depth and tree planting requirements**

**Recommendation:** The City should change the buffer depth requirement (proposed 20.895.120 section C.2) from 25 feet to 15 feet, and clearly state that any tree requirement required in proposed 20.895.120 Section D can be planted in the landscaped buffer area. At developer's discretion, allow any tree requirement to be completed at an approved off-site location.

This requirement should also be reconsidered if the project's environmental assessment can mitigate wildlife, water retention and climate impacts in other ways if necessary. The port suggests removing the required area (20% of the building area) from the tree planting requirements.

Increasing the setback to 25 feet AND requiring an additional 20 percent of the building footprint area to be covered by trees significantly impacts the financial viability for a development project so burdened – especially since the proposed code would also restrict development to 75 percent of the project area or less. Without the recommended changes outlined above, the site reduction (100 to 75 percent), landscape buffer (currently 25 feet), and tree plantings (20 percent of building footprint) will make large scale warehouses – whether they are freight related or manufacturing related – extremely difficult to construct.

The Port does not have space in its marine operations area to limit required marine facilities to the proposed “maximum lot coverage of 75 percent” versus the current 100 percent allowed. Additionally, it would not be appropriate or effective to require the port to plant trees in its marine industrial areas.

Allowing the planting of trees offsite, when onsite tree planting is deemed impractical, will also allow developers to use any tree credits they may have or to buy tree credits if needed.

Additionally, reducing the landscape buffer to 15 feet would improve traffic safety – especially as site lines would be obscured as the plantings mature.

#### **5. Trip generation for Warehouse / Freight Movement facilities exceeding 250,000 square feet**

**Recommendation:** Add a traffic metric (such as 100 tractor trailer trips per 24-hour period) in addition to the use and size criteria for “Warehouse / Freight Movement”



facilities exceeding 250,000 square feet to invoke the additional miscellaneous special use standards of proposed in VMC 20.895.120.

Adding a traffic count to the “Warehouse / Freight Movement” use category for proposed warehouses of at least 250,000 square feet would provide a clear metric that both developer and city can understand when applying these code changes. This metric would come from a traffic consultant paid for by the developer.

## 6. EV outlets at loading docks

**Recommendation: Restate 20.895.120 Section D. 6 as outlined below:**

*All loading docks will have conduit and other electrical infrastructure to allow for future installation of electrical systems to charge electric powered freight trucks servicing the facility.*

The port supports and is pursuing electrification within our adopted Climate Action Plan. As currently proposed, however, the port has concerns that underutilized, charging infrastructure would be prone to costly vandalism and theft. Developers would rather have the conduit in place to meet future demands and standardization with the technology in place at that time. Requiring developers to install full charging infrastructure will result in capital wasted as newer and more secure electrical technologies emerge.

## 7. EV charging stations for parking area

**Recommendation: Restate 20.895.120 Section D.7 as outlined below:**

*For any warehouse over 250,000 feet at least 10 electric vehicle (EV) charging stations will be provided at initial occupancy. Conduit to support EV charging will be constructed to serve all parking spaces at initial occupancy.*

Designating a specific number of parking stalls to have EV charging stations (10) meets the City’s goal to have adequate EV charging installed during initial construction. Requiring conduit to be placed for the remainder of the parking stalls allows for future upgrades to occur efficiently as EV’s capture more of the market and anti-vandalism solutions can be developed.

## 8. Calculation of Total Square Footage

**Recommendation:** The ordinance should clearly state that the threshold of 250,000 square feet applies to any single structure on a given site, and not the total square footage of multiple separate structures or facilities.

Thank you for your consideration of the Port of Vancouver USA's feedback and recommendations. We look forward to continuing to work with Council and staff throughout this process to ensure an outcome that addresses the City's concerns and continues to responsibly advance trade and economic development within the City of Vancouver and throughout the region.

Sincerely,

A handwritten signature in black ink, appearing to read 'Mike Bomar', with a stylized, cursive script.

Mike Bomar

Port of Vancouver USA, Director of Economic Development

**From:** [Terry Dunn](#)  
**To:** [Planning Commission](#)  
**Subject:** Requested zone change at the corner of SE 15th street and SE 192nd Avenue  
**Date:** Saturday, October 14, 2023 11:56:21 AM

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To the Vancouver Planning Commission,

I am writing to argue against the approval of the zone change at the corner of SE 15th street and SE 192nd Avenue. I hope the commission will take these points into consideration when they make a decision on the zone change.

Firstly, it is disturbing to read the false statements made by Planning Commission staff in support of the change. Staff supports the requested change by saying “applies with applicable criteria for Comprehensive Plan and zoning map changes”. Further, the principal planner states, “the proposed development would be consistent with the surrounding area”. Both these statements are factually false. The change would drastically change the neighborhood character in violation of the Vancouver Municipal Code and the Washington Administrative Code. Nowhere in the neighborhood is there high density housing. The surrounding areas were not constructed/designed to handle high-density living

Secondly, the approach taken by Vance Development in requesting the change is a disingenuous strategic ploy. Vance first requested a change to R-30 zoning allowing 4-story apartment buildings. When the anticipated outrage appeared, Vance changed their request to R-22 zoning which permits 3-story apartment buildings. Vance called this a “compromise” when in fact it is simply a minor change that preserves the high-density apartment building and in no way complies with the requirement to preserve the neighborhood character.

Given all these facts, I hope that the Commission will deny the zone change, notwithstanding the recommendation of the Planning Commission staff.

Sincerely,  
Terrence Dunn  
1809 SE 18th PL  
Vancouver WA 98683  
[terrydunn11@gmail.com](mailto:terrydunn11@gmail.com)

**From:** [Heidi Cody](#)  
**To:** [Planning Commission](#)  
**Cc:** [Cathryn Chudy](#)  
**Subject:** Updated ACE Asks and Concerns re: City Warehouse Moratorium  
**Date:** Wednesday, October 18, 2023 11:08:21 AM  
**Attachments:** [Draft ACE asks re Warehouse Moratorium.rev.pdf](#)

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Good morning Planning Commission,

ACE has a slightly updated version of our questions and concerns regarding the Warehouse Moratorium, attached below. The main additions are:

- We will be short of electricity if we don't add trees or solar canopies to most new warehouses
- Require solar panels and batteries on all warehouses
- Electric heat pumps for heating and water should be required. Warehouses should not be allowed to connect to gas for those uses.

If someone could confirm receipt of this email, that would be helpful. We welcome conversation about this and hope you will reach out to us. My phone number is 718-986-2348. Thank you for your consideration and have a wonderful day.

Heidi Cody and Cathryn Chudy

--

Coalition Manager  
**Alliance for Community Engagement**

## **Draft ACE Asks and Talking Points: Draft Warehouse Moratorium**

**We are concerned that the Warehouse Moratorium will be a crucial missed opportunity for the City to reduce pollution and emissions, which affects the health of our communities.**

The City has a responsibility to follow its core values of equity, safety and climate. The City adopted an ambitious Climate Action Framework with a goal of carbon neutrality by 2040. Setting expectations through Municipal Code around our influx of warehouses is a great opportunity to make meaningful progress on emissions and pollution reduction.

Instead, the City focusing exclusively on warehouses over 250,000 sq. ft. effectively allows developers to have no climate provisions on individual or multi-building warehouses up to 249,999 sq. ft. There are currently no climate considerations whatsoever for the vast majority of warehouses.

Making all warehouses Permitted Use prevents community from engaging in the approval process.

