
APPENDICES

METHODS AND ASSUMPTIONS MEMO

April 18, 2017

FINAL METHODS AND ASSUMPTIONS MEMO

US 2 / SR 204 Interchange Justification Report



Washington State
Department of Transportation
15700 Dayton Avenue N
Shoreline WA 98133-9710

WSDOT Job No: Y-11600 AB

Submitted by:

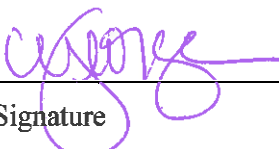
PARSONS

In association with:
Fehr and Peers
PRR

STAKEHOLDER ACCEPTANCE

The undersigned parties, including all members of the support team from WSDOT and the Local Agencies, concur with the methods and assumptions for US 2 / SR 204 Interchange Justification Report as presented in this document.

WSDOT NW Region



Signature

Engineering Manager

Title

5/3/17

Date

Snohomish County Traffic Representative



Signature

TRAFFIC ENGINEER

Title

5/3/17

Date

WSDOT HQ Assistant State Design Engineer



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For Greg Lippincott ASDE

Title

5/3/17

Date

City of Lake Stevens Traffic Representative



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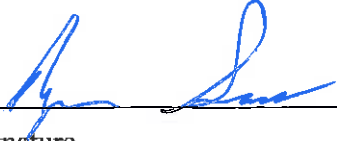
Mayor

Title

5/3/2017

Date

City of Everett Traffic Representative



Signature

City Engineer

Title

03 May 2017

Date

Community Transit Representative



Signature

Service Development Manager

Title

5-3-17

Date

(1) Participation on the Stakeholders Committee and/or signing of this document does not constitute approval of the US 2 / SR 204 Interchange Justification Report.

(2) All members of the Stakeholder Committee will accept this document as a guide and reference as the study progresses through the various stages of project development. If there are any agreed upon changes to the methods or assumptions in this document a revision will be created, endorsed and signed by all the stakeholde

At the time this Methods and Assumptions document was signed, the latest and controlling version of the WSDOT Design Manual Chapter 550 was dated July 2016.

Date: April 18, 2017
To: Michael Horntvedt (Parsons)
From : Will Lisska (Fehr & Peers)
Subject: Methods and Assumptions Document

POLICY POINT #1 – NEED FOR THE ACCESS POINT REVISION

INTRODUCTION

In the 2016 Legislative session, the Legislature provided funding, as part of ESHB 2524.SL, to develop an Interchange Justification Report (IJR) for the U.S. 2 trestle, covering the SR 204 and 20th Street interchange at the eastern end of the westbound structure.

Prior to that, WSDOT in partnership with Snohomish County, the Cities of Everett, Marysville, Lake Stevens, Snohomish, Monroe and Community Transit developed a corridor planning study for US 2, between Everett Port/Naval Station and SR 9. The plan identified that the future replacement of the westbound trestle is driven by the useful life of the existing structure and that continued maintenance of the trestle will extend the useful life of the westbound trestle to approximately 2045.

However, given the community interest in addressing significant lead time to replace the trestle and the current safety and congestion related operational issues during peak hours at the US 2/SR 204/20th Street interchange, the IJR will build on the previous corridor study by looking at alternate improvement concepts that can be phased and incorporated into the longer term replacement plan while providing near term operational and safety benefits.

The approach outlined in this document is consistent with WSDOT traffic analysis guidelines and uses the standard tools and data sources. This document requires concurrence by the review agencies, since the outlined methodology will guide the traffic analysis throughout the life of the project.

PROJECT DESCRIPTION

Describe the purpose of the project, the needs being addressed, and define the current problem or deficiency that the project is looking to address or overcome.

The purpose and need for improvements at the US 2 / SR 204 interchange will be determined by analyzing traffic operations, as described in **Policy Point #3**, and gathering input from project stakeholders. To demonstrate the need for improvements, we will document existing and potential future deficiencies related to travel demand, traffic operations, and safety within the interchange. The purpose and need statement will focus on issues that can be adequately addressed by near-term operational and safety improvements and later incorporated into the longer-term trestle replacement plan. The statement will be refined in coordination with project team stakeholders as a key criteria in the development and screening of alternatives.

How do you plan to demonstrate that the local transportation system and the existing interchanges cannot be improved to satisfactorily accommodate the horizon year travel demands?

Analysis will be completed for all intersections/segments in the study area for existing, opening or design year, and horizon year conditions.

The Project Team has also been tasked to evaluate an improvement scenario that may be prudent to pursue in the near term. This short-term improvement will involve a transit and high-occupancy vehicle (HOV) bypass of the US 2 trestle along the existing 20th Street SE right-of-way between 51st Avenue SE and SR 204. This additional work could represent a “Local Improvements Only” scenario (i.e. an alternative with improvements only to local streets rather than access improvements to limited-access state facilities). This Local Improvements Only alternative would be analyzed for both the design year and horizon year.

Describe the local and regional traffic that would be affected either positively or negatively by the proposal.

The US 2 corridor is the primary east-west connector between Everett and eastern Snohomish County and provides the most direct point of transfer between I-5 and SR 9, the two principal north-south regional travel corridors in the County. Capacity improvements to the existing US2/SR 204 interchange could help alleviate peak hour congestion currently experienced by westbound drivers attempting to access the US 2 trestle from SR 204 and 20th Street SE. Additionally capacity improvements could help accommodate local traffic growth from Lake Stevens and central Everett, regional pass-through traffic growth, and freight access to the Port of Everett. Since any action that improves westbound traffic congestion at the east end of the Trestle means more efficient loading of downstream segments—i.e. the main Trestle segment itself and the junction with I-5 at the west end of the Trestle, traffic analyses under this project will include an assessment of the impacts of any Build alternative to downstream highway segments and junctions.

POLICY POINT #2 REASONABLE ALTERNATIVES

Describe the process that will develop alternatives, determine if they are viable, and assess the viable alternatives in order to determine the preferred alternative. If viable alternatives have already been assessed, describe the reasonable alternatives that have been evaluated.

The project team will develop a range of multimodal alternatives building from the US 2 Everett Port/Naval Station to SR 9 Corridor Planning Study traffic analysis. Initially, the project team will work in coordination with WSDOT to conduct a workshop session to identify the full range of options both eastbound and westbound at the US 2 / SR 204 interchange. These options will then be reviewed through a two-step screening process:

1. **First Level Screening** – Consultant will conduct a fatal-flaw screening process to remove options that do not meet the purpose and need or have obvious physical or operational fatal flaws. It is anticipated that this level of screening will use some quantitative and some qualitative measures for evaluation, including existing year traffic operations data for the AM peak hour and 2040 No

Build travel demand model outputs. The screening will result in no more than three (3) 2040 Build alternatives for detailed analysis. Results of the first level evaluation will be shared with the IJR Support Team for their input and concurrence.

2. **Second Level Screening** – The second level of evaluation will be a more quantitative analysis that will include all identified environmental disciplines, traffic operations analysis, and measures of effectiveness outlined in **Policy Point #3**, and a cost opinion for up to three Build alternatives. The Consultant will develop screening criteria and a screening/decision matrix to document the quantitative and qualitative comparison of alternatives being screened.

Following the completion of the Second Level Screening, the project team will prepare an Alternatives Screening Technical Memorandum for review by the IJR Support Team to document the process and results of screening. The alternatives shall fall into two categories: “Alternatives Considered and Not Carried Forward” and “Preferred Alternative”. The IJR Support Team will make a recommendation for a proposed action to be further analyzed in the IJR. The project team will document final recommendations from the IJR Support Team and finalize the alternative analysis.

Upon selection of the Preferred Alternative, the project team will develop a potential phasing scenario that could allow for effective portions of the project to be implemented early as funding is identified. Up to three (3) phasing scenarios will be developed. Phasing options will be developed using a qualitative evaluation process to determine early effectiveness at meeting the project need.

POLICY POINT #3 OPERATIONAL AND COLLISION ANALYSIS

An operational and safety analysis will be conducted and presented to document how the proposed improvements will affect traffic operations and safety. The analysis will observe the analysis years and time periods; study area and project limits; and methodologies described in the following sections.

ANALYSIS YEARS AND ANALYSIS PERIODS

The analysis years for this project include an existing year (2016), opening/design year (2020), and horizon year (2040). For each of these years, traffic operations during the AM and PM peak periods will be analyzed.

The screening of alternatives will use horizon year AM peak period volumes. PM peak volumes will be used to document existing and future year conditions with the preferred alternative.

The early implementation stage for the Preferred Alternative will be identified using design year AM peak period volumes. PM peak period volumes will be used to document future year conditions with the Preferred Alternative.

STUDY AREA AND PROJECT LIMITS

The IJR study area for traffic operations analysis is expected to include the I-5 corridor from Pacific Street interchange to the Marine View Drive Interchange, US 2 from the I-5 Interchange to south of the Bickford

Avenue interchange, 20th Street SE from 51st Avenue SE to Cavelero Road, and SR 204 from the US 2 / 20th Street SE interchange to 81st Avenue SE. The study area is further summarized by freeway mainline, freeway on/off ramp, and arterial intersection location in the list below.

- Freeway Mainline
 - US 2 Eastbound
 - I-5 on-ramps to 51st Street SE (Ebey Island) off-ramp
 - 51st Street SE to SR 204/20th Street SE off-ramp
 - SR 204/20th Street SE off-ramp to SR 204 on-ramp
 - SR 204 on-ramp to Bickford Avenue off-ramp
 - Bickford Avenue off-ramp to Bickford Avenue on-ramp
 - Bickford Avenue on-ramp to SR 9
 - US 2 Westbound
 - SR 9 to Bickford Avenue on-ramp
 - Bickford Avenue on-ramp to SR 204 off-ramp
 - SR 204 off-ramp to SR 204/20th Street SE on-ramp
 - 20th Street SE on-ramp to 20th Street SE (Ebey Island) off-ramp
 - 20th Street SE (Ebey Island) off-ramp to 51st Street SE (Ebey Island) on-ramp
 - 51st Street SE (Ebey Island) on-ramp to I-5/California Street/Walnut Street off-ramps
 - I-5 Northbound
 - 41st Street on-ramp to Pacific Avenue off-ramp
 - Pacific Avenue off-ramp to US 2 Eastbound off-ramp
 - US 2 Eastbound off-ramp to US 2 Westbound/Everett Avenue on-ramp
 - US 2 Westbound/Everett Avenue on-ramp to E Marine View Drive off-ramp
 - I-5 Southbound
 - E Marine View Drive on-ramp to US 2 Eastbound/Everett Avenue off-ramp
 - US 2 Eastbound/Everett Avenue off-ramp to US 2 Westbound On-ramp
 - US 2 Westbound On-ramp to Pacific Avenue on-ramp
 - Pacific Avenue on-ramp to 41st Street off-ramp
- Freeway Ramps

- US 2 Eastbound
 - I-5 Northbound on-ramp
 - I-5 Southbound on-ramp
 - Hewitt Avenue on-ramp
 - 51st Street SE (Ebey Island) off-ramp
 - SR 204 Northbound off-ramp
 - 20th Street SE off-ramp
 - SR 204 Southbound on-ramp
 - Bickford Avenue off-ramp
 - Bickford Avenue on-ramp
- US 2 Westbound
 - Bickford Avenue on-ramp
 - SR 204 Northbound off-ramp
 - SR 204 Southbound on-ramp
 - 20th Street SE on-ramp
 - 20th Street SE (Ebey Island) off-ramp
 - 51st Street SE (Ebey Island) on-ramp
 - I-5 Northbound off-ramp
 - I-5 Southbound off-ramp
 - Walnut Street off-ramp
 - California Street off-ramp
- I-5 Northbound
 - Pacific Avenue off-ramp
 - US 2 Eastbound off-ramp
 - US 2 Westbound/Everett Avenue on-ramp
 - Marine View Drive off-ramp
- I-5 Southbound
 - Marine View Drive on-ramp
 - US 2 Eastbound/Everett Avenue off-ramp

- US 2 Westbound on-ramp
- Pacific Avenue on-ramp
- Other roadway segments
 - SR 204 north of 9th Street SE
 - Sunnyside Boulevard north of SR 204
 - 20th Street SE east of Cavaleros Road
- Intersections
 - SR 204 / 9th Street SE / 10th Street SE
 - SR 204 / Sunnyside Boulevard SE
 - SR 204 / 20th Street SE
 - 20th Street SE / Cavalero Road
 - 20th Street SE / 51st Avenue SE (Ebey Island)