### **ACE suggests:**

- Trees need to be planted and maintained onsite at the largest warehouses. Consider requiring that most pavement be shaded, either with trees or with solar canopies, for most new warehouses, not just the largest ones. We will be short of electricity if we don't. Trees mitigate the heat absorbed by vast areas of asphalt and concrete these warehouses bring.
- Require solar panels (plus 4-hour batteries), ev-ready electrical conduit and wiring, and (double-paned) clerestory windows on the largest warehouses.
- Require solar-ready roofs, ev-ready electrical conduit and wiring of all warehouses over 100,000 sq. ft.
- Prevent municipal code loopholes whereby developers could build a 249,999 sq. ft. warehouse or multiple smaller warehouses to avoid climate provisions. If it's not possible to create air-tight municipal code to prevent that, please change warehouses over 100,000 sq. ft. to Conditional Use.
- Idling for non-electric truck engines should be banned.
- No new buildings should be built, where the primary heating system for space and water is fossil fuel. Electric heat-pump water heaters and space heaters should be required. OR as the Washington State Energy Strategy says – Make new buildings all-electric ready.

**So Far So Good:** Please do not rezone other parts of the city for Heavy Industrial use to allow the larger warehouses to go in there. Truck traffic associated with these 250,000 sq. ft. warehouses should not be on Fruit Valley Road. Reducing parking lot sizes is good; as is clustering HVAC on rooftops.

City Manager communications would be a good time to bring this issue back to Council.



**From:** [Kennedy, Rebecca](#)  
**To:** [Nischik, Julie](#)  
**Cc:** [Snodgrass, Bryan](#)  
**Subject:** FW: 192nd and 15th St Rezone Proposal  
**Date:** Saturday, October 21, 2023 3:21:37 PM  
**Attachments:** [image003.png](#)

---

Julie-

Please distribute to the PC.

Note that I already forwarded this to CMO for distribution to Council.

Thanks,

**Rebecca Kennedy** | Deputy Director  
Pronouns: She/Her/Hers  
CITY OF VANCOUVER, WASHINGTON  
Community Development Department (CDD)  
**M:** (360) 624-6070 | **O:** (360) 487-7896  
[rebecca.kennedy@cityofvancouver.us](mailto:rebecca.kennedy@cityofvancouver.us)  
[www.cityofvancouver.us](http://www.cityofvancouver.us)



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**From:** Kevin Barron <kdbarron1974@gmail.com>  
**Sent:** Saturday, October 21, 2023 12:01 PM  
**To:** Snodgrass, Bryan <Bryan.Snodgrass@cityofvancouver.us>; Kennedy, Rebecca <Rebecca.Kennedy@cityofvancouver.us>; Anne.McEnerny-Ogle@cityofvancouver.us; City of Vancouver Washington General Info <CityInfo@cityofvancouver.us>  
**Cc:** achen522@gmail.com; Mtsang621@gmail.com; jacobbillingsley92@gmail.com; sweow@gmail.com; DasGupta44@gmail.com; aebarron@yahoo.com  
**Subject:** 192nd and 15th St Rezone Proposal

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Good afternoon,

We, the neighbors of Bennington and Fishers Landing East, hereby petition the Mayor, City Council,

and City Planning Commission, to reject the proposal (PIR 83420) of rezoning the property on the Northwest corner of 192nd Avenue and SE 15th Street, from Urban Low Density to Urban High Density. The proposed zoning change does not meet the Zoning Changes Approval Criteria (VMC 20.285.050) of compatibility and violates the housing goal/policy of the preservation of neighborhood character outlined in the Washington State Legislature Housing Element (WAC 365-396-410).

There are already several high density residential housing options near the proposed development site, five of which are within a one mile radius, and many others that are in the plans of several future projects in the area. It is worth noting that all of the existing and future planned apartment complexes are either directly adjacent to commercially zoned areas or within mixed use zoned areas. The proposed apartment development is surrounded in all four directions by Urban Low Density zoned areas which is not suitable or consistent with precedent for this type of construction.

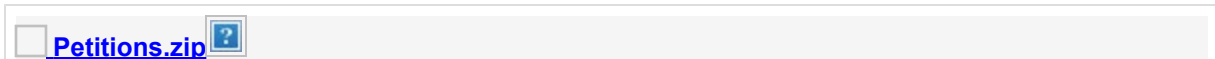
Additionally, there are several other potential concerns for our community, such as the impact on schools, traffic, noise, and crime, that need to be addressed and accounted for.

We have attached a zip file, containing the signatures of approximately 600 concerned members of our neighborhood.

We respectfully request that you reject any proposal that includes Urban High Density Zoning.

Sincerely,

Kevin D. Barron and the neighbors of Bennington and Fishers Landing East



**From:** [Michael Chen](#)  
**To:** [Eiken, Chad](#); [Snodgrass, Bryan](#); [Planning Commission](#)  
**Cc:** [Brett Conway](#); [Scott Moore](#)  
**Subject:** Warehouse Code Amendment - Written Comments  
**Date:** Tuesday, October 24, 2023 10:05:00 AM  
**Attachments:** [mackenzie\\_monogram\\_rgb\\_emailsignature2\\_a986193c-328e-491e-9e12-e13ead8c5181.png](#)  
[00LTR-COV Warehouse Code Amendment-Comment Letter-231024.pdf](#)

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Mr. Eiken and Mr. Snodgrass,

Good morning. Attached you find our written comments based on the draft warehouse code amendment dated October 2, 2023.

We look forward to providing our testimony at this evening's Planning Committee meeting.

Best Regards,

**Michael Chen**

he/him/his

D 206-582-2573 C 206-734-8428

Land Use Planning

Associate Principal

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October 24, 2023

City of Vancouver

Attention: Chad Eiken, Community Development Director and Bryan Snodgrass, Principal Planner  
415 W. 6th Street  
Vancouver, WA 98660

**Re: City of Vancouver Warehouse Code Amendments**

Dear Mr. Eiken and Mr. Snodgrass:

Please accept the following letter as our written comments to the proposed warehouse code amendments, specifically City of Vancouver zoning code section 20.89.120 (Warehouses Larger than 250,000 square feet) as outlined in your October 2, 2023, memorandum to the City Council.

20.895.120.C. – Visual Impact. Item #1 and #2. Generally, measures like façade articulation and landscape buffers relate to certain types of roads or adjacent non-industrial zoned areas. No language as it relates to adjacent non-industrial zoned areas is included and the scoping provision for a public street does not provide latitude for an exception for low volume side streets.

20.895.120.C.1 – Architectural elements. The paragraph does not provide guidance for the applicant and the City planners on the “why” of the provisions. Providing guidance on City goals will provide the developer with a stronger framework to provide excellent architecture and landscape design solutions; and provide staff tools to guide its approval process.

20.895.120.C.2 – A sixty-foot-high wall of conifer trees introduces a visual barrier restricting an Owners legitimate desire to provide a site that utilizes Crime Prevention Through Environmental Design (CPTED) concepts (safety/security design measures). A closed off site works against CPTED concepts that aim to reduce victimization, deter offender decisions that precede criminal acts, and build a sense of community among inhabitants so they can gain territorial control of areas, reduce crime, and minimize fear of crime. We recommend consideration of a “street tree “approach (deciduous) trees, low berms and low shrubs which provide visual access into the property for occupant, visitor, and premise safety. In addition, it is in the public’s interest to allow sufficient visual access to the site to allow wayfinding to both autos and trucks seeking to access a particular site. If the frontage is totally obscured by evergreen trees, additional traffic may be added to adjacent streets due to visitors failing at initial approach to recognize and/or access the property promptly.

20.895.120.D.1 – We strongly recommend the City not provide additional solar panel language or requirements. The State Building Code - current version 2018 and the soon to be adopted 2021 version - have strong and very detailed Renewable Energy provisions. Refer to Section C411. The language provided in the state Code is detailed and beyond what has been provided in the memorandum. Adopting this language would add unnecessary confusion to this issue.

20.895.120.D.2 – We strongly recommend the City not provide additional skylight/clerestory window language or requirements. The State Building Code - current version 2018 - has provided a strong framework for this climate measure and is maintained in the soon to be adopted 2021 version. It is a strong and very detailed daylighting provision. Refer to WAC 51-11C-40232, Section C402.4.2 Minimum skylight fenestration area. The language provided in the State Code is detailed and beyond what has been provided in the memorandum. Adopting this language would add unnecessary confusion to this issue.



20.895.120.D.4 – How will engine idling be enforced? How would this provision be addressed within the Site Plan Review process?

20.895.120.D.5 – The technology for charging electric powered trucks is changing rapidly. The electrical load/demand is significant. This requirement places a huge financial burden on the developer of new warehouses for technology that may be outdated or not even used by future tenants. Additionally, the electrical utility company may not be able to meet the power demands of this requirement.

20.895.120.D.6 – EV charging. We strongly recommend the City not provide additional EV Charging language or requirements. The State Building Code - current version 2018 - has provided a mild framework for EV Vehicle charging infrastructure and the requirements are significantly increased in the soon to be adopted 2021 version. It is strong and configured into three tiers: 10% EV charging stations, 10% EV-Ready spaces, and 10% EV-Capable spaces. Refer to WAC 51-50-0429 Section 429—Electric vehicle charging infrastructure. The language provided is beyond what has been provided in this memorandum. Adopting this language would add unnecessary conflicting language to this issue.

We look forward to providing verbal testimony at the October 24, 2023, Planning Commission meeting.

Sincerely,



Brett Conway  
Associate Principal



Michael Chen  
Associate Principal

**From:** [Heidi Cody](#)  
**To:** [Planning Commission](#); [Eiken, Chad](#)  
**Cc:** [Small, Rebecca](#); [Dalgaard, Stacey](#); [Lande, Aaron](#); [McEnerny-Ogle, Anne](#); [Holmes, Eric](#); [Stober, Ty](#); [Fox, Sarah](#); [Harless, Kim](#); [Perez, Diana](#); [Hansen, Bart](#); [Paulsen, Erik](#); [Cathryn Chudy](#)  
**Subject:** ACE letter to Planning Commission re: Warehouse Moratorium Code Changes  
**Date:** Tuesday, October 24, 2023 11:26:50 AM  
**Attachments:** [ACE City Warehouse Code changes response.pdf](#)

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Hello Chair Ledelll, Planning Commission, Chad Eiken and everyone else,

Attached please find a letter from Alliance for Community Engagement to the Planning Commission about the City's Draft Warehouse Moratorium. Please feel free to contact us if you have any questions.

Thank you for your work.

Sincerely, Heidi Cody and Cathryn Chudy

--

Coalition Manager  
**Alliance for Community Engagement**



October 24, 2023

Alliance for Community Engagement (ACE)

City of Vancouver Planning Commission

Dear Chair Ledell and Planning Commission,

Thank you for your ongoing work with the Warehouse Moratorium. Alliance for Community Engagement submitted a list of concerns and questions about the Draft Warehouse Moratorium to the Planning Commission and the Community Development Team. Yesterday we received a memo from Chad Eiken addressing ACE's concerns and the Port of Vancouver's concerns. While ACE still has concerns, we appreciate being allowed to comment on this important policy, and thank the Community Development Department for communicating with us about it.

ACE is concerned that this Warehouse Moratorium is a missed opportunity to meaningfully reduce greenhouse gas emissions in keeping with our ambitious Climate Action Framework goals.

The threshold of 250,000 square feet for considering warehouse code changes has had a determinative effect for all warehouses under that threshold. We find it problematic that a 249,999 sq. ft. warehouse or smaller simply has no climate expectations to meet, considering that the City has a city-wide carbon-neutrality goal of 2040.

We understand the Green Building/Policies Standards don't yet exist. But delaying climate measures for all warehouses under 250,000 sq. ft. until the Green Buildings Standards are established creates a policy gap that misses a decisive moment to curb greenhouse gas emissions. The same is true for the current lack of requirements that heat pumps be used exclusively for space and water heating in warehouses.

The Community Development Staff responded in its Oct. 23 memo that they were not proposing climate requirements for warehouses under 250,000 sq feet in order to be consistent with the Moratorium. However, the Moratorium is not the only City Council directive. City Council policies go beyond warehouses, and the goal of those policies is to aggressively reduce emissions community-wide by 2030. In the Council meeting on Oct 23, Council expressed concern about the lack of data visualization that shows where the City is at currently in reducing emissions, versus where the City should be at to meet impending emissions reduction goals. Council also asked for a continued sense of urgency about those deadlines.

ACE suggests that the Planning Commission recommend that new buildings should NOT generate greenhouse gas emissions. The City's goal is to reduce emissions.

ACE also recommends that the Planning Commission revise the warehouse size threshold and apply it to *groups of buildings that exceed 250,000 sq. ft. in a single development application*. Otherwise warehouse developers are likely to use this loophole to avoid climate measures the City should implement.

**Questions about the data:**

ACE wonders what data City planning staff used to make their recommendations. For example, is there any evidence that planting trees elsewhere actually offsets the environmental impacts of lots of pavement, truck traffic and a very large building? A cluster of small buildings would produce even more pollutants and heat mass than one mega building, as more concrete and steel would be used in construction.

Similarly, was any environmental analysis done of the impacts of a 250,000 sq. ft. warehouse, compared to a slightly smaller one (or a cluster of smaller ones, or of locating more heavy industry in an existing IH zone compared to spreading IH out across the city. If not, what justifies this arbitrary 250,000 sq. ft. cutoff?

**Other concerns:**

- Solar cells on warehouse roofs would shade the buildings, thereby reducing heat and cooling energy costs.
- All tree plantings required of the largest warehouses should be located on site.
- Neither the site plan review process (Type II Action) nor the SEPA review process offer nearly as much public engagement process as Conditional Use Permitting would.

**Thank you for:**

- The requirement for EV conduit/wiring and double-paned clerestory windows.
- Maintaining Fruit Valley Road Neighborhood as a high priority equity area, and naming Fruit Valley Road as a freight corridor that does not need more truck traffic.
- Banning idling for non-electric truck engines.
- Not rezoning parts of the City to Heavy Industrial to accommodate the largest warehouses.
- Maintaining a 25 ft. tree buffer on the largest warehouses

**Lack of clarity:**

ACE is looking for clarification on if/how climate measures can/will be applied to new warehouses after these code changes pass with this Warehouse Moratorium.

- Will there be Interim Green Building/Policies Standards applied for warehouses smaller than 250,000 sq. ft.?
- Is there a meaningful distinction between the land use policy permits and building permits? How do these permit processes affect new warehouses?

As the City continues to implement new policies, every effort should be made to incorporate actions that reflect the urgency of achieving emissions reductions to meet the goals and deadlines established by the Climate Action Framework. Tonight the Planning Commission's question to itself should be: are your recommendations to Council consistent with the Council's policy goal of reducing emissions? The current draft Warehouse Moratorium seems to be a missed opportunity to operationalize our Climate Action Framework. Thank you for your consideration, and for your work.

Sincerely,  
Alliance for Community Engagement (ACE)

**From:** [Chris Erickson](#)  
**To:** [Planning Commission](#)  
**Subject:** Comments on Zoning Map Changes  
**Date:** Tuesday, October 24, 2023 11:41:05 AM

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I wholeheartedly support the four Comprehensive Plan and zoning map designation change requests as outlined in the Fall 2023 presentation, particularly the 192nd Ave/15th St site. Everyone knows we're in a housing crisis and upzoning a small site like this is but one step towards solving the problem. Quite frankly, I'm disappointed that this is not a mixed use development. We know that suburban sprawl has killed our cities and continuing to build residential-only development is asinine. I'm also disappointed that Vance Development decreased the upzone from R-30 to R-22. If the development must be residential only, then it should be as dense as possible. Caving to a few loud detractors is unacceptable. Their selfishness is only surpassed by their hypocrisy. They [say](#) that they are "sympathetic" to the housing crisis and "want to help the city reach its goal of getting denser housing". Just not here. Not in *their* backyard. (Sidenote: This development barely affects the surrounding homes as the traffic studies have shown a negligible increase in traffic on surrounding streets, the site is insular meaning residents will not travel through the adjacent neighborhoods to reach their complex, and the buildings themselves would be a \*whopping\* 2-3 stories poking up behind their fences. Boo-hoo.) No doubt these critics, including one Andrew Chen, will be present at the community meeting to air their grievances. I suspect they will bring up the same tired, unfounded arguments that always get brought up in these situations. Do not let a few disgruntled (and in my opinion, entitled) residents get in the way of progress. I'd love to see this site be denser and include mixed uses. But if it must be residential only, the denser the better. At the end of the day, R-22 is better than a vacant lot. I urge the Planning Commission to support the zoning changes and send their recommendations to the City Council. We can create a livable, vibrant city, and every site, no matter how small, helps us achieve these goals.