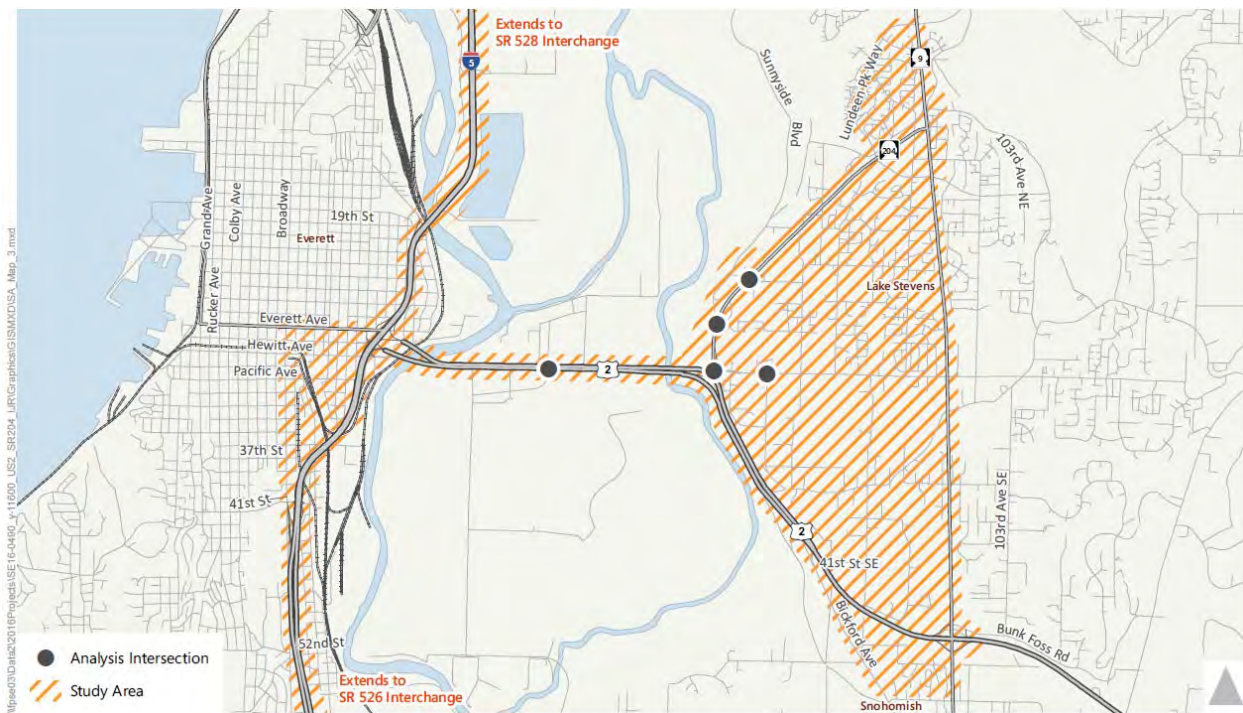


Figure 1: Study Intersections and Data Collection Locations

Additional segments, ramps, and/or intersections will similarly be analyzed if they are new intersections associated with any Build Alternative. The dynamic traffic assignment (DTA) analysis limits will include the area depicted in **Figure 1**. The DTA analysis (described in a following section) will be used to estimate

traffic flow and congestion along the I-5 corridor and to capture diversion on local streets to the east of the US 2/ SR 204 interchange over the course of the three-hour AM and PM peak periods.

The project limits for potential physical improvement is expected to include the entirety of the US 2/SR 204/20th Street SE interchange, the intersection of SR 204 / 20th Street SE, and the 20th Street SE corridor between 51st Avenue SE and SR 204.

DATA COLLECTION

The following sections describe the collection and processing methods for the 2016 baseline data.

Traffic Volume Data

Traffic data will be compiled for the locations specified in the Study Area and Project Limits section. Seven (7) day, 24-hour tube counts with vehicle classification will be gathered for all freeway mainline and ramp locations. Two-hour intersection turning movement counts will be collected for the AM and PM peak periods. To the extent possible, the project team will leverage existing WSDOT and jurisdictional data sources, including permanent traffic recorder (PTR) locations on US 2 east of the I-5 interchange and on I-5 between 41st Avenue and Pacific Avenue. The project team will collect data in November and December 2016 for all locations without recently collected counts (i.e. within the past two years). Vehicle occupancy data will be collected for traffic traveling westbound on SR 204, 20th Street SE, and US 2 approaching the study interchange.

To address potential volume differences between intersections and ramps resulting from the varied dates of data collection, the project team will use seasonal factoring methods described in the WSDOT Short Count Factoring Guide (April 2016). PTR data from US 2 and I-5 (described above) will be used to analyze seasonal variation and year-to-year growth in traffic volumes for the AM and PM peak hours. Counts will be adjusted reflect high-season travel demand.

Counts will be balanced along the US 2, SR 204, and I-5 mainlines. Some counts along 20th Street SE will be left unbalanced to represent driveway ingress and egress between study intersections. Field observations will be used to assess the validity of driveway ingress/egress with respect to count imbalance.

Counts taken prior to 2016 will be factored to account for background traffic growth. Growth factoring will be based primarily on balancing the seasonally-adjusted 2016 count data to locations with older counts. However, the resulting growth rated that result from the balancing of 2016 count data will be compared to historic traffic growth rates from any WSDOT PTR data.

Travel Time Data and Queuing

Travel time data will be collected by floating car survey for key corridors in the study area, summarized in **Table 1**. On-board GPS will be used to record floating car location and time, and speed and travel time will be interpolated from these data points. Data collection personnel will aim to record 10 travel time runs for each corridor path during two weekday collection sessions. If crash events, inclement weather, or

extenuating circumstances create traffic flow and travel time conditions judged to be unrepresentative of typical weekday conditions, data collection will be halted and resumed at the next available date.

During collection sessions, personnel will collect corridor queuing data for intersections and ramps by visual inspection (estimating number of vehicles queued).

Table 1: Travel Time Data Collection Corridors

Time	Path	Number of Runs
AM Peak Period 7 – 8 AM	Start: SR 204 Westbound at 81st Avenue NE (or end of queue) End: US 2 Westbound off-ramp to I-5 Southbound	10
	Start: I-5 Northbound on-ramp to US 2 Eastbound End: SR 204 Eastbound at 81st Avenue NE	10
	Start: 20 th Street Westbound at 79th Avenue SE End: US 2 Westbound off-ramp to I-5 Southbound	10
	Start: I-5 Northbound on-ramp to US 2 Eastbound End: 20 th Street Eastbound at 79th Avenue SE	10
	Start: US 2 Westbound at SR 9 on-ramp End: US 2 Westbound off-ramp to I-5 Southbound	10
	Start: I-5 Northbound on-ramp to US 2 Eastbound End: US Eastbound off-ramp to SR 9	10
PM Peak Period 4 – 5 PM	Start: SR 204 Westbound at 81st Avenue NE End: US 2 Westbound off-ramp to I-5 Southbound	10
	Start: I-5 Northbound on-ramp to US 2 Eastbound End: SR 204 Eastbound at 81st Avenue NE	10
	Start: 20 th Street Westbound at 79th Avenue SE End: US 2 Westbound off-ramp to I-5 Southbound	10
	Start: I-5 Northbound on-ramp to US 2 Eastbound End: 20 th Street Eastbound at 79th Avenue SE	10
	Start: US 2 Westbound at SR 9 on-ramp End: US 2 Westbound off-ramp to I-5 Southbound	10
	Start: I-5 Northbound on-ramp to US 2 Eastbound End: US Eastbound off-ramp to SR 9	10
Total		120

* Along both eastbound and westbound US 2, the floating car will travel in outermost lane (lane 1 of 2)

Truck Data

Vehicle classification will be recorded at all ramp and segment count locations. These vehicle classification counts will provide peak hour truck volumes on U2, SR 204, and I-5 and indicate how truck volumes vary by time of day. The heavy vehicle roadway segment counts collected here will be cross-referenced to the vehicle turning volume counts (which include a heavy vehicle percentage measurement) to confirm consistency.

Transit Data

Information related to existing service coverage, frequency, and on-time reliability for buses that serve the study area will be identified through published schedules provided by Community Transit. Additionally, the project team will request that Community Transit provide the most recent available data on the following:

- AM peak hour transit boardings and alightings by route at bus stops in the study area
- On-time performance at major route timepoints within or near the study area.

Current bus routes that serve the study area include Routes 270, 271, 277, 280, and 425. Of these routes, only the 280 and 425 make service stops within the study area (along 20th Street SE at 79th Avenue SE and 83rd Avenue SE). Proposed changes in bus routings currently being considered by Community Transit will also be documented, as appropriate.

TRAFFIC OPERATIONS ANALYSIS

Although intersection and freeway LOS can be determined using *Highway Capacity Manual* (HCM) methods, traffic simulation analysis using VISSIM overcomes the following HCM limitations:

- volume constraints due to upstream bottlenecks
- congestion caused by downstream bottlenecks
- ramp meter operations
- turn bay overflow (queues that exceed the pocket length)
- right turn on red volume and delay
- non-standard roadway geometry

VISSIM version 8.0 will be used to model the entire study area as defined in the Study Area and Project Limits section. A VISSIM network including the IJR study area was previously developed for the US 2 Trestle analysis. This network will be upgraded to the current VISSIM version (8.0) and modified to include recently completed roadway improvements (for example, the turning movement restrictions at SR 204 / Sunnyside Boulevard SE intersection).

In addition, the VISSIM analysis network currently in-use for the SR 9 / SR 204 Intersection Improvement Project will be integrated into the US 2 / SR 204 IJR network. The network will be joined along the SR 204 corridor and used to assess the extent and impact of vehicle queuing on SR 204 southbound during the AM peak hour as well as northbound queuing during the PM peak hour. Measure of effectiveness calculation procedures are described in the Selection of Measures of Effectiveness subsection.

VISSIM Model Development and Validation

VISSIM simulation models will be developed for the AM and PM peak hour and will include the study area locations listed in Study Area and Project Limits section. Model network coding, parameters, and data input will be developed according to the WSDOT VISSIM Protocol (September 2014), which provides in-depth instructions for freeway and urban street simulation networks.

There are two separate criteria that must be met in order to justify the validity of a particular model and its usefulness in evaluating the transportation system.

- **Confidence** – Ensuring that the reported model results are representative of the model
- **Calibration** – Matching the model results to real world conditions

Confidence

Given the varying results that inherently exist between micro-simulation runs (due to the random seed number), every model is required to evaluate its reported results in a way that confides that they are representative of the model and not skewed towards a statistical outlier. Per the WSDOT VISSIM Protocol, the VISSIM model runs will use a simulation resolution of 10 time steps per second. The analysis results will be based on an average of at least 11 model runs, each using a different random seed value. These seed values will be reported so that the results can be verified. For the existing conditions model, the statistical significance of 11 simulation runs will be confirmed for model throughput volume outputs using a 95 percent confidence level at the US 2 / SR 204 interchange.

Calibration

Calibration is the process used to achieve adequate reliability or validity of the model by establishing suitable parameter values so that the model replicates local traffic conditions as closely as possible. The existing conditions VISSIM model will be calibrated to traffic counts and speeds/travel times. As a proxy for replication of throughput volumes, the GEH statistics shall be calculated for all entry/exit locations, freeway ramps, and roadway segments in the calibration area of the model. Peak hour volume outputs will be broken down into four 15-minute intervals. **Tables 2 and 3** provide the recommended calibration criteria for the GEH statistic.

Table 2: GEH Statistic Guidelines

GEH Statistic	Calibration Guideline
< 3.0	Acceptable fit
3.0 to 5.0	Acceptable for local roadway facilities
> 5.0	Unacceptable

Table 3: Throughput Traffic Volume (veh/h/ln) Calibration Criteria

Criteria	Acceptable Target
GEH < 3.0	All entry and exit locations within the calibration area
GEH < 3.0	All entry and exit ramps within the calibration area
GEH < 5.0	At least 85% of applicable local roadway segments
Sum of all segment flows within the calibration area	Within 5% of traffic counts

The key corridors measured by floating car survey (described in the **Data Collection** section) will be calibrated to the observed travel times. The travel time calibration criteria are separated into two types of facilities: uninterrupted flow (i.e. freeways and ramps) and interrupted flow (i.e. signalized arterials). As described in **Table 4**, the amount of allowable travel time variation will be calculated for each time interval as speeds (travel times) fluctuate through the analysis period. For interrupted flow facilities, the allowable travel time variation is established using the free flow speed (FFS) of the corridor. If the FFS is unknown, the posted speed limit will be used.

The visual inspection of freeway queuing will described in the Data Collection section will be compared with the VISSIM model (over multiple runs) to validate that the model is reasonably replicating field queuing conditions.