Chris Erickson  
Vancouver Resident

**From:** [Bev & Ken Tyler](#)  
**To:** [Planning Commission](#)  
**Subject:** Fircrest Neighborhood Association Statement re: SEPA  
**Date:** Monday, October 23, 2023 7:50:20 PM  
**Attachments:** [SEPA Statement - Final FNA Version.docx \(1\).pdf](#)

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**CAUTION:** This email originated from outside of the City of Vancouver. Do not click links or open attachments unless you recognize the sender and know the content is safe.

My name is Beverly Tyler. I serve as Fircrest Neighborhood Association Development Chair. In June of 2023, Fircrest Neighborhood Association wrote a membership statement regarding loosing" SEPA usage. I have attached a copy of the statement for your reference and will also be presenting the material virtually on behalf of FNA.

Beverly Tyler

1403 NE 131st Ave

Vancouver, Wa 98684

Ph: 360-256-3417

**FIRCREST NEIGHBORHOOD ASSOCIATION’S STATEMENT RE:**  
**PROPOSED SEPA THRESHOLD CHANGES**

*The Fircrest Neighborhood Association met on June 6, 2023, to discuss the proposal to adopt loosened state environmental regulations for new residential developments.*

The Fircrest Neighborhood Association understands the need for increased housing in the City of Vancouver and recognizes that these changes would increase the construction of single- and multi-family housing projects.

However, one role of government is to balance competing goals, and the goals that are supported by the SEPA process are important.

The State Environmental Policy Act known as SEPA has been around since 1971. The SEPA process helps cities analyze the environmental impacts of proposed construction projects while (1) protecting environmental impacts on floodplains, wetlands, trees, archeology and water and (2) mitigating impacts from traffic and surface run-off. These issues can affect other residents in the area.

The SEPA process acts as a safeguard, providing another “**pair of eyes**” to ensure our environmental and archeological treasures are preserved. SEPA offers an explicit “**guideline**” for environmental protection as well as providing an important process to appeal decisions. Changing the thresholds, especially the multi-family housing threshold from 20 units to 200, increases the probability that environmental and archeological issues will be overlooked, resulting in damages in the very areas that SEPA is intending to protect. It is also very concerning that there would be **no opportunity to appeal decisions in order to address SEPA-related concerns**.



The memo presented by the City Manager states that developments under 200 units rarely have issues arise through the SEPA process, but “rarely” indicates that there have in fact been instances when the SEPA process has discovered problems and led to mitigation measures.

The Fircrest Neighborhood Association (FNA) has consistently advocated for the environment and supported Vancouver’s rich culture of caring for the natural resources around us. The City of Vancouver has shown time and time again the value it places on green spaces and the environment. Loosening the state environmental regulations tilts the balance too much toward development and away from protecting the environment. It would be sad and concerning to see the City of Vancouver shift away from its own principles of environmental sustainability and the value it places on “parks, green spaces, and other natural systems” (December, 2022 Climate Action Framework).

Votes in favor - 14

+ 2 who had to leave the meeting early before all the revising/editing was done.

Votes opposed - 0

+1 who had to leave the meeting early before all revising/editing was done.

Reasons for opposition: Concerns about limited housing in the city and the resulting high cost of housing

Abstained - 0

**From:** [Kennedy, Rebecca](#)  
**To:** [Nischik, Julie](#)  
**Subject:** FW: No Re-zone @15th and 192nd.  
**Date:** Tuesday, October 24, 2023 11:17:21 AM  
**Attachments:** [image003.png](#)

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Please forward to PC. Thanks,

**Rebecca Kennedy** | Deputy Director  
Pronouns: She/Her/Hers  
CITY OF VANCOUVER, WASHINGTON  
Community Development Department (CDD)  
**M:** (360) 624-6070 | **O:** (360) 487-7896  
[rebecca.kennedy@cityofvancouver.us](mailto:rebecca.kennedy@cityofvancouver.us)  
[www.cityofvancouver.us](http://www.cityofvancouver.us)



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OUR FUTURE 2045

Learn more about [Our Vancouver](#): an effort to update our City's plan for growth and development over the next 20 years.

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**From:** DeeJ H <deej.harriman@gmail.com>  
**Sent:** Tuesday, October 24, 2023 11:06 AM  
**To:** Snodgrass, Bryan <Bryan.Snodgrass@cityofvancouver.us>; Kennedy, Rebecca <Rebecca.Kennedy@cityofvancouver.us>; Anne.McEnerny-Ogle@cityofvancouver.us; City of Vancouver Washington General Info <CityInfo@cityofvancouver.us>  
**Subject:** No Re-zone @15th and 192nd.

Some people who received this message don't often get email from [deej.harriman@gmail.com](mailto:deej.harriman@gmail.com). [Learn why this is important](#)

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Good Morning,

I just wanted to add my 2 cents about the rezone. **Not if favor**

The planned development location is already close to a number of high density residential housing alternatives, all located within a mile of each other, or are planned to be available in nearby planned developments (near the transit center and behind Banfield Corporate). It is important to note that every residential complex, both planned and existing, is located inside mixed-use zones or immediately next to commercial zones. The planned apartment complex is encircled by Urban Low Density designated zones on all four sides, which is inappropriate and inconsistent with previous

construction precedents for this kind of building.

In addition, there are a number of other possible issues that our community may be concerned about, such as the effect on schools, traffic, noise, and crime, all of which need to be taken into consideration. Our teachers just got through a strike, I see adding this and the number of students that come with it (approx. 90) as a burden to an already fragile ecosystem.

The traffic study alone calls a need for change to 15th that would be needed with the high density flow off of 15th. As of right now the only other place that does that is off of 192 and 20th and that has 2 lanes of traffic allowing for a better flow. 15th is a single lane through-way that already has backups because of the timing of lights at 15th and 192nd.

Lastly, I would be concerned for our local station and police force having to take on additional services potentially increasing the response call time for our local neighborhoods.

Thank you,  
DJ Harriman

**From:** [Don Steinke](#)  
**To:** [Planning Commission](#); [Nischik, Julie](#)  
**Cc:** [Heidi Cody WCA](#); [Cathryn Chudy](#); [Sean Denniston](#)  
**Subject:** Planning Commission agenda items, Oct 24, 2023  
**Date:** Tuesday, October 24, 2023 10:35:42 AM

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I would like to speak tonight and provide written comments now.

From Don Steinke -- Climate Action of Southwest Washington, member of ACE

To the planning Commission at the City of Vancouver, and staff  
Re Beyond the warehouse moratorium . . . to Vancouver's emissions reduction goals.

Hello Chair Ledell, Commission, and staff,

I was very impressed by staff for bringing forward the warehouse moratorium proposal about 10 months ago and yesterday, I was very impressed with the staff progress report on the Climate Action Framework at the Council workshop.

But then . . . 2 council members said, our first benchmark is to reduce emissions 80% in city operations by 2025. Could we have an interim report on progress toward that goal? And the next benchmark is to reduce emissions 80% community wide by 2030. Another expressed eagerness to do more, faster, because the clock was ticking. I heard no dissent about that point.

Therefore, I'm concerned, and ACE is concerned that by focusing only on warehouses that exceed 250,000 sq feet, we are missing an opportunity and we are guaranteeing that emissions will increase instead of decrease. This is true not only regarding the warehouses, but for zone changes for the multifamily developments on the agenda tonight.