Table 4: Travel Time Calibration Criteria Equations

Criteria	Acceptable Target
Free-flowing	$\Delta = \frac{1}{\frac{1}{t} - \frac{4.4}{L}} - t$
Interrupted Flow	$\Delta = \frac{1}{\frac{1}{t} - \frac{0.1 * 5280 * S}{3600 * L}} - t$

Δ = Allowable travel time variation (+/- seconds)

t = Observed travel time (Seconds) – from floating car survey

L = Length (Feet)

S = Free flow speed (mph); Posted speed may be used for FFS if unknown

Calibration according to the criteria described above will require the adjustment of several VISSIM input parameters to reflect study-area driving conditions. These adjustments are described below:

- The VISSIM default vehicle composition contains only standard sedans. However, a significant portion of vehicles in the study area are SUVs (including light trucks). As a result, the auto traffic composition will be revised according to the summary in **Table 5**. The truck traffic composition, including 2 axle (single unit) and 3 or more axle (multi unit) trucks, will be revised using observed classification data for the SR 204, 20th Street SE, and US 2 corridors, summarized in **Table 6**.
- The default lane change distances in VISSIM are appropriate for most arterial roadway networks, but they do not well represent freeway conditions. The higher-speed facilities such as freeways provide advanced guide signs so that drivers can anticipate turns and they have more time to react. Typically, these signs appear about ½ mile upstream from the turn. Freeway network settings will assume that lane changing for turns will begin at the first advance guide sign. Any changes to lane change distance will be documented with the model confidence and calibration report.
- The driving behavior for freeway merge areas will may modified to better model any one-to-one merging that is observed in the field. Without these adjustments, vehicles will come to a stop in order to yield to through freeway traffic, even if the merging links are assigned freeway link and behavior attributes.

Table 5: VISSIM Calibration Parameter Adjustments

Parameter	Default Value	Adjusted Value
Auto Vehicle Type – Sedans	100%	45%
Auto Vehicle Type – SUVs	0%	45%
Auto Vehicle Type – Sports Cars	0%	10%

Table 6: VISSIM Calibration Parameter Adjustments – Truck Fleet Mix

Parameter	Default Value	Adjusted Value*		
		SR 204 north of Sunnyside	20th Street SE east of Cavalero Road	US 2 east of Bickford Avenue
Truck Vehicle Type – 2 Axles	0%	96%	94%	66%
Truck Vehicle Type – 3 or More Axles	100%	4%	6%	34%

* Determined using vehicle classification counts from December 2016, as described in Data Collection section

Intersection timing parameters will be specified using the Ring Barrier Controller (RBC) method in VISSIM. Synchro software (Version 9.1, build 905, revision 293) will be used to store the signal timing settings and peak hour volume information. Signal timing plans will be optimized in Synchro for all future year conditions and imported into VISSIM for simulation analysis.

The following volume and speed assumptions will be used for developing the existing conditions traffic operations analysis model:

- Peak hour traffic volumes will be entered in 15-minute intervals at the roadway network gateways. The variation in volume among the 15-minute intervals, derived from the turning movement counts, will provide sufficient variation in traffic volume such that no peak hour factor will be used.
- Speeds for the model network will be initially set based on the posted speed limit. Adjustments will be made during model calibration/validation process, if warranted.

Traffic volume forecasts will be assigned in the VISSIM models using origin-destination (O-D) matrix estimation processes described in the WSDOT VISSIM Protocol. Three-hour demand volume matrices corresponding to the study area will be extracted from the 2016 existing, 2020 design, and 2040 horizon year travel demand forecasting model (described in Section 6 of this document). The dynamic traffic

assignment model, described in the Volume Development section, will capture the effects of peak spreading over three-hour periods during both the AM and PM. From the dynamic traffic assignment model, one-hour OD matrices representing the peak-hour within each three-hour period will be extracted. The difference of these one-hour matrices will be calculated. The resulting difference matrix will be added to the existing conditions O-D matrix developed for existing conditions using O-D estimation (VISUM TFlowFuzzy function). Initial O-D pair values that are negative will be set to zero. The resulting horizon year matrices will be assigned to the study network, and the forecasts will be reviewed.

To ensure consistency between models representing different times of day, the AM peak hour model will be constructed and calibrated first using the methods described above. The PM peak hour model will be built by modifying the AM peak hour model and calibrating to PM traffic counts and queues. Overall, the following scenarios will be developed and reported:

- Existing AM Peak Hour
- Existing PM Peak Hour
- One 2040 AM Peak Hour No Build Alternative
- One 2040 PM Peak Hour No Build Alternative
- One 2020 AM Peak Hour No Build
- One 2020 PM Peak Hour No Build
- Up to Three 2040 AM Peak hour Build Alternative
- Up to Three 2040 PM Peak hour Build Alternative
- One 2020 AM Peak hour Build Alternative
- One 2020 PM Peak hour Build Alternative

TRAVEL FORECAST

The travel demand forecasting framework for this study will be based on the Snohomish County Travel Demand Model, implemented using the transportation planning software package EMME, version 4.2.5. This model is the most appropriate travel demand forecasting tool for the study area for the following reasons:

- Based on the 4,000 zone version of the Puget Sound Regional Council's travel demand model (PSRC 4k Model, Version 4.0.1)
- Includes the most up-to-date comprehensive planned land use and transportation assumptions within Snohomish County jurisdictions and unincorporated areas

- Incorporates the land use and transportation assumptions of the recently adopted sub area plans in Lake Stevens (Lake Stevens Center and 20th Street SE) and the Everett Comprehensive Plan update

Model refinements will be made to account for local travel behavior surrounding the US2 / SR204 study area, particularly related to centroid connector loading and intersection turning movement penalties/restrictions. Some additional street network connections may be added, but no additional zonal detail is anticipated to be needed. The model does not assume region-wide state highway tolling in the horizon year. We will review the PSRC 2040 Travel Demand Model outputs with and without regional state highway tolling to understand the impact of tolling on traffic forecasts in and around the study area. The set of assumptions that result in higher traffic volumes across the US 2 trestle and on SR 204 north of the US 2 interchange will be applied to the Snohomish County model, since regional tolling is unconfirmed for 2040.

Travel Demand Model Inputs

Key travel demand model inputs include land use, traffic analysis zones, and the transportation network, which are described in the sections below.

Land Use

The Snohomish County Model has a 2012 base year scenario. For the base year, population and housing data are based on information from the PSRC regional land use estimates and input from Snohomish County planning staff.

The 2020 design and 2040 horizon year use estimates for the travel demand model will be derived using the official PSRC release of regional land use forecasts called the Land Use Targets (September 2013). This dataset was explicitly designed to align with jurisdictional growth targets. The land use data contain household and employment for the years 2010, 2025, 2031, and 2035. The forecasts are developed using a set of allocation methods that distribute jurisdictional growth targets to sub-jurisdictional zones based on available net development capacities and a series of policy-based preferential weights for certain centers, such as designated regional growth centers and other locally defined activity centers. Future year data land use assumptions from 2035 also reflect the Comprehensive Plan land use assumptions for Snohomish County and constituent jurisdictions. The 2016 existing, 2020 design, and 2040 horizon year land use inputs will be derived using the average annual growth rate for the period between 2012 and 2035.

The household information contains estimates of housing units, households, household population, housing by income quartile, group quarter population, and total population. The employment information contains total employment and the individual sector groupings, Manufacturing-WTU (wholesale, transportation & utilities), Retail-Food Services, FIRE (Finance, Insurance & Real Estate)-Service, Government-Higher Education, Education-K12 and Construction-Resources.

Transportation Analysis Zones

Compared to the traditional 1,000 zone version of the PSRC regional model, the Snohomish County Model contains a more detailed Transportation Analysis Zone (TAZ) system in the vicinity the US 2 / SR 204 interchange and along the I-5 corridor in Everett. **Figure 2** shows the traffic analysis zones (TAZs) within the study area. The PSRC TAZs are shown in the red outline and the Snohomish County Model TAZs are shown in a black outline. The Snohomish County model has a more refined TAZ structure than the 4K version of the PSRC model, specifically more detail around the 20th Street SE corridor and in central Everett. Due to the amount of zonal detail in the vicinity of the study area, no addition or refinement to the TAZ system is anticipated for this analysis.

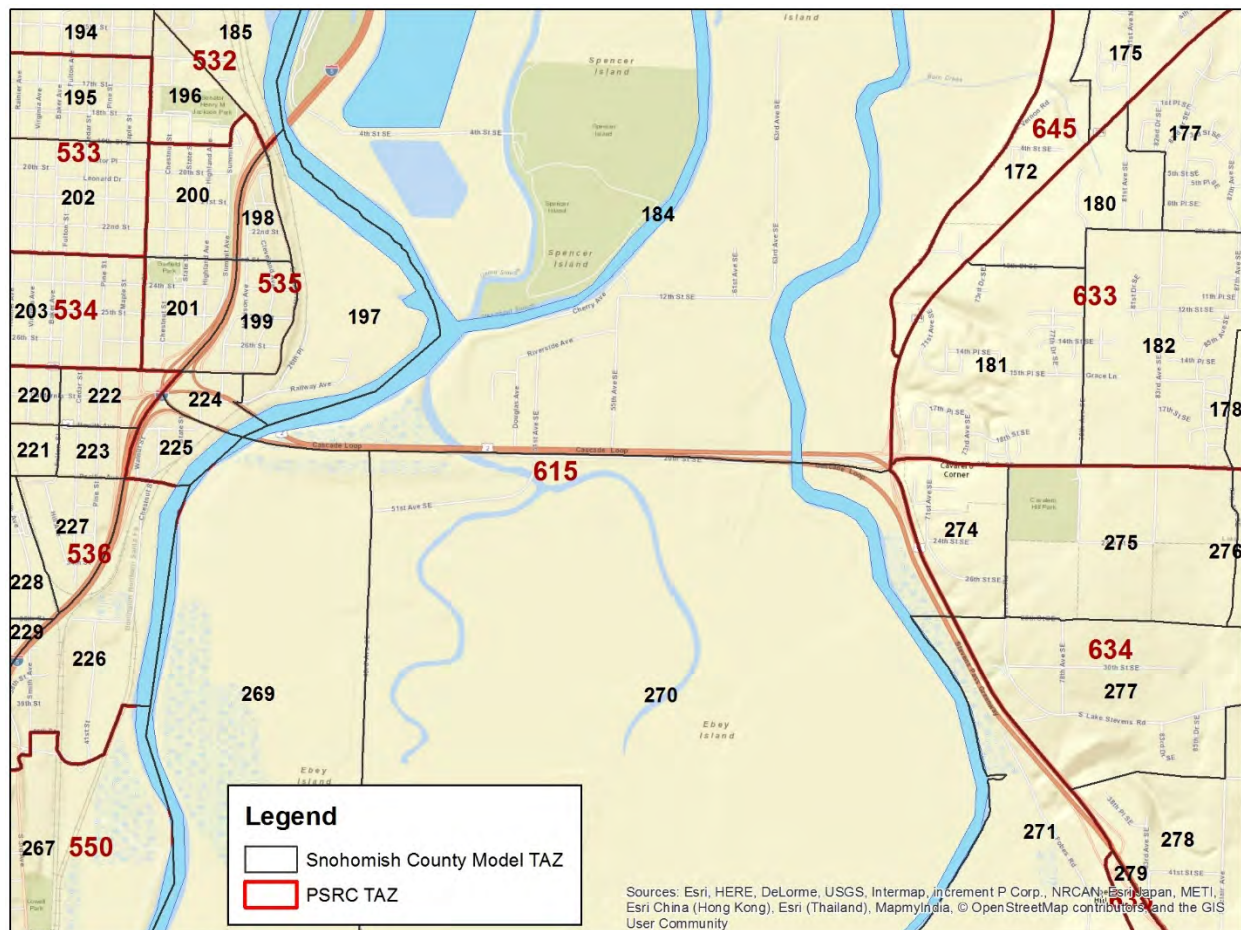


Figure 2: Traffic Analysis Zones within the Study Area

Network Assumptions

Base Year Transportation Network Enhancements

The Snohomish County Model includes all major ramps, freeway segments, arterial roadway segments, and intersections within the study area as shown in **Figure 3**. The entire length of 20th Street SE from SR 204 to 51st Avenue SE is also represented, including the one-way eastbound segment. For this study, several local street segments and access points that currently exist but are not represented in the base version of the Snohomish County Model will be added to improve network representation accuracy and model assignment routing. Segments to be added include:

- 9th Street SE between Sunnyside Boulevard SE and SR 204
- North leg of 20th Street SE / Cavalero Road intersection
- South leg of 20th Street SE / 83rd Avenue SE intersection

We will also review and revise turning movement penalties/restrictions and centroid loading to improve network assignment results.