For every proposal, the questions that should be asked are, *Will this development be consistent with the City's Climate Action Policy Goals? Will this development increase emissions and what can be done to eliminate them?*

Our state goal for reducing emissions is very ambitious, but Vancouver's goal is more ambitious. Therefore, we need to go beyond state implementation policies.

All new construction should be all-electric ready, solar ready, and EV ready and exceed state energy efficiency standards. More on that in my written comments.

For fifty years, we've been funding energy efficiency upgrades for homes. The PUD and the County worry every year if Congress will approve the Low-income heating assistance program, commonly called LiHeap, for another two years. It's a lot cheaper to maximize efficiency at the beginning.

We need solar, because the law requires Clark PUD to provide for demand, and the PUD will purchase polluting energy on the market if they need to and they need to do that the most in the summer, according to their latest power supply workshop.

25 years ago, every proposal that came before the planning commission was met with the question, does this proposal comply with the Puget Sound Stormwater Manual? Now, for every proposal ask: *Will this development be consistent with the City's Climate Policy Goals? Will this development*

*increase emissions and what can be done to eliminate them?*

And do not accept renewable energy credits as substitutes. They rarely generate new clean energy investments.

Staff is planning to conduct a greenhouse gas inventory soon. Every inventory for the rest of this decade will show an increase if we continue to allow the more obvious burning of fossil fuel to increase.

Even more so if the embodied emissions from concrete and steel are included in the inventory.

Yes, the task is daunting, but we can do better.

Not only should the buildings be solar ready, they should install solar either on site or within close proximity. The City of San Jose hired Sean Denniston cc'd of America's Vancouver as their consultant for their Climate Action Plan.

Their draft plan 3-4 year's ago added a great deal of nuance to the solar and EV charging requirements. If a building wasn't suitable, solar could be added in a defined zone near the building and the number of charging plugs varied depending on the type of development.

The PAE building in downtown Portland produces more electricity in a year than it consumes.

Don Steinke

**From:** [ssilvey643@aol.com](mailto:ssilvey643@aol.com)  
**To:** [Planning Commission](#)  
**Subject:** Planning commission meeting  
**Date:** Tuesday, October 24, 2023 7:23:54 AM

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Sirs

The following are some comment from reviewing your Fall 2023 comprehensive plan.....

It appears that in most of these projects, the impact on parking, density are affected, and the excuse of state mandate is used too much.

### **192nd Ave**

The question to ask is parking which tends to be limited in any project built currently. Example abound within the city over the recent years, yet the city continues on their quest of no parking spots or 1/2 space per unit, which then impacts the old neighborhoods as the overflow goes there. The concept drawings do not in many case ever match what is built, as has been demonstrated many time, most recently on 18th St.

They mention jobs in the area, what is area, 3 miles, 6 miles, and 20 miles? Area these jobs paying enough to support rent at least then 30% of take home, or is more like 50 to 60 % of take home, thus increasing likely hood that there are 2 to 3 workers per unit, thus requiring more transport and parking.

While a state law may require something is it feasible? Is it practical and where is the study, data, research to show this. To state that one must do something because some pie in the sky person believes it is not a reason. One must be honest in the fact that should they wish to increase housing then the Projects are next, meaning, like Chicago, ST Louis, East Berlin, and other area, 20- **30** story tenement buildings, on the bus line, or tram line. But given the fact that industrial jobs are not here due to code changes, elimination of supplies, etc.: where is it that these people work, what is it that they do?

The other question with all these buildings is the water run-off calculated and system capable of handling it? As recently explained to me there seems to be a double taxation for property owners, and issues that come up.

### **Wood Duck springs...**

Is the wetlands designation to stay, seems that in the past the city planners have turned a blind eye to fill in on some areas and then allowed building of houses, and



this resulted in agriculture to drill new wells as the building project pumped out water to a level to allowing piping to go in, lowering intake of existing well pumps.

**Miller Map change:**

When state that public services reviewed traffic, are these the same folks whom when questioned about a flaw in a traffic study told the judge it didn't matter. That allowing only one exit on a narrow street, for over 200 homes to escape in case of emergency, such as fire in the remaining wetlands and now homeless camps hiding in them.

The lack of parking and no city ordinance for tenets that they may not have a car exists, where do they park, again with cutting back on space, and not dealing with reality creates real world issues.

**Date park:**

54 housing units and only 44 parking spots, and power point map shows on street parking currently in photo, so only .75 cars per unit, and these folks work where? Earn how much?

**Other comments:**

Changing codes is all find and well, but how about following the rules currently and in past. Having recently been involved in a repair, remediation project for the community I live in I find it amazing that one must get permits yet the city did nothing to enforce code, in the past, and follow rules and regs, yet the current owners must now pay. Further that one would expect that if you received the permit which states land size, distances etc that they would be accurate since in fact they have the city stamp, yet they are not.

So if past practice is any indication of what goes on it is a sad day for this city, as they continue to use excuses to justify their existence, rules and changes, yet allow the politicians to make unfounded decisions which shall affect all quality of life, and lower the quality of neighborhoods within the city.

TA

Steven Silvey

Vancouver, WA

**From:** [Corinna Dollar](#)  
**To:** [Planning Commission](#)  
**Subject:** Public comment regarding planned rezone of 192nd Ave.  
**Date:** Sunday, October 22, 2023 11:00:06 AM  
**Attachments:** [image.png](#)  
[image.png](#)

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You don't often get email from belltowermoon@gmail.com. [Learn why this is important](#)

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Greetings,

We are residents of 18915 S.E. 12th Way and will be directly affected by the proposed rezone of the 192nd Ave. property that will be discussed at the Planning Commission Meeting on October 24th.

Our backyard faces the property in question, and would be greatly impacted by the proposed rezone for apartments, with a loss of trees, wildlife, and the addition of a 2-3 story building looking directly into our yard.

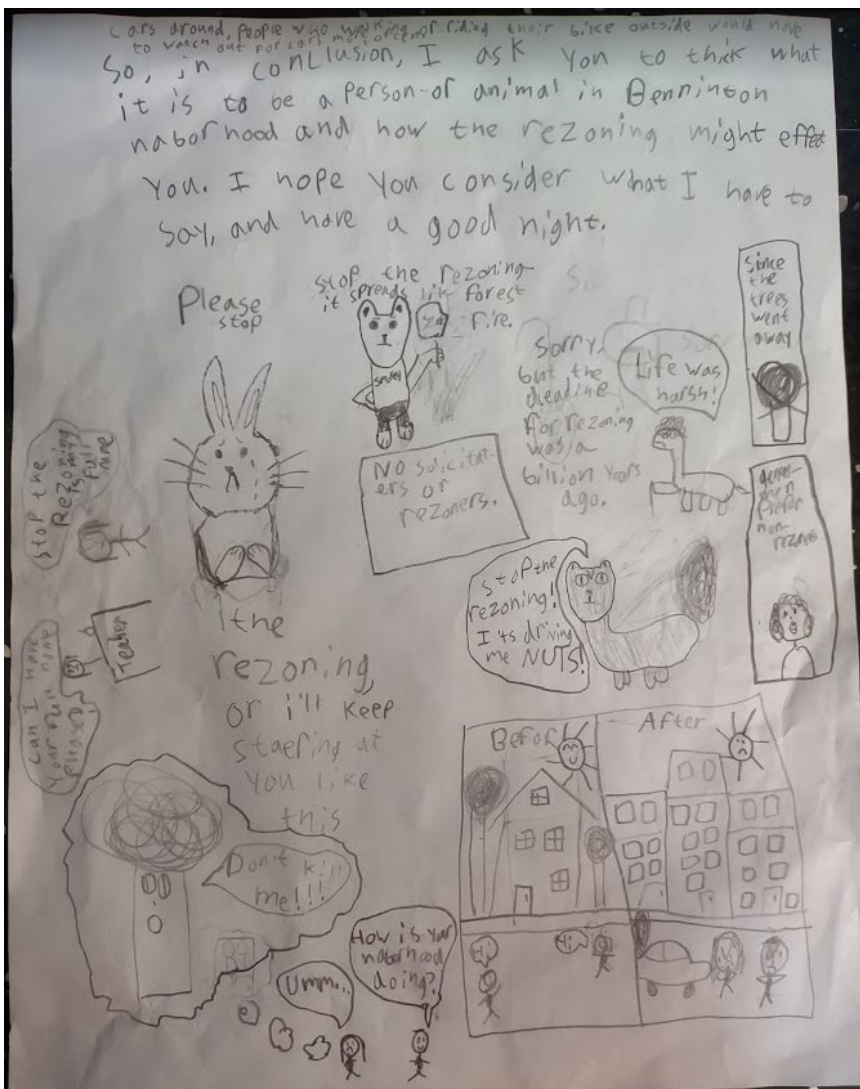
Our 11 year old daughter prepared comments she wanted to present at the upcoming meeting, but as we cannot attend on the 24th we offer them here:

Hi. My name is Mera, and I believe we should Not rezone.

One reason is for the animals sake. Birds and squirrels need trees to build their nests and rabbits need bushes to hide in. If there are future plans to remove most of these, it would take a while for those animals to find new home.

A backyard without animals wouldn't be a very happy place to be in. And if most of the trees were removed, it wouldn't be a very good view, either.

If there are 296 apartments, that means that there would be a lot of noise, people, cars, motion and maybe even a few fights! Bennington, a peaceful, quiet neighborhood, would turn into a loud, busy place. People who live there would want to move out, and no one would want to move in. The houses would become cheaper and cheaper until they would be so cheap, landlords might lose money, and the city would have to tear them down. And if there are more



Thank you for your consideration.

Corinna Dollar  
18915 SE 12th Way  
Vancouver, WA 98683  
(206) 496-8522

**Timothy Dunton**  
2114 Main St., #196  
Vancouver, WA 98660

October 17, 2023

Planning Commission Vancouver, WA,

I urge you NOT TO APPROVE the rezoning application that has been submitted for the properties at 3607, 3701, 3701 ½ E. 18<sup>th</sup> St., 98661.

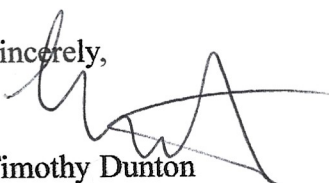
The neighborhood does not need any more low- income housing. VC 20.870.010 prohibits a disproportionate burden to fall on one area. While 54 units are proposed, we all know that 54 people may be housed, but another 54 (or more) will be hanging around the neighborhood. That's the way it works, and we've all seen it long enough to know that's the truth. The small park just adjacent to these properties is already filled with homeless people and evidence of drug use, such that the children living on 17<sup>th</sup> and 18<sup>th</sup> streets can't even use the park to play.

I have owned many units on E. 18<sup>th</sup> for many years. I have seen the area improved dramatically and do not want to see it go back to how it was, with homeless people wandering around and and higher crime rate.

Another homeless community in this high crime neighborhood is very unfair to residents in the smaller apartment buildings and single family homes who are trying to live in peace!

Our neighborhood has done its time, do not approve the rezone from R18 to R30!

Sincerely,

A handwritten signature in black ink, appearing to be 'Timothy Dunton', written over a horizontal line.

Timothy Dunton

October 24, 2023

VIA EMAIL ONLY

City of Vancouver Planning Commission  
Attn: Chair Ledell  
City Hall  
415 W. 6<sup>th</sup> Street  
Vancouver WA 98660

Email: [PlanningCommission@cityofvancouver.us](mailto:PlanningCommission@cityofvancouver.us)

Re: **192<sup>nd</sup> Avenue Comprehensive Plan and Zoning Map Changes**  
Our File No. 54595-81718

Dear Chair Ledell and Planning Commissioners:

Jordan Ramis PC represents Gary Vance, the applicant for the 192nd Avenue Comprehensive Plan and Zoning Map changes. This proposal to rezone the current site from R-6 to R-22 will facilitate the creation of much needed market-rate and affordable housing. Importantly, the proposal fully conforms to all applicable requirements contained in state and local law, including those contained in the Vancouver Municipal Code, the Vancouver Comprehensive Plan, the draft Housing Action Plan, the Vancouver Action Plan, the Revised Code of Washington, and the Washington Administrative Code. The Project Summary, as part of the applicant's submission, is included in the staff report for the October 23, 2023 Planning Commission meeting and fully details this compliance. Additionally, city staff fully concur with this analysis and fully support the project.

Project opponents have raised issues concerning compliance with Vancouver Municipal Code 20.285.050 and Washington Administrative Code 365-196-410. This memo reviews the code sections in question and details how the project fully conforms with the above.

**1. Per Vancouver Municipal Code 20.285.050, the Proposed R-22 Zoning is More Consistent with the Vancouver's Long-Range Planning than the Existing R-6 Zoning**

Project opponents contend that the proposal is not consistent with VMC 20.285.050, which establishes the approval criteria for comprehensive plan amendment and zone changes. Importantly, they do not point to any particular subsection, but rather the approval criteria as a whole. However, as reviewed below, the proposal is fully aligned with the applicable approval criteria.

The proposed R-22 zoning allows for appropriate residential density in a fully urbanized community that currently lacks a variety of housing options available for Vancouver residents at all spectrums of the economic ladder. The addition of denser housing in the neighborhood would help address recent studies that show a significant housing deficit across Clark County and within the City of Vancouver. The proposal will help introduce a housing type not broadly available in the immediate area and will



provide a combination of market rate rental units and covenanted affordable units, which serve broader economic segments of the population. Further, the request is consistent with actions outlined in the city's Housing Strategies, which the City Council reviewed in July of 2022 and specifically included recommendations for upzoning near important transit corridors in order to ensure new housing is interconnected into the transportation network.

The proposal is consistent with the Community Development, Housing, and Public Facilities elements of the Comprehensive Plan in that it facilitates dense residential development in an urban area with adequate public services, including utilities, and is adjacent to employment and personal services such as grocery, restaurant, and leisure. Development of the site is expected to include the completion of frontage improvements, including the construction of bicycle lanes and the addition of sidewalks on SE 15th Street, which will improve multi-modal connectivity throughout the neighborhood. As reflected in the revised transportation analysis that is included in the applicant submittal, the eastbound left-turn queues at SE 192nd Avenue and SE 15th Street are expected to exceed the storage length currently provided on the roadway and, as such, the applicant anticipates that an extension of this turn lane will be required at the time of site redevelopment. Additionally, the incorporation of specific site development compatibility considerations including enhanced landscaping, substantial open space, the preservation of existing mature trees, and limited building heights, will facilitate elegant integration with the existing neighborhood.

Specifically, in order to ensure the smooth integration of a future project into the existing build environment, and to minimize potential impact, the applicant is unilaterally proposing to adhere to the following design standards:

- Buildings adjacent to the west and north property lines will be setback at least 35 feet from the property line and will be limited to two stories.
- Buildings adjacent to SE 15th Street and SE 192nd Avenue will be limited to three stories.
- Any three-story building will be setback at least 120 feet from the north and west property line; and
- The site will include a 20-foot-wide landscape buffer in excess of setback requirements along the north and west property lines that will consist of existing mature trees and other natural features.

In sum, these standards will further enhance the built environment and the proposal will bring critically needed market-rate and affordable housing to the City of Vancouver. As discussed above and fully detailed in the applicant's submittal documents, the proposal fully conforms with Vancouver Municipal Code 20.285.050 and the rezone will better meet the intent of the city's Comprehensive Plan and associated documents than the existing R-6 zoning.

## **2. The Proposal is Consistent with the Requirements of Washington Administrative Code 365-196-410**

Project opponents contend that the proposal is not consistent with WAC 365-196-410, which establishes the requirements the city must follow when implementing the housing element section of

its Comprehensive Plan. Again, project opponents do not point to any particular subsection, but rather the approval criteria as a whole. Despite this, WAC 365-196-410 is applicable to jurisdictions, not individual projects. As such, it is not applicable to the proposal itself.