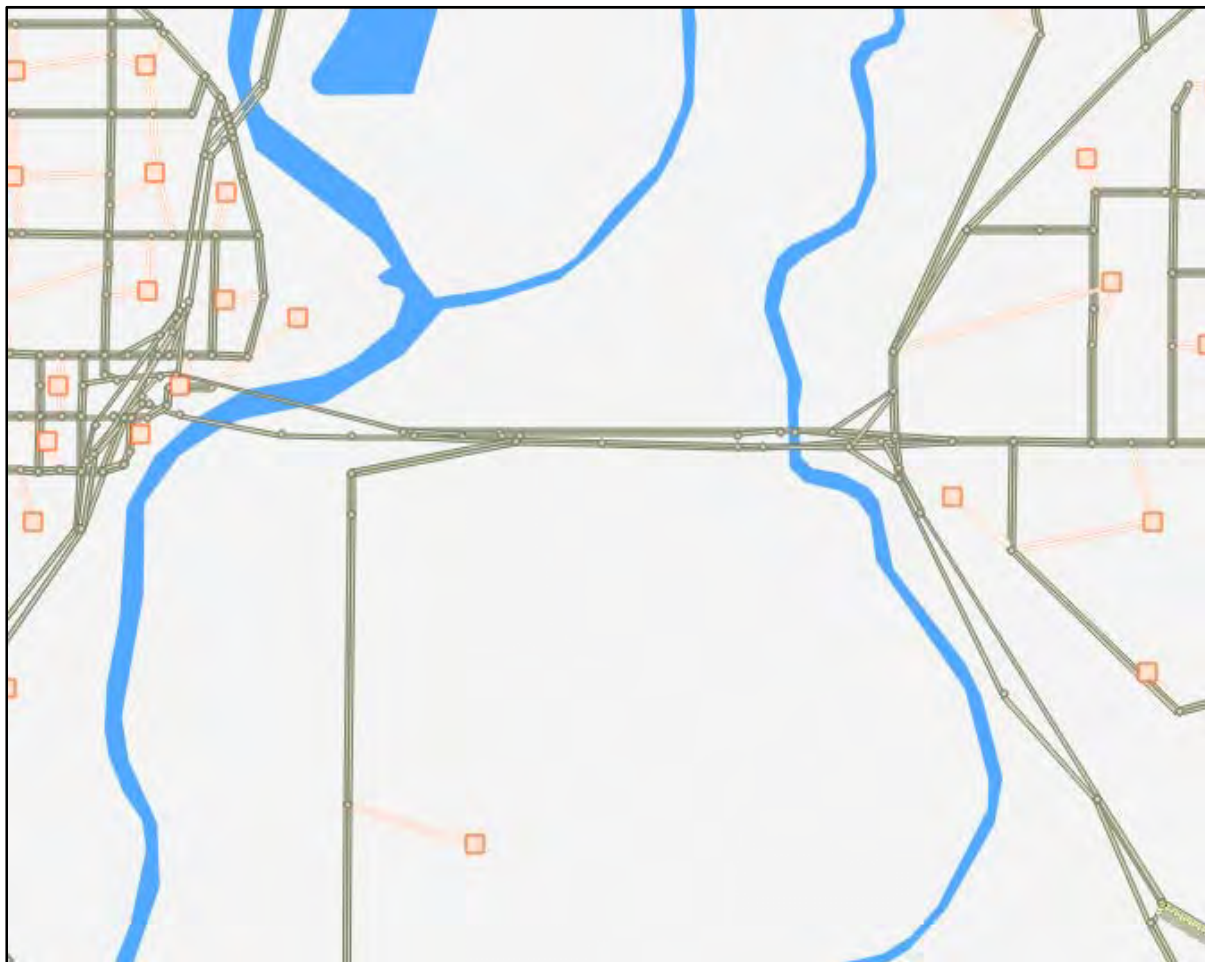


Figure 3: Model Network within the Study Area

Future Year Roadway and Transit Network Enhancements

The future year scenario of the Snohomish County Model uses a 2035 transportation network that includes capacity expansion projects included in regional and local transportation improvement programs (TIPs). To identify necessary network modifications for the 2020 design and 2040 horizon years, the project team has reviewed the comprehensive plans and TIPs for the Cities of Lake Stevens and Everett, as well as for Snohomish County, Puget Sound Regional Council (Transportation 2040), and WSDOT. In addition, projects included in Sound Transit 2 and 3, Nickel, and Transportation Partnership Agreement funding packages, and the Legislative Evaluation & Accountability Program (LEAP) transportation project list were reviewed. We will assume no changes to capacity or access along SR 9 and SR 204 within the study area for the 2020 design and 2040 horizon year no build models.

Table 7 includes a list of reasonably foreseeable roadway projects in the local area that will be included in the 2020 design and 2040 horizon year travel demand models, and omitted from the base year model network. The regional projects are identified by their Transportation 2040 Capacity Project ID numbers as well as their current approval status. Projects that are considered “Candidate” or “Approved” are included in the plan’s financial strategy and able to have funds programmed by PSRC for any project phase. Further, an “Approved” project has been cleared by the PSRC Executive board to proceed towards implementation, but a “Candidate” project still needs additional analysis performed before the Executive Board can take action. “Unprogrammed” projects are not included in the Transportation 2040 financial strategy and may only receive PSRC funds for planning and pre-design activities.

Major transit improvements will also be included in the 2040 horizon year travel demand model. These improvements include expansion of Community Transit’s Swift BRT system, expansion of local transit specified in the 2016 – 2021 Transit Development Plan, and eventual light rail extensions, including the segment between Seattle and Everett (ST 3).

Table 7: Planned / Funded Projects Included in Future Baseline Models

ID	Project Description	Design (2020)	Horizon (2040)	Current Status
Regional Projects¹				
n/a	SR 9 / SR 204 intersection improvements (preferred alternative)		✓	Candidate (ongoing alternatives study)
4206	SR 9 from 176 th Street SE to SR 96 – widen to 4/5 lanes	✓	✓	Candidate
4208	SR 9 from US 2 to Lake Stevens Road – widen to 4/5 lanes		✓	Candidate
5433	SR 9 / US 2 interchange improvements – reconstruct interchange as tight diamond		✓	Candidate
5432	SR 9 from Snohomish River Bridge to US 2 – widen to 4 lanes		✓	Candidate

ID	Project Description	Design (2020)	Horizon (2040)	Current Status
5431	Snohomish River Bridge Replacement – replace existing 2 lane structure with 4 lane bridge		✓	Candidate
4207	SR 9 from Marsh Road to Snohomish River Bridge – widen to 4 lanes		✓	Candidate
4415	SR 99 from 148 th Street SW to Airport Road – add BAT lanes	✓	✓	Candidate
5324	US 2 Trestle Widening from I-5 to SR 204 – widen trestle to 3 lanes in each direction, including 2 general purpose and 1 HOV lane (accessible to HOV 2+ vehicles per assumption in PSRC 2040 regional travel demand model)		✓	Unprogrammed
5444	US 2 Monroe Bypass Phase 1 – construct 2 lane extension from US 2 (west of SR 522 interchange) to Chain Lake Road		✓	Candidate
1620	US 2 Monroe Bypass Phases 2 and 3 – complete bypass from Chain Lake Road to US 2 near east City limits and widen to 4 lanes		✓	Unprogrammed
4175	US 2 from SR 204 to Bickford Road – widen mainline from 2 to 4 lanes		✓	Candidate
4176	US 2 from Bickford Road to future Monroe Bypass (west) – widen mainline from 2 to 4 lanes		✓	Unprogrammed
4177	US 2 from Monroe Bypass (east) to Sultan west City limits – widen from 2 to 4 lanes		✓	Unprogrammed
4178	US 2 within Sultan – widen from 2 to 4 lanes		✓	Unprogrammed
1704	US 2 from Sultan east City limits to Gold Bar west City limits – widen from 2 to 4 lanes		✓	Unprogrammed
5419	US 2 within Gold Bar – widen from 2 to 4 lanes		✓	Unprogrammed
4257	SR 522 / Paradise Lake Road Interchange – construct grade separated diamond interchange	✓	✓	Candidate
2380	SR 522 / NE 195 th Street Interchange – construct second half of existing half-diamond interchange		✓	Unprogrammed
1698	SR 522 from Paradise Lake Road to Snohomish River – widen from 2 to 4 lanes		✓	Candidate
4260	SR 524 from 35 th / 39 th Street to SR 522 – widen to 5 lanes		✓	Unprogrammed
4259	SR 524 from SR 527 to 35 th / 39 th Street – widen to 5 lanes		✓	Unprogrammed
1714	SR 524 from 24 th Avenue to SR 527 – widen to 5 lanes		✓	Approved
1639	SR 531 from 43 rd Avenue to SR 9 – widen to 4 lanes		✓	Candidate
4396	I-405 Corridor from SR 522 to I-5 – (a) Add 2 lanes NB and SB, except 1 lane NB between NE 195 th Street and SR 527 where NB lane previously built, resulting in 5 lanes (1 HOV & 4 GP or 2 HOV & 3 GP) in each direction.		✓	Candidate
1624	I-5 from 220 th Street SW to 44 th Avenue W – add northbound auxiliary lane		✓	Candidate
4631	I-5 / 44 th Avenue N interchange improvements – Completion of existing half diamond interchange by adding access to the north; includes two braided ramps.	✓	✓	Candidate
4278	I-5 / 196 th Street / SR 524 interchange improvements – adds a braided ramp NB		✓	Candidate

ID	Project Description	Design (2020)	Horizon (2040)	Current Status
1706	I-5 / SR 96 / 128 th Street SW interchange improvements – Reconstruct interchange as SPUI		✓	Unprogrammed
4006	I-5 / 100 th Street SE / Everett Mall interchange – construct new under crossing along 100 th Street SE with NB/SB direct access ramp to I-5 for HOV		✓	Candidate
1945	I-5 / 88 th Street N interchange improvements – Reconstructs an existing diamond interchange into a Single Point Urban Interchange with greater capacity	✓	✓	Candidate
	I-5 Hard Shoulder Running between Everett and Marysville		✓	
4410	I-5 / SR 529 interchange improvements – Complete current half interchange by constructing a new I-5 northbound off-ramp onto SR 529 and new southbound on-ramps from SR 529 to I-5		✓	Candidate
5429	I-5 / 116 th Street NE interchange improvements – Reconstructs an existing diamond interchange into a Single Point Urban Interchange with greater capacity	✓	✓	Candidate
4411	156 th Street NE Interchange with I-5 – construct new SPUI accessing 156 th Street NE overcrossing		✓	Candidate
Local Projects²				
D(1C)	SR 92 / Grade Road intersection – convert to roundabout		✓	Six-year TIP: finish by 2021
7(1)	20 th Street SE – widen from 2 to 4 lanes from 83 rd Avenue SE to 91 st Avenue SE	✓	✓	Six-year TIP: finish by 2020
7(3)	20 th Street SE – widen from 2 to 4 lanes from US 2 to 83 rd Avenue SE		✓	Six-year TIP: finish after 2021
2(2)	91 st Avenue SE – widen from 2 to 3 lanes from 20 th Street SE to 4 th Street SE		✓	Six-year TIP: finish after 2021
2(3)	91 st Avenue SE – new 2 lane connector from 20 th Street SE to 24 th Street SE	✓	✓	Six-year TIP: finish by 2020
14(7)	99 th Avenue SE – widen from 2 to 3 lanes from 20 th Street SE to 4 th Street SE		✓	Six-year TIP: finish after 2021
14(8)	99 th Avenue SE – widen from 2 to 3 lanes from 20 th Street SE to Lake Stevens Road		✓	Six-year TIP: finish after 2021
D(1A)	20 th Street NE / Grade Road intersection – provide additional turn pockets or convert to roundabout		✓	Six-year TIP: finish after 2021
D(1B)	Grade Road – widen from 2 to 3 lanes from 20 th Street SE to SR 92		✓	Six-year TIP: finish after 2021
12(5)	91 st Avenue NE / Vernon Road intersection – minor widening and safety improvements	✓	✓	Six-year TIP: finish by 2018
15(2)	Lundeen Parkway / Vernon Road intersection – safety improvements, may restrict E/W traffic		✓	Six-year TIP: finish by 2021
15(1)	Vernon Road – widen segment from 91 st Avenue NE to SR 9 to provide turn pocket		✓	Six-year TIP: finish after 2021
N/A ³	20 th Street Extension from Bickford Avenue to Lake Avenue – new 2 lane roadway with signalized intersection at SR 9	✓ ³	✓ ³	Six-year TIP: finish by 2017
N/A ⁴	South Broadway – widen from 2 to 3 lanes from SR 526 to 41st Street		✓ ⁴	Six-year TIP: finish by 2022

ID	Project Description	Design (2020)	Horizon (2040)	Current Status
Local Access Projects to Occur with Development (or Redevelopment)²				
3	90 th Avenue NE – new connector providing right-in right-out movement on EB SR 204		✓	Six-year TIP: finish after 2021
6(2)	24 th Street SE – new 2 lane roadway segment from 73 rd Avenue SE to 79 th Avenue SE		✓	Six-year TIP: finish after 2021
6(3)	24 th Street SE – new 2 lane roadway segment from 91 st Avenue SE to SR 9	✓	✓	Six-year TIP: finish by 2017
¹ As listed in Transportation 2040 Appendix N: Regional Capacity Projects. Last amended in 2015. Some projects like ramp metering in Marysville are not listed because they do not impact the regional travel demand forecasting modeling results. ² As listed in City of Lake Stevens Six-Year Transportation Improvement Program (2016 – 2021), unless otherwise noted. ³ As listed in City of Snohomish Six-Year Transportation Improvement Program (2015 – 2020). ⁴ As listed in City of Everett Six-Year Transportation Improvement Program (2017 – 2022).				