Subsection 410 requires cities and counties to develop a housing element that includes: 1) An inventory and analysis of existing and projected housing needs; 2) A statement of the goals, policies, and objectives for the preservation, improvement, and development of housing, including single-family residences; 3) Identification of sufficient land for housing including, but not limited to, government-assisted housing, housing for low-income families, manufactured housing, multifamily housing, group homes and foster care facilities; and 4) Adequate provisions for existing and projected housing needs of all economic segments of the community. Importantly, there is no evidence on the record that indicates the city has failed to properly implement its housing element. Additionally, if the project opponents wish to attack the underlying housing element, doing so in a collateral manner by attacking the proposal is not the appropriate forum.

Regardless of the above and read in the most generous light, project opponents argue that the proposal does not conform with the city's housing element. As discussed above and fully detailed in the applicant's submittal documents, the proposal fully conforms with the housing element. Importantly, housing production in the city and county as a whole, is not keeping pace with population growth, which is resulting in a housing supply deficit.

In a Housing Strategies Workshop presentation prepared by city staff and delivered to City Council in July of 2022, staff detailed how housing production has not kept up with growth and demand for housing. According to this analysis, the city had a housing deficit of 5,670 units. Staff estimated that the city would need to produce at least 2,500 housing units annually in order to keep pace with population projections and eliminate the housing deficit within a 10 year period.

In order to facilitate the creation of these units, staff identified a number of key strategies including the upzoning of land near high quality transportation corridors. The applicant's proposal seeks to implement this strategy by utilizing an existing regulatory process (annual comprehensive plan amendment and concurrent zone change) to upzone a site from R-6, a low-density residential zone with a net density range of 4.5 to 5.8 units per acre, to R-22, a high-density residential zone with a net density range of 18.1 - 22 units per acre. In doing so, the proposal implements the city's recommended strategy and facilitates the creation of needed market-rate and covenanted affordable housings.

If approved, the proposal would provide an opportunity to infuse the housing market with up to 223 dwelling units, a potential net increase of as many as 166 units over the existing zoning. It would also likely result in development of apartments, a housing type that is not widely available in this area. Market rate units will have a lower monthly rental rate compared to single family detached units in the area thus the proposal will help provide enhanced housing options to a wider range of income levels. Additionally, the applicant has unilaterally committed to lease 5% of the future housing units to those making no more than 80% of area median income. In doing so, the proposal would facilitate the creation of covenanted affordable units, which is a key goal of the city's housing element.

### 3. The Proposal Meets All of the Applicable Criteria Contained in the Comprehensive Plan and Strategic Plan

As reviewed in detail in the applicant's submission material, the proposal addresses and complies with all applicable criteria contained in the city's Comprehensive Plan and Strategic Plan. A review of the relevant standards is provided below.

| Chapter 1, Community Development                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CD-1 Citywide land supplies.</b> Establish land supplies and density allowances that are sufficient to accommodate adopted long-term City of Vancouver population and employment forecast allocations.                                                                                                                                                           | The proposal increases available capacity along a well established corridor, ensuring that Vancouver can accommodate needed housing.                                                                                                                                                                                                                           |
| <b>CD-2 Efficient development patterns.</b> Encourage efficient development throughout Vancouver to ensure achievement of average density of 8 units per acre set by countywide planning policies. Encourage higher density and more intense development in areas that are more extensively served by facilities, particularly transportation and transit services. | The proposal meets the minimum density requirement and places higher density along a corridor with ample access to public facilities, including transportation systems. The proposal will facilitate the development of a project that will provide enhanced offsite transportation improvements, ensuring the smooth flow of traffic around the project site. |
| <b>CD-3 Infill and redevelopment.</b> Where compatible with surrounding uses, efficiently use urban land by facilitating infill of undeveloped properties, and redevelopment of underutilized and developed properties. Allow for conversion of single to multi-family housing where designed to be compatible with surrounding uses.                               | The proposal increases housing opportunity via redevelopment along a corridor characterized by multifamily and commercial development. A future project will provide enhanced setbacks and reduced building in height in order to fully integrate into the surrounding community.                                                                              |
| <b>CD-6 Neighborhood livability.</b> Maintain and facilitate development of stable, multi-use neighborhoods that contain a compatible mix of housing, jobs, stores, and open and public spaces in a well planned, safe pedestrian environment.                                                                                                                      | The proposal will introduce a much needed housing typology into the existing neighborhood, while ensuring that compatibility is maximized. The size of the project site is such that it can be effectively planned to minimize impacts while enhancing circulation and the pedestrian environment.                                                             |

|                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CD-9 Compatible uses.</b> Facilitate development that minimizes adverse impacts to adjacent areas, particularly neighborhoods.                                                                                                              | The proposal will facilitate the development of low-scale multifamily housing that fully compatible with the surrounding single-family and commercial uses. The future project will provide enhanced setbacks to ensure appropriate spacing between these uses and the new housing.                                                                                                                                                                                                                                                    |
| <b>CD-10 Complementary uses.</b> Locate complementary land uses near one another to maximize opportunities for people                                                                                                                          | The proposal will appropriately site residential uses next to existing residential uses with higher density located along a key corridor to facilitate a smooth transportation network.                                                                                                                                                                                                                                                                                                                                                |
| <b>Chapter 3, Housing</b>                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>H-1 Housing options.</b> Provide for a range of housing types and densities for all economic segments of the population. Encourage equal and fair access to housing for renters and homeowners.                                             | The proposal will enhance housing options by facilitating the creation of new market-rate and covenanted affordable rental units.                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>H-4 Innovative zoning.</b> Encourage innovative housing policies that provide for affordable housing and maintain neighborhood character.                                                                                                   | The proposal will facilitate much needed housing (both market-rate and covenanted affordable) in order to address the city's housing deficit and support Vancouver residents.                                                                                                                                                                                                                                                                                                                                                          |
| <b>H-5 Housing placement near services and centers.</b> Facilitate siting of higher density housing near public transportation facilities and in designated centers and corridors.                                                             | The proposal will appropriately upzone along an established transportation corridor, which will ensure that people and goods can easily traverse to and from the project site.                                                                                                                                                                                                                                                                                                                                                         |
| <b>Chapter 5, Public Facilities and Services</b>                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>PFS-1 Service availability.</b> Consider water, sewer, police, transportation, fire, schools, storm water management, and parks as necessary facilities and services. Ensure that facilities are sufficient to support planned development. | The proposal documents includes a transportation study that demonstrates there is sufficient transportation infrastructure to accommodate a future project. The future project will include an onsite stormwater management system to fully address stormwater. As part of the development, the applicant will receive all necessary approval and pay all necessary fees to ensure that the project fully mitigates any impacts related to sewer, police, fire, schools, and parks. No construction will occur absent these approvals. |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>PFS-2 Service standards.</b> Establish service standards or planning assumptions for estimating needed public facilities, based on service capabilities, local land use designations and nationally recognized standards. Use LOS standards to encourage growth in designated centers and corridors.</p>                                                                                                                                                                                                                       | <p>The proposal is sited along an existing corridor, ensuring that people and goods can smoothly traverse to and from the project site.</p>                                                                                                                           |
| <p><b>PFS-4 Transportation system.</b> Develop and maintain an interconnected and overlapping transportation system grid of pedestrian walkways, bicycle facilities, roadways for automobiles and freight, transit and high-capacity transit service. Include support programs such as traffic operations, transportation demand management, neighborhood traffic management, and the regional trails program. Work towards completing and sustaining individual components and programs to ensure success of the entire system.</p> | <p>The proposal will facilitate a future project that will likely include offsite transportation improvements that will help complete the city's transportation network.</p>                                                                                          |
| <p><b>Strategic Plan</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                       |
| <p><b>Goal 1, Objective 1.1.</b> Develop and maintain a safe, balanced and innovative transportation system that will meet the needs of future generations.</p>                                                                                                                                                                                                                                                                                                                                                                      | <p>The city's existing, multi-modal transportation system can support the requested proposal. Future site development will yield additional roadway improvements along SE 15th Street.</p>                                                                            |
| <p><b>Goal 6, Objective 6.1.</b> Support a strong, active neighborhood program that enhances livability and community connections</p>                                                                                                                                                                                                                                                                                                                                                                                                | <p>The proposal will increase housing supply, create diversity in housing options and will provide covenanted affordable housing units in an urban area equipped with services including transportation, utilities, employment, retail, education and recreation.</p> |