Volume Development

Demand Model Validation Process

The consultant team will develop a baseline 2016 travel demand model for validation purposes and to post-process volumes for the 2020 design year and the 2040 horizon year traffic volume forecasts. The 2016 baseline model will be developed by scaling up the 2012 production-attraction tables based on the past several years’ population and employment growth in Lake Stevens, Everett, and Snohomish County. Travel model validation will be completed by comparing the travel demand model output data on US 2 east of the I-5 interchange, SR 204 north of the US 2 interchange, and 20th Street SE east of Cavalero Road. Model adjustments will be made with the aim of calibrating to a level of ±10% of actual traffic across these segments. Refinement factors will be developed for use in post processing for the final traffic volume forecasts that will be estimated for future year traffic at the roadway segments and intersections. Post-processing is an important step in the travel forecasting process since it helps to reduce model errors by applying the growth in model volumes between the base year and future year to actual traffic counts. As described in the VISSIM Model Development and Validation section, the traffic simulation model will be further calibrated to observed roadway segment count, travel time, and delay data within the study area using origin-destination (O-D) matrix estimation methods, namely the VISUM TFlowFuzzy function.

Future Year Forecast Post-Processing

A technique known as the “difference method,” as outlined in NCHRP 765, will be used to develop future year traffic forecasts and minimize the influence of localized model error. Rather than take the direct output from the future year model (which generally carries forward assignment error from the base year model), the difference method calculates the growth between the base year and the future year models, and adds that growth to an observed traffic count. For example, assume a road has an existing hourly volume of 500 vehicles. If the base year model showed a volume of 400 vehicles, and the future year model showed a volume of 650 vehicles, 250 vehicles would be added to the existing count for a future volume forecast of 750 vehicles.

Prior to import into the VISSIM operations model, vehicle demand output from the SnoCo Model will be further calibrated to match observed roadway segment and turning movement count data within the study area model using origin-destination (O-D) matrix estimation methods. Initially, the study area network and three-hour AM/PM demand matrices will be extracted from the county travel model to create the inputs for the Dynamic Traffic Assignment (DTA) software, Dynameq. The Dynameq network will be updated to reflect actual geometries and operations characteristics. The DTA model will then be calibrated and run to develop a more realistic one-hour demand matrices that accounts for peak spreading and capacity constraints that affect vehicle arrival into the traffic operations analysis area. The difference existing and future year one-hour demand matrices from DTA will be calculated. The resulting difference matrix will be added to the existing conditions O-D matrix developed for existing conditions using O-D estimation (VISUM TFlowFuzzy function). Initial O-D pair values that are negative will be set to zero. The resulting horizon year matrices will be fed into Visum and the resulting routes and demand will be subsequently fed into VISSIM. This technique will also be used for all future year analysis.

The post processing approach will be used to develop year 2040 AM and PM peak traffic volumes for each of up to three (3) build multimodal alternatives including No Build. When a preferred multimodal alternative is selected, the Consultant will also develop year 2020 AM and PM peak hour traffic volumes for analysis of the preferred multimodal alternative. A select link analysis will be used to determine the trip distribution patterns and markets served by each build scenario. Forecasts for the following scenarios will be developed:

- 2020 AM and PM No Build.
- 2020 AM and PM Preferred Alternative.
- 2040 AM and PM No Build.
- 2040 AM and PM Up to three (3) Build Scenarios, including Preferred Alternative.

SELECTION OF MEASURES OF EFFECTIVENESS (MOES)

The traffic operations and safety analyses will provide the following measures of effectiveness (MOEs):

- Intersections – level of service (LOS), average vehicle delay, and 95th percentile queues using VISSIM model
- Freeway segments – LOS, density, speed, and queues using VISSIM model
- Corridor – average travel time (by mode), average travel speed, and queues using VISSIM model
- Mode split estimate – single-occupancy vehicle, high-occupancy vehicle, and transit using traffic counts, transit data, and EMME model outputs
- Collisions, using Highway Safety Manual predicted crash rate calculations
 - Current year analysis (2016)

- Difference between current expected fatal and injury crashes per year and current predicted fatal and injury crashes per year
- Difference between current expected property damage only (PDO) crashes per year and current predicted PDO crashes per year
- Design (2020) and horizon year (2040) analyses
 - Difference between the predicted fatal and injury crashes per year of each alternative including no-build
 - Difference between the predicted PDO crashes per year and current predicted PDO crashes per year

The methods used to calculate and report these MOEs are described in the following subsections and the Collision Analysis section.

Intersection Level of Service and Delay

Intersection LOS is a qualitative description of traffic flow based on such factors as speed, travel time, delay, and freedom to maneuver. Six levels are defined, from LOS A, with the least congested operating conditions, to LOS F, with the most congested operating conditions. LOS E represents “at-capacity” operations. Operations are designated as LOS F when volumes exceed capacity, resulting in stop-and-go conditions. LOS is measured differently, depending on whether an intersection is signalized or unsignalized. How LOS would be measured in each case is described as follows.

- **Signalized Intersections.** The method for measuring vehicle LOS at signalized intersections is based on average control delay, as described in Chapter 18 of the Transportation Research Board’s fifth edition of the Highway Capacity Manual (HCM 2010). Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. The average total delay per vehicle for signalized intersections will be calculated using VISSIM, a detailed micro-simulation tool. The delay value will then be correlated to the LOS designations shown in **Table 3**.
- **Unsignalized Intersections.** Operations of unsignalized study intersections will be evaluated using the method contained in Chapters 19 and 20 of the HCM 2010. At two-way or side-street stop-controlled intersections, control delay is reported for the minor movement with the highest control delay, not for the intersection as a whole. For all-way stop-controlled intersections, the LOS is based on the weighted average control delay of all movements. Similar to signalized facilities, LOS at unsignalized intersections will be calculated using VISSIM and LOS designations correlate with those presented in **Table 8**.

The LOS analysis will consider the adopted LOS standards of the operating agencies (i.e. I-5, US 2, and SR 204 intersections use WSDOT LOS standards and 20th Street SE uses City of Lake Stevens LOS standards).

TABLE 8: INTERSECTION LEVEL OF SERVICE THRESHOLDS

Level of Service	Signalized Intersection Control Delay (sec/veh) ^a	Unsignalized Intersection Control Delay (sec/veh) ^a	General Description
A	0 – 10.0	0 – 10.0	Little to no congestion or delays.
B	10.1 – 20.0	10.1 – 15.0	Limited congestion, short delays
C	20.1 – 35.0	15.1 – 25.0	Modest delays and stable flow
D	35.1 – 55.0	25.1 – 35.0	Long delays, but stable flow
E	55.1 – 80.0	35.1 – 50.0	Operations at or near capacity
F	> 80.0	> 50.0	Over-capacity, breakdown flow

a. Intersection vehicle delay results generated by micro-simulation models such as VISSIM are not HCM compliant. HCM calculations are based on control delay and stopped delay that directly contributes to the traffic control devices. VISSIM directly measures the total delay, which consists of control delay, stopped delay, and other delay incurred in the vicinity of the traffic control device, such as vehicles slowing down for turn movements. However, for simplicity, the differences are usually negligible. Per the WSDOT VISSIM protocol, the control delay-based LOS thresholds can be applied to the total delay-based outputs from VISSIM.

Source: Highway Capacity Manual 2010 (Transportation Research Board 2010).

95th Percentile Queue Length

Queue length is a measurement of the physical space vehicles will occupy while waiting to proceed through an intersection. It is commonly used to assess the amount of storage required for turn lanes and to determine whether the vehicles from one intersection will physically spill over into an adjacent intersection. The 95th percentile queue is defined to be the queue length (in vehicles) that has only a 5-percent probability of being exceeded during the analysis time period. 95th percentile queue lengths will be extracted from the existing and future year alternative models.

Corridor Travel Time, Speeds, and Queues

Corridor travel time, speeds, and queues will be measured for the key corridors described in Data Collection section. As described in the VISSIM Development and Validation section, the existing year VISSIM model will be calibrated to reflect the observed floating car survey data, and the increase/decrease in travel time will be reported for future year No Build and Build scenarios. Travel time data will be reported separately for single-occupancy vehicles, high-occupancy vehicles, and transit for each scenario.

Freeway Level of Service, Density, Speed, and Queues

Freeway LOS is a qualitative description of traffic flow for basic mainline segments, ramp junctions, and weave sections. Six levels are defined, from LOS A, with the least congested operating conditions, to LOS F, with the most congested operating conditions. LOS E represents “at-capacity” operations. Operations

are designated as LOS F when volumes exceed capacity, resulting in stop-and-go conditions. LOS is measured in terms of vehicle density, as expressed in terms of vehicles per mile per lane (vpmp). Density at freeway study locations will be calculated using VISSIM and LOS designations will be correlated according to the HCM thresholds shown in **Table 9**. Additionally, speed and queuing estimates will be reported for freeway segments and ramps.

TABLE 9: FREEWAY LEVEL OF SERVICE (LOS) THRESHOLDS

LOS	Average Density ^a		General Description
	Basic Sections	Ramp Junction & Weave Sections	
A	< 11	< 10	Free-flow speeds prevail. Vehicles are almost completely unimpeded in their ability to maneuver.
B	> 11 to 18	> 10 to 20	Free-flow speeds are maintained. The ability to maneuver with the traffic stream is only slightly restricted.
C	> 18 to 26	> 20 to 28	Flow with speeds at or near free-flow speeds. Freedom to maneuver within the traffic stream is noticeably restricted, and lane changes require more care and vigilance on the part of the driver.
D	> 26 to 35	> 28 to 35	Speeds decline slightly with increasing flows. Freedom to maneuver with the traffic stream is more noticeably limited, and the driver experiences reduced physical and psychological comfort.
E	> 35 to 45	> 35 to 43	Operation at capacity. There are virtually no usable gaps within the traffic stream, leaving little room to maneuver. Any disruption can be expected to produce a breakdown with queuing.
F	> 45 or v/c > 1.0 ^b	v/c > 1.0 ^b	Represents a breakdown in flow.

Notes:
 a. Density in vehicles per mile per lane (vpmp). Because heavy vehicles are modeled explicitly in VISSIM, density is not converted to passenger car equivalents as used in the HCM methodology.
 b. With microsimulation analysis, v/c is not directly calculated. As a result, a density of 45 vpmp will be used as the LOS F threshold.
 Source: *Highway Capacity Manual* (Transportation Research Board, 2010).

COLLISION ANALYSIS

The safety performance of the existing freeway system and local transportation system, as well as future no build proposed alternatives, will be analyzed within the safety analysis study area. The following methodology and assumptions will be followed:

Safety conditions will be assessed using WSDOT collision data in conjunction with Federal Highway Administration (FHWA) and *Highway Safety Manual* (HSM) procedures.

WSDOT collision data from the previous five consecutive years (January 2011 through December 2015) will be obtained for all freeway segments, freeway ramps, arterial roadway segments, and intersections defined in the Study Area and Project Limits section. Collision type, severity, frequency, and contributing circumstances will be summarized in a map and table. We will identify locations with high crash rates and/or problems by the following measures:

- **Collision Rates:** To allow comparison of collision rates between locations and to average rates on similar facilities around the state, collisions per million vehicle-miles travelled (MVMT) will be calculated at each location.
- **Collision Types:** The share of collisions by type (e.g., fixed-object collisions, rear-end collisions) and collision rates by type (per MVMT) will be reported. Comparing the proportion of collision types by location will help identify potential contributing factors to collisions.
- **Collision Patterns:** The project team will analyze traffic collision data seeking to discover and report pertinent patterns. Patterns may include the time of day, day of week, lighting conditions, movements involved, and causation.
- **Collision Severity:** The share of injury collisions (per MVMT) relative to total collisions reported.

Additionally, existing arterial roadway data for SR 204 and 20th Street SE will be entered into the AASHTO Highway Safety Manual (HSM) spreadsheet for urban and suburban arterials for comparison with actual conditions. Likewise, freeway and ramp data will be entered into the HSM Enhanced Interchange Safety Analysis Tool (ISATe) spreadsheet to compare expected and actual crash rates. These prediction spreadsheets, as well as the measures defined above, will be used as a base condition for comparison with future No Build and Build alternatives. Locations with above average/baseline collision results will be identified on a map and table. Predicted crash rates will be reported for all collisions types as well as injury/fatal collisions.

The method for estimating collision rates for future scenarios includes comparing and applying collision rates for similar facilities to the forecasted volumes. We anticipate assembling data for up to three similar facilities. Standard Federal Highway Administration crash reduction/counter measure factors will also be used when forecasting future collision rates and frequencies. Crash estimates for the 2040 No Build will be derived based on existing crash data in conjunction with the traffic volume forecasts described in the Travel Forecast Section.

References to the WSDOT collision database will include the following Section 409 Disclaimer: "Under Section 409 of Title 23 of the United States Code, collision data is prohibited from use in any litigation against state, tribal or local government that involves the location(s) mentioned in the collision data."

POLICY POINT #4 ACCESS CONNECTIONS AND DESIGN

This section will discuss how the proposed improvements provide full directional access and meet identified performance needs as well as their general design criteria.

The current US2/SR 204 interchange provides fully-directional access and the modified interchange is not expected to change the provision of fully-directional access.

The proposed design will be advanced to a sketch level. As such, specific deviations and full design details will not be developed. Anticipated deviation types and design standards will be presented.

POLICY POINT #5 LAND USE AND TRANSPORTATION PLANS

Relevant land use and transportation plans are expected to include:

- US 2 – Everett Port/Naval Station to SR 9 Corridor Planning Study
- Comprehensive Plan and Transportation Improvement Program
 - Snohomish County
 - City of Everett
 - City of Lake Stevens
 - City of Marysville
 - City of Snohomish
- Puget Sound Regional Council *Transportation 2040*
- WSDOT 2017-2020 Statewide Transportation Improvement Program (STIP)
- Nickel, and TPA (Transportation Partnership Agreement) funding packages, and the Legislative Evaluation & Accountability Program (LEAP) transportation project list
- Community Transit 2016 – 2021 Transit Development Plan
- Sound Transit 2 and 3 funding packages

Consistency of the preferred alternative with these land use and transportation plans will be reviewed and confirmed during the development of the preferred alternative (described in Policy Point #2).

POLICY POINT #6 FUTURE INTERCHANGES

WSDOT, in partnership with Snohomish County, the Cities of Everett, Marysville, Lake Stevens, Snohomish, Monroe and Community Transit, developed a corridor planning study for US 2, between Everett Port/Naval Station and SR 9. The plan identified that the future replacement of the westbound trestle is driven by the useful life of the existing structure and that continued maintenance of the trestle will extend the useful life of the westbound trestle to approximately 2045. A specific improvement concept for the trestle replacement and the modification of the US 2/SR 204/20th Street interchange was

not defined by this study, though several alternative concepts were developed. These alternative concepts may be considered as part of this IJR.

POLICY POINT #7 COORDINATION

In addition to public outreach, coordination will include Snohomish County, City of Everett, City of Lake Stevens, City of Marysville, City of Snohomish, City of Monroe, and Community Transit.

POLICY POINT #8 ENVIRONMENTAL PROCESSES

The IJR team is seeking Operational and Engineering Acceptability at this time and is aware that the full IJR approval is contingent on the completion of environmental documentation. Materials to satisfy Policy Point 8 will be provided by WSDOT.

WSDOT Design Manual Chapter 550 will be the basis for the draft and final IJR document. Policy Points 1 through 8 shall be addressed. Individual draft chapters will be presented to the IJR Support Team as they are completed throughout the duration of the IJR process. We assume the following about the IJR documentation process:

- All policy points will be developed based on the assumptions outlined in this Methods and Assumptions Memo.
- Support Team members will have fifteen (15) working days to review and provide comment for individual draft IJR policy points throughout the duration of this effort.
- Support Team members will have fifteen (15) working days to review the consolidated draft IJR and provide comments for final version.
- The comments on the final report will be minor in nature and primarily consist of formatting and editing because the draft Policy points will have been previously reviewed by support team throughout the duration of the IJR process and discussed at IJR support team meetings.
- WSDOT will provide Policy Point 8.

CONCLUSION

From time to time, ideas or suggestions arise late in the evaluation or documentation process. Some of these late emerging ideas may have merit and added benefits to the project, but be difficult to incorporate in the on-going process. It is understood that new ideas may bring value to the final outcomes and therefore should not be automatically dismissed because of the sequence of events and timing of the information. Specific protocols will be in place to allow new ideas and information to be “vetted” and reviewed for consideration, as follows:

If new ideas and information are brought forward, they will be first discussed by the WSDOT Project Management Team who will determine its merits. If they decide that the new idea has merit it will be referred to the Project Stakeholders Group to decide how the new idea should be addressed in the IJR

and environmental review process. If the WSDOT Project Management Team decides that the idea has little merit, it will be documented and addressed, if appropriate, in the IJR or environmental document.

For ideas that have already been considered and dismissed, but there is new interest in re-consideration, the WSDOT Project Management Team will determine if reintroducing the idea has merit. If they decide that the new idea has merit, it will be referred to the Project Stakeholders Group to decide how the revised idea should be addressed in the IJR and environmental process.

If new ideas and/or prior information are brought forward during a stakeholder meeting, the content of this information will not be fully discussed if it impacts the scheduled agenda. The WSDOT Project Management Team will note the comments and content of the information and will assure that review of the new information will follow the approved protocols for consideration.

STAKEHOLDER INTERVIEWS SUMMARY (PHASE 1)

March 9, 2017

US 2/SR 204/20th Street SE Interchange Justification Report Stakeholder Interviews Summary (Phase 1)

March 9, 2017

Project overview

The population of Snohomish County has more than doubled since 1980 and is expected to gain another 200,000 residents by 2035. This population growth will add additional traffic demand to the county's high-traffic routes, including the US 2, SR 204 and 20th Street Southeast interchange, which already experiences severe congestion during peak commute times. These backups can sometimes spill over onto other highways and surface streets.

WSDOT and the local jurisdictions have heard concerns from the public regarding congestion through the interchange during the morning commute. Often, traffic through the interchange experiences long delays and unreliable travel times.

As a result, the US 2/SR 204/20th Street SE Interchange Justification Report (IJR) study will be a multi-jurisdictional, collaborative effort to identify near-term and long-term improvements to help reduce congestion delays and improve safety at the interchange.

This study is a first step toward implementing improvements for person and freight mobility at the interchange. Current funding provides the initial study, and future environmental planning, design and construction phases will be funded through future legislative action.

Purpose and goals of the stakeholder interviews

The purpose of stakeholder interviews is to better understand experiences and perceived problems at the US 2, SR 204 and 20th Street SE interchange. Additionally, the stakeholder interviews are intended to give us a better sense of the priorities and purpose for trips in the corridor.

Following the stakeholder interviews, we will use the findings to inform questions in the online survey to be conducted in spring 2017. By the end of this study, we will provide a report to the legislature, including a list of potential improvements for the US 2/SR 204/20th Street SE interchange that address the needs of the traveling public.

Stakeholder interview methodology

Through research and internal coordination, WSDOT identified ten stakeholders to interview. Interviews were conducted in-person, with two exceptions, and led by a member of the consultant team. When possible, a member of the WSDOT project team attended the interview as well.

Corridor stakeholders interviewed in February 2017 included:

City/Agency/Organization	Staff in Attendance
City of Monroe	Brad Feilberg, Public Works Director
City of Snohomish	Steve Schuller, Public Works Director
City of Marysville	Jeff Laycock, City Engineer
City of Lake Stevens*	Mick Monken, City Engineer
City of Everett	Ryan Sass, Engineer
Snohomish County	Steve Thomsen, Public Works Director
Community Transit	Carol Thompson, Service Development Manager
Cascade Bicycle Club	Jeff Aken, Regional Planning Director

Washington Trucking Association*	Sheri Call, Vice President
Boeing	Richard White, Government Relations

*Indicates phone interview

Summary of key themes

WSDOT's interviews with corridor stakeholders helped provide a better understanding of existing interchange conditions, stakeholder priorities, and opportunities for meaningful community engagement.

Stakeholder interview participants were asked approximately 20 questions. The list of questions may be found in *Appendix A: Interview Script*. Four key themes emerged as part of our interviews. They are summarized below.

Key themes
1. <i>The current interchange operations are poor during peak travel times and stakeholders are supportive of a study to identify near-term improvements to relieve congestion.</i>
2. <i>Top priority improvements were varied for stakeholders but all could agree that the near-term improvements must not adversely impact local streets and communities or hinder potential for long-term improvements, i.e. the recommended improvements should consider and compliment regional and future transportation planning.</i>
3. <i>Potential future improvements that reduce travel time and increase speed and reliability are key indicators that the study is successful.</i>
4. <i>Stakeholders confirmed there are plenty of ways to engage the public on the study.</i>

Following is a description of each theme:

1. ***The current interchange operations are poor during peak travel times and stakeholders are supportive of a study to identify near-term improvements to relieve congestion.***

Replacement of the US 2 trestle has been a top priority for the jurisdictions surrounding the area. The replacement of the US 2 trestle is cost prohibitive at this time, thus the project team sought to better understand the current challenges facing the US 2/SR 204/20th Street SE interchange and gather information to inform the development of a set of potential projects to be completed until the trestle replacement is funded. Through ten stakeholder interviews, we observed the following:

- All the interviewees were aware of the poor functionality and daily congestion at the US 2/SR 204/20th Street SE interchange.
- All the stakeholders voiced support for the study.
- Some brought specific improvement projects to the interview, which they've asked WSDOT to include in the study.
- The majority of respondents felt it was likely that any solution that eases traffic congestion will be welcomed by the traveling public.

Specific operational challenges include:

- Congestion on the trestle causes backups on the surrounding surface streets.
- During the morning peak commute, the merge onto westbound US 2 from SR 204 and 20th Street SE, where two lanes are merging onto one lane, causes a considerable backup.
- During the evening peak commute, drivers coming from 20th Street SE are merging onto SR 204 at high speeds and often failing to yield. Drivers on SR 204 headed toward US 2 have difficulty seeing drivers coming from 20th Street SE.
- Bicycle routes need specific directional signage.



- 2. Top priority improvements were varied for stakeholders but all could agree that the near-term improvements must not adversely impact local streets and communities or hinder potential for long-term improvements, i.e. the recommended improvements should consider and compliment regional and future transportation planning.**

All respondents had at least one priority improvement for the interchange. Many noted concerns in their own communities and how interchange adjustments could impact them. Some key improvement themes included:

- Any solution should not divert traffic or move chokepoints
- Any solution should be compatible with the future improvements including the replacement of the US 2 trestle
- Maintain or improve transit reliability through the interchange
- Maintain or improve bicycle access through the interchange
- Consider development plans within the surrounding communities

Specific priorities identified included:

- Utilize ramp metering getting on westbound US 2
- Added signage, wayfinding and striping for bicycles
- Transit-only access
- Remove merge at 20th Street SE and SR 204
- Construct a longer merge from SR 204 onto westbound US 2
- Move to merge farther south on US 2
- Consider adding additional lanes north of the existing interchange
- Explore increasing HOV and transit options
- Assess the benefits of tolling
- Explore transit reroutes to avoid 20th Street SE, specifically reroute buses to approach westbound US 2 from further south
- Consider phased solutions from the Snohomish County and City of Everett trestle study

- 3. Potential future improvements that reduce travel time and increase speed and reliability are key indicators that the study is successful.**

Given the intent of the project to relieve congestion through this corridor, most interviewees indicated that a reduction in travel time and increase in speed and reliability would make the project a success. Other key drivers for success included:

- No ancillary impacts on local streets or interchanges
- Improvement in safety is key
- Look for opportunities to improve experience for all modes, including transit, carpools and rideshare

- 4. Stakeholders confirmed there are plenty of ways to engage the public on the study.**

The stakeholder interviews provided greater insight on who the key audiences are for the study as identified below. They also provided information about the best opportunities and mechanisms to reach those audiences and learn about their concerns.