#### 4. Conclusion

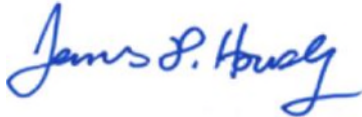
The proposal will provide a new housing typology in the immediate neighborhood including covenanted affordable housing units. These units will help address Vancouver's housing deficit, and ensure that low-income residents are able to find a place to call home. The proposal will integrate seamlessly into the existing community through the use of enhanced setbacks and open space that includes mature trees, as well as limited building heights near existing single-family homes. The proposal will enhance the transportation network through offsite improvements, helping ease traffic flow.

Chair Ledell and Planning Commissioners  
October 24, 2023  
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As discussed above, the proposal is consistent with all applicable local and state criteria. City staff fully agree with this analysis. In response to the proposal, project opponents have not placed any evidence on the record to show that the applicable standards are not met. For these foregoing reasons, we respectfully request that the Planning Commission recommend approval of the proposal.

Very truly yours,

JORDAN RAMIS PC



Jamie D. Howsley  
Admitted in Oregon and Washington

cc: Bryan Snodgrass via email [Bryan.Snodgrass@cityofvancouver.us](mailto:Bryan.Snodgrass@cityofvancouver.us)



**From:** [Kennedy, Rebecca](#)  
**To:** [Deej H](#); [Snodgrass, Bryan](#); [City of Vancouver Washington General Info](#); [Pyle, Zachary](#); [City of Vancouver - Office of the City Manager](#); [sarah.fox@cityofvancouver.us](mailto:sarah.fox@cityofvancouver.us)  
**Cc:** [Nischik, Julie](#)  
**Subject:** RE: No Re-zone @15th and 192nd.  
**Date:** Tuesday, October 24, 2023 9:37:09 PM  
**Attachments:** [image003.png](#)  
[image004.png](#)

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Thank you DJ, confirming this will be included in the public record for this project, and will be shared with Planning Commission and City Council. Thank you,

**Rebecca Kennedy** | Deputy Director  
Pronouns: She/Her/Hers  
CITY OF VANCOUVER, WASHINGTON  
Community Development Department (CDD)  
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**From:** Deej H <[deej.harriman@gmail.com](mailto:deej.harriman@gmail.com)>  
**Sent:** Tuesday, October 24, 2023 9:34 PM  
**To:** [Snodgrass, Bryan](mailto:Snodgrass, Bryan) <[Bryan.Snodgrass@cityofvancouver.us](mailto:Bryan.Snodgrass@cityofvancouver.us)>; [Kennedy, Rebecca](mailto:Kennedy, Rebecca) <[Rebecca.Kennedy@cityofvancouver.us](mailto:Rebecca.Kennedy@cityofvancouver.us)>; [City of Vancouver Washington General Info](#) <[CityInfo@cityofvancouver.us](mailto:CityInfo@cityofvancouver.us)>; [Pyle, Zachary](#) <[Zachary.Pyle@cityofvancouver.us](mailto:Zachary.Pyle@cityofvancouver.us)>; [City of Vancouver - Office of the City Manager](#) <[CMO@cityofvancouver.us](mailto:CMO@cityofvancouver.us)>; [sarah.fox@cityofvancouver.us](mailto:sarah.fox@cityofvancouver.us)  
**Subject:** Re: No Re-zone @15th and 192nd.

Some people who received this message don't often get email from [deej.harriman@gmail.com](mailto:deej.harriman@gmail.com). [Learn why this is important](#)

**CAUTION:** This email originated from outside of the City of Vancouver. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Thank you for your time, I would like these to be part of the public record and for the proposed developer to follow up.

Follow-up to the 15th Street discussion this evening. I believe a refuse lane should be considered by the developer for the traffic turning out of the Complex before the 192nd stoplight before the left turn holding lane. This will allow residents to exit the complex without having to worry about cross

traffic and additional accidents (pedestrian, bicycle or otherwise). Additionally, I would like to know what emergency access into the surrounding neighborhoods would look like, are they just gated as I know proposed complex members will park in the adjacent neighborhoods and walk through the emergency access into the proposed complex (current problem in the suburbs of both Tigard and Portland).

This photo is a sample of the small refuse lane off of SE 20th that provides exiting cars a place to hold until traffic clears. Additionally, it allows for a left hand turn into the complex that alleviates through traffic which is not evident in the proposed traffic study along 15th but should be (i.e. turning left into the proposed complex from 15th).



Lastly, the Municipal Code for zoning district considerations, specifically, 20.420.025 better fits under R-18 rather than R-22 as outlined below.

Higher-Density Residential Zone Function and Location Criteria.

A. R-18 (Higher-Density Residential) Zone Location Criteria. The R-18 designation is most appropriate in areas with the following characteristics and relationships to the surrounding area:

1. Areas occupied by a substantial amount of multifamily development, **but where factors such as narrow streets, on-street parking congestion, local traffic congestion, lack of alleys and irregular street patterns restrict local access and circulation and make a lower intensity of development desirable.** (*narrow streets along 15th currently*)
2. **Areas where properties are well-suited to multifamily development, but where adjacent single-family developments or public open space make a transitional scale of development (height and bulk) desirable.** There should be a well-defined edge such as an arterial, open space, change in block pattern, topographic change or other significant feature that provides physical separation from the single-family area. **(This is not a necessary condition where existing moderate-scale multifamily structures have already established the scale relationship with abutting single-family areas).** (*there are not any of these moderate-scale multifamily structures in the surrounding area to establish the scale*)
3. Properties must have access from collector or arterial streets, such that vehicular travel to and

from the site is not required to use local access streets through lower-density residential zones. ***(this was called out in tonight's public comments with the traffic cutting through WestRidge via 195th from 15th Street).***

Under the current considerations for R-22, this proposed complex doesn't meet any of the considerations under the same municipal code 20.420.025.

Please take these back to Gary Vance of the applicant group Vance Development to address these concerns.

Thank you,  
DJ Harriman, PMP

On Tue, Oct 24, 2023 at 11:05 AM DeeJ H <[deej.harriman@gmail.com](mailto:deej.harriman@gmail.com)> wrote:

Good Morning,

I just wanted to add my 2 cents about the rezone. **Not if favor**

The planned development location is already close to a number of high density residential housing alternatives, all located within a mile of each other, or are planned to be available in nearby planned developments (near the transit center and behind Banfield Corporate). It is important to note that every residential complex, both planned and existing, is located inside mixed-use zones or immediately next to commercial zones. The planned apartment complex is encircled by Urban Low Density designated zones on all four sides, which is inappropriate and inconsistent with previous construction precedents for this kind of building.

In addition, there are a number of other possible issues that our community may be concerned about, such as the effect on schools, traffic, noise, and crime, all of which need to be taken into consideration. Our teachers just got through a strike, I see adding this and the number of students that come with it (approx. 90) as a burden to an already fragile ecosystem.

The traffic study alone calls a need for change to 15th that would be needed with the high density flow off of 15th. As of right now the only other place that does that is off of 192 and 20th and that has 2 lanes of traffic allowing for a better flow. 15th is a single lane through-way that already has backups because of the timing of lights at 15th and 192nd.

Lastly, I would be concerned for our local station and police force having to take on additional services potentially increasing the response call time for our local neighborhoods.

Thank you,  
DJ Harriman