- An overarching message from our stakeholders is that communities along the corridor are well organized and there are clear and established mechanisms for communication within these groups. Some specific stakeholders mentioned during our interviews included:
 - Everett Housing Authority
 - Senior centers



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- Farmers Bureau
 - Freight communities
 - Snohomish chapter of Cascade Bicycle
 - Boeing
 - Chambers of commerce
 - Economic Alliance Snohomish County
- Stakeholders were asked about other languages spoken and potential need for translation and interpretation services in the area surrounding the US 2/SR 204/20th Street SE interchange, the following languages were identified as commonly spoken:
 - Spanish
 - Korean
 - Vietnamese
 - Chinese
 - Russian
 - Ukrainian
- The stakeholders identified the following as key sources of information in their communities:
 - City and county website and listservs
 - Commute Trip Reduction (CTR) information sharing through businesses
 - Local area newspapers and newsletters
 - Project flyers to targeted stakeholders in the corridor
 - Radio
- When asked to identify common gathering places or good opportunities for engagement, our respondents suggested:
 - Online open houses, traditional open house and farmer's markets
 - One-on-one sessions
 - Area libraries and community centers

Summary

The stakeholders that WSDOT met with as part of these interviews are supportive of the project. The project team was able to learn essential information that will help us to actively engage the public along the corridor to share information, hear concerns and keep the community informed. Through the interviews the concerns and opportunities highlighted above will be considered and incorporated where possible into our outreach and communication throughout the study.

Appendix A: Interview Script

Stakeholder Interview Questions February 2017

Introduction

WSDOT and the local jurisdictions have heard concerns from the public that travel through the US 2/SR 204/20th Street SE interchange during the morning commute results in long delays and unreliable travel times. As a result, the US 2/SR 204/20th Street SE Interchange Justification Report (IJR) study will be a multi-jurisdictional, collaborative effort to identify short-term and long term improvements to help reduce congestion delays and improve safety at the interchange. During this study, staff will use stakeholder interviews, an online open house and an online survey to gather information from the public.

This study is a first step toward implementing improvements for person and freight mobility within the corridor. Funding is currently only available for the initial study, so any future environmental planning, design and construction phases will need to be funded through additional legislative action.

Interview questions

Awareness and perceptions

1. What are your initial thoughts about the operation of the interchange today?
2. What are your priorities for changes to the interchange?
3. How do these priorities best serve your communities?
4. If you could improve the interchange today, what are the top 3 things you would change?
#1 _____
#2 _____
#3 _____
5. Suppose funding was limited. What, if anything, does that change?
6. Do you have, or are you aware of, development plans or land use changes happening in the area surrounding the interchange?
 No (skip to Q7)
 Yes
7. How do you think these development plans or land use changes could affect future travel within your community?
8. In your opinion, what would make this study successful?

Community outreach

9. Based on your understanding of this study, what steps would you suggest to ensure the public has a clear understanding of the study and the desired objectives?

Let's talk about the people and groups in your community:

10. What languages are spoken?
 Spanish
 Korean
 Vietnamese



**Washington State
Department of Transportation**

- Chinese
- Tagalog
- Russian
- Other _____

Should project informational materials be translated?

- No (skip to Q12)
- Yes

11. What languages should be used for the translations?

- Spanish
- Korean
- Vietnamese
- Chinese
- Tagalog
- Russian
- Other _____

12. Are there specific minority and low income groups that we should be aware of?

- No (skip to Q14)
- Yes

13. Which minority or low income groups?

14. Are there any other specific people or groups we should engage in the public outreach process (that we haven't already discussed)?

- No (skip to Q17)
- Yes

15. What other specific people or groups should we be aware of?

- Property owners
- Businesses
- Other (please specify) _____

16. How would you recommend we reach out to these communities?

17. Is there anything else we should keep in mind with when reaching out to any of these communities?

18. Where do people get information about things that matter to your community so that we can let the public know about the online open houses and survey? (*prompt with the following once the interviewee has come up with own list*)

- From you and your organization/department:
- Chamber of commerce
- Websites
- City and organizational listservs or email distributions
- Blogs
- Newspaper
- Radio
- Community bulletin boards
- Email
- Facebook
- Twitter



Other (please specify) _____

Concerns and risks

19. Do you have any concerns regarding this study?

- No (skip to Q21)
- Yes

20. What are your top two concerns regarding the study?

#1 _____

#2 _____

Conclusion

21. Are there any other topics, interests or concerns that we have not discussed that you would like us to address?

Thank you for your comments.

Our next step will be to use the information from the interviews to help write survey questions that will be posted on the on-line open house website this spring. We will also make any relevant changes to our study process to address concerns or issues that we did not foresee when putting together our work plan. Thank you for taking the time to sit with us and discuss the study.


FINAL SURVEY SUMMARY REPORT

May 2017

US 2/SR 204 Interchange Justification Report

Final Survey Summary Report

FINAL
(05/2017)

 Washington State
Department of Transportation
15700 Dayton Avenue N
Shoreline WA 98133-9710

Submitted by:
PARSONS

Prepared by:


US 2/US 204 Interchange Justification Report

Agreement No. Y-11600

FINAL

MAY 2017

The US 2/US 204 Interchange Justification Report is an effort between the Washington State Department of Transportation (WSDOT), and Parsons Transportation Group, Inc. To conduct this project, WSDOT contracted with:

Parsons Transportation Group, Inc.

600 University Street
Suite 700
Seattle, WA 98101

In association with:

Fehr & Peers
PRR

WSDOT
Final Survey Summary Report

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ACRONYMS, ABBREVIATIONS AND DEFINITIONS

State	State of Washington
WSDOT	Washington State Department of Transportation

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PURPOSE AND METHODS

PURPOSE

The population of Snohomish County has more than doubled since 1980 and is expected to gain another 200,000 residents by 2035. This growth will add pressure to the county's high-traffic routes, including the US 2, SR 204 and 20th Street Southeast interchange, which already experiences severe congestion during peak commute times. These backups can sometimes spill over onto other highways and surface streets, creating additional congestion.

In December 2016, WSDOT formed a project support team of representatives from Snohomish County, Community Transit, and the cities of Lake Stevens, Everett, Snohomish, Monroe and Marysville. This team is currently working to identify existing issues and potential future improvements at the interchange. The project support team will provide feedback and direction on the future potential improvements throughout the duration of the study.

This spring 2017 the public had an opportunity to provide input on issues and needed improvements through an online survey.

WSDOT will use findings from the support team and public survey to develop an Interchange Justification Report. These reports are studies required by the Federal Highway Administration to support changes to highways.

METHODS

Conducted an online survey by sharing the survey URL with the WSDOT project webpage, city and county websites, city councils, business organizations, relevant listservs, social service providers, Everett Herald newspaper, and freight/transit/ bicycle organizations and associations.

- 3,483 people started the survey
- The results of the survey are based on the 2,750 who completed the survey
- Most (92%) live in one of the following zip codes:
 - 98258 – Lake Stevens (65%)
 - 98290 – Snohomish (9%)
 - 98270 – Marysville (7%)
 - 98252 – Granite Falls (4%)
 - 98201 – Everett (3%)
 - 98223 – Arlington (2%)
 - 98272 – Monroe (2%)
- Most respondents were between the ages of 25 and 54

Respondent Ages	Percent
17 or younger	0.1%
18-24	5.3%
25-34	27.2%
35-44	29.0%
45-54	20.4%
55-64	13.3%
65 and older	4.7%

Figure 0-1: Survey respondents ages

KEY FINDINGS

TRAVEL BEHAVIORS

Three-quarters (74%) travel through the US 2, SR 204th and 20th Street SE interchange five or more days a week, with a third (34%) doing so every day of the week.

Most are traveling through the interchange during the morning peak period (64%) and/or the evening peak period (63%).

The vast majority (87%) drive alone through the interchange, with two-fifths (45%) also traveling in a carpool with other household members.

Most (77%) are traveling through the interchange for the purpose of commuting to and from work and/or for running errands or shopping (58%).

DEALING WITH TRAFFIC CONGESTION

The vast majority (78%) reported that their travel time through the interchange has changed in the last five years, with essentially all indicating that the time has increased.

Almost half (48%) reported timing their trips through the interchange most of the time to avoid peak hours of traffic.

A quarter (25%) reported avoiding 20th Street SE or SR 204 most of the time when accessing the US 2 westbound trestle.

The alternate route mentioned by most respondents was Route 9 (33%). Other frequently mentioned alternate routes included:

- Bickford Road (6%)
- River Road (5%)
- Sunnyside Blvd. (4%)
- Bunk Foss Road (3%)

MOTIVATORS FOR USING ALTERNATIVE TRAVEL MODES

The top things that would motivate people to use transit (or use more frequently) when traveling through the interchange are:

- More direct service that doesn't require transfers (33%)
- More parking at park and ride lots and transit centers (27%)
- Transit provided service to more locations (22%)

The top things that would motivate people to vanpool (or use more frequently) when traveling through the interchange are:

- Free ride home in case of emergencies (32%)

- Free parking for vanpoolers (30%)
- Help establishing a vanpool (26%)

The top things that would motivate people to carpool (or use more frequently) when traveling through the interchange are:

- Reserved parking for carpoolers close to place of work (33%)
- Help establishing a carpool (30%)
- Free ride home in case of emergencies (28%)

DESIRED IMPROVEMENTS

The major categories for improvements included:

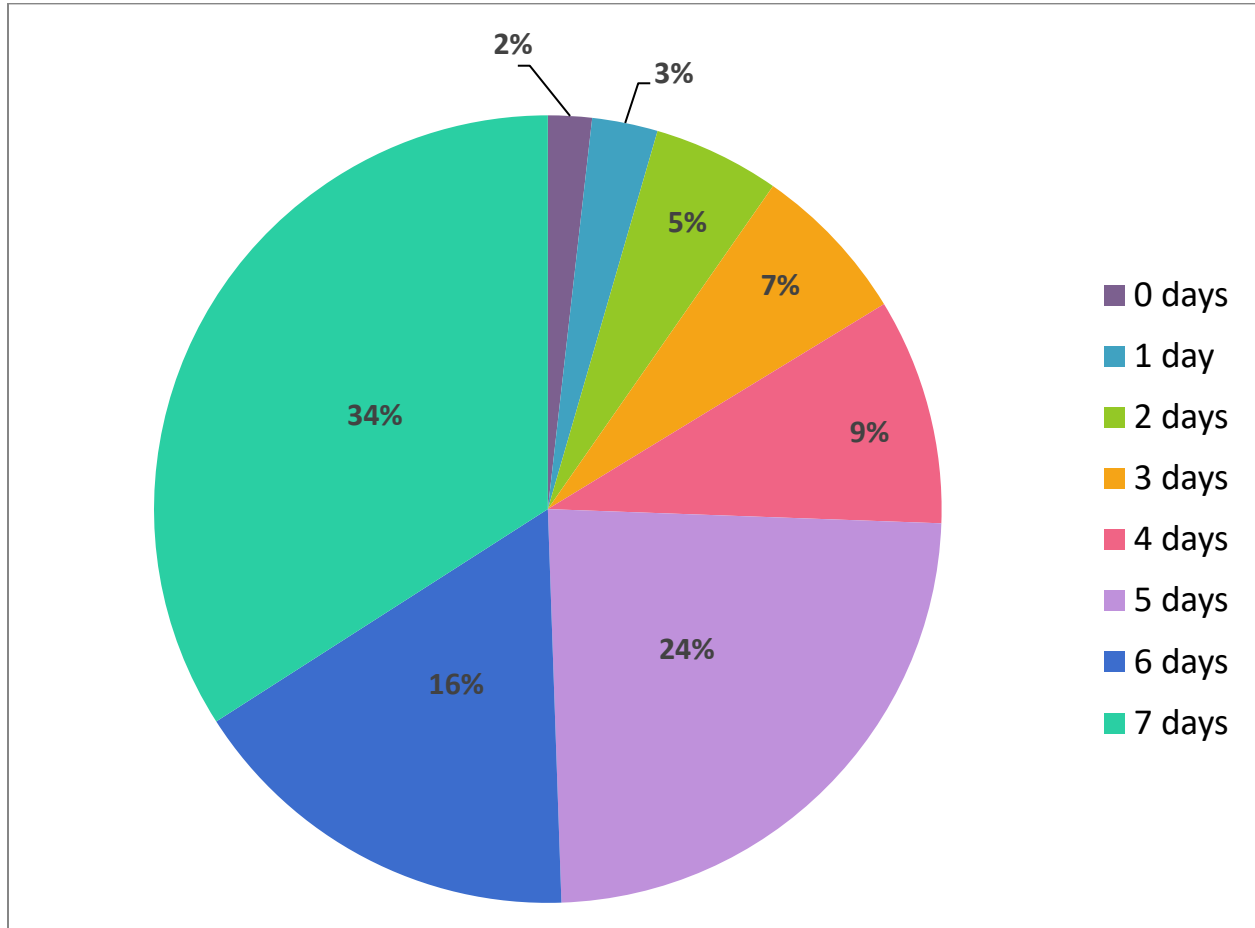
- Lane improvements (53%), especially:
 - Add more lanes (25%)
 - SR 204 needs its own lane (6%)
 - Add an additional westbound lane/additional roads east and west (4%)
 - 20th Street SE needs its own lane (3%)
 - Widen lanes (3%)
- Merge improvements (20%), especially:
 - SR 204 and 20th Street SE merge -- 20th Street SE should merge, it has better/safer view for merging (9%)
 - Improve merging lanes - non-specific (6%)

TRAVEL BEHAVIORS

How many days did you travel (by driving, carpooling, using transit, or other means) through the US 2, SR 204th and 20th Street SE Interchange in the last seven days?

- Three-quarters (74%) travel through the US 2, SR 204th and 20th Street SE interchange five or more days a week, with a third (34%) doing so every day of the week.

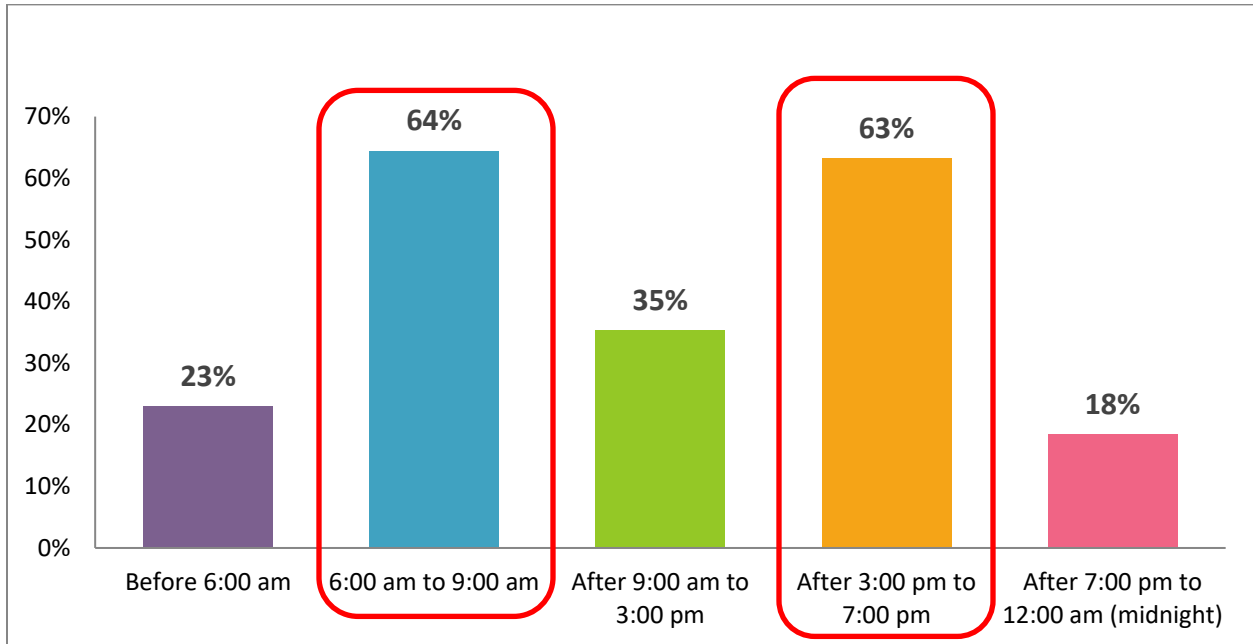
n = 2,704



What time of the day did you travel through the US 2, SR 204 and 20th Street SE interchange during weekdays in the last seven days? (check all that apply)

- Most are traveling through the interchange during the morning peak period (64%) and/or the evening peak period (63%).
- About a third (35%) travel through the interchange during the mid-day period.

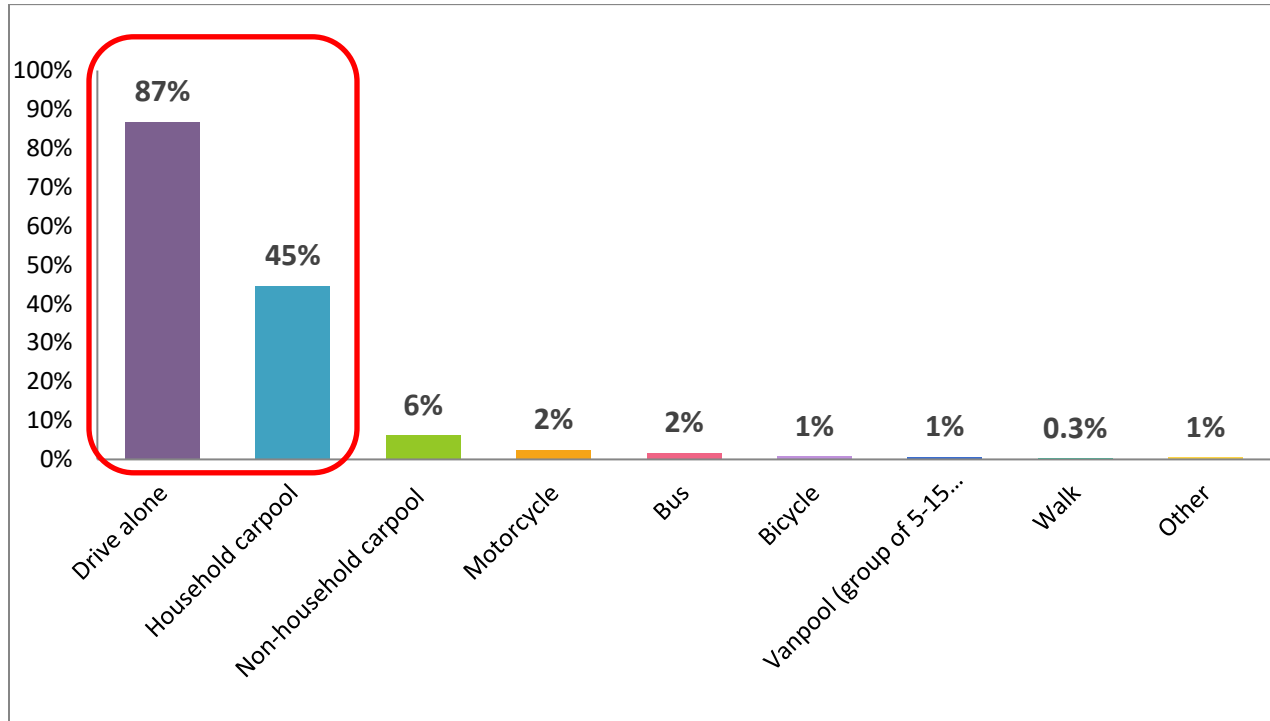
n = 2,270



How did you travel through the US 2, SR 204 and 20th Street SE interchange in the last seven days? (check all that apply)

- The vast majority (87%) drive alone through the interchange.
- More than two-fifths (45%) travel in a carpool with other household members. This is especially the case for those 25-44 years of age.

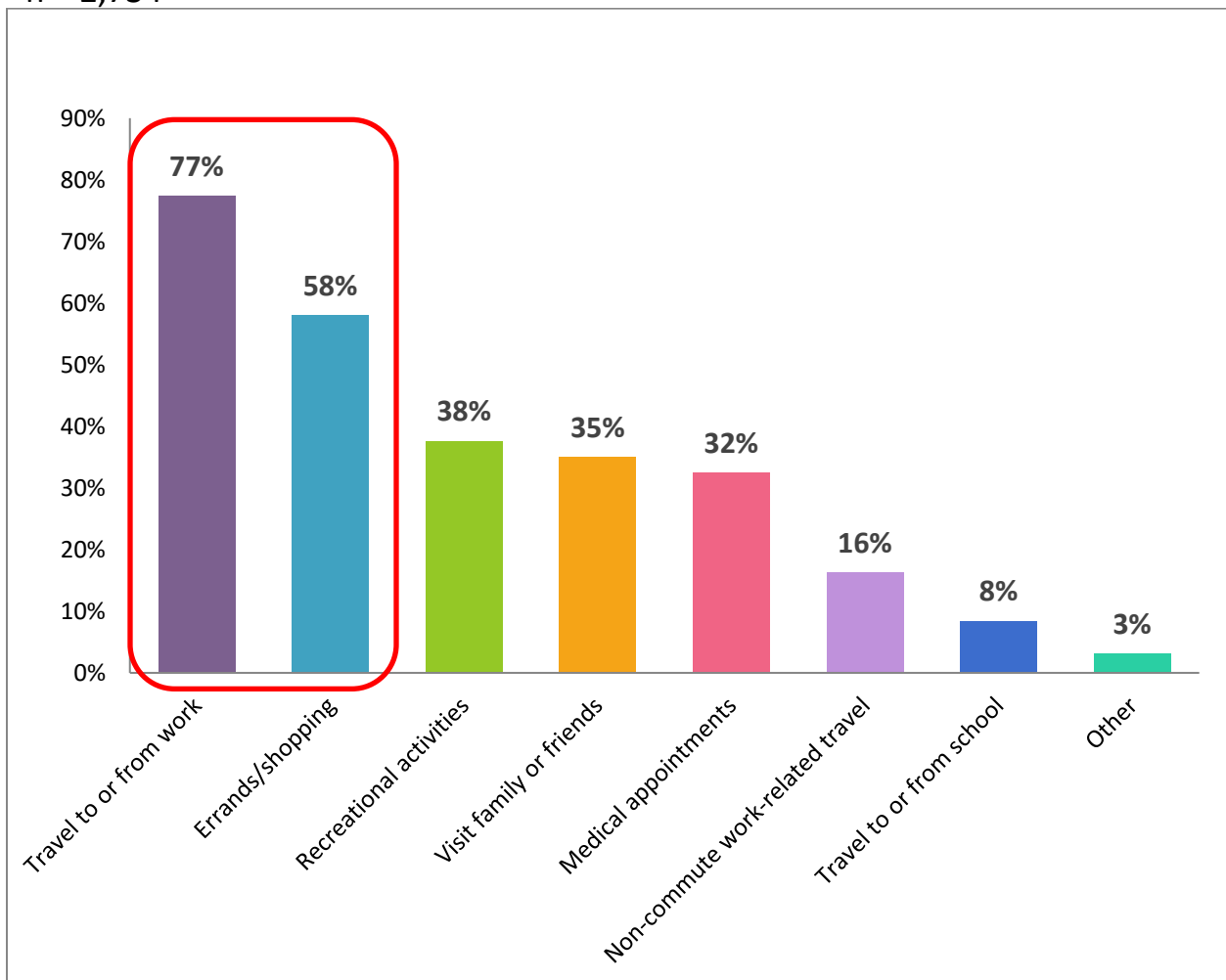
n = 2,730



For what trip purposes did you use the US 2, SR 204 and 20th Street SE interchange in the last seven days?
(check all that apply)

- Most (77%) are traveling through the interchange for the purpose of commuting to and from work.
- More than half (58%) also travel through the interchange while running errands or shopping.
- Around a third travel through the interchange for:
 - Recreational activities (38%)
 - Visiting family and friends (35%)
 - Medical appointments (32%)

n = 2,734

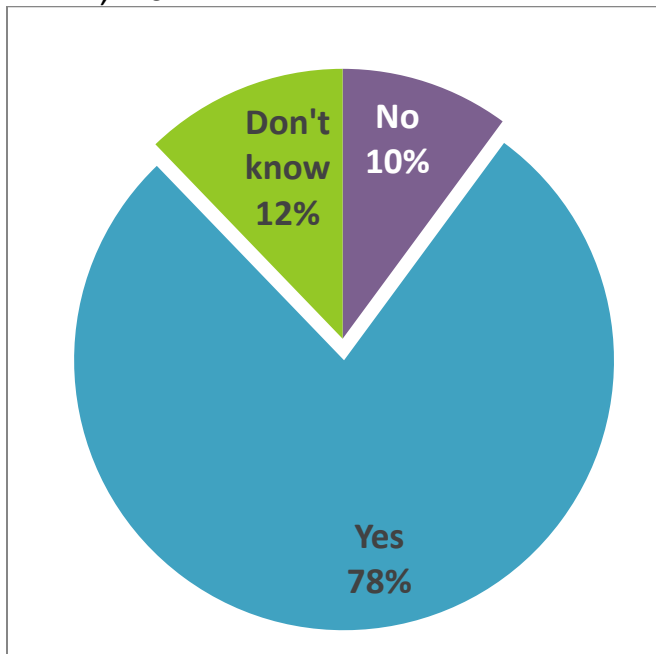


DEALING WITH TRAFFIC CONGESTION

Has your travel time through the US 2, SR 204 and 20th Street SE interchange changed over the last five years?

- The vast majority (78%) reported that their travel time through the interchange has changed in the last five years, with essentially all indicating that the time has increased, especially:
 - 6 to 10 minutes (21%)
 - 11 to 15 minutes (30%)
 - 16 or more minutes (42%)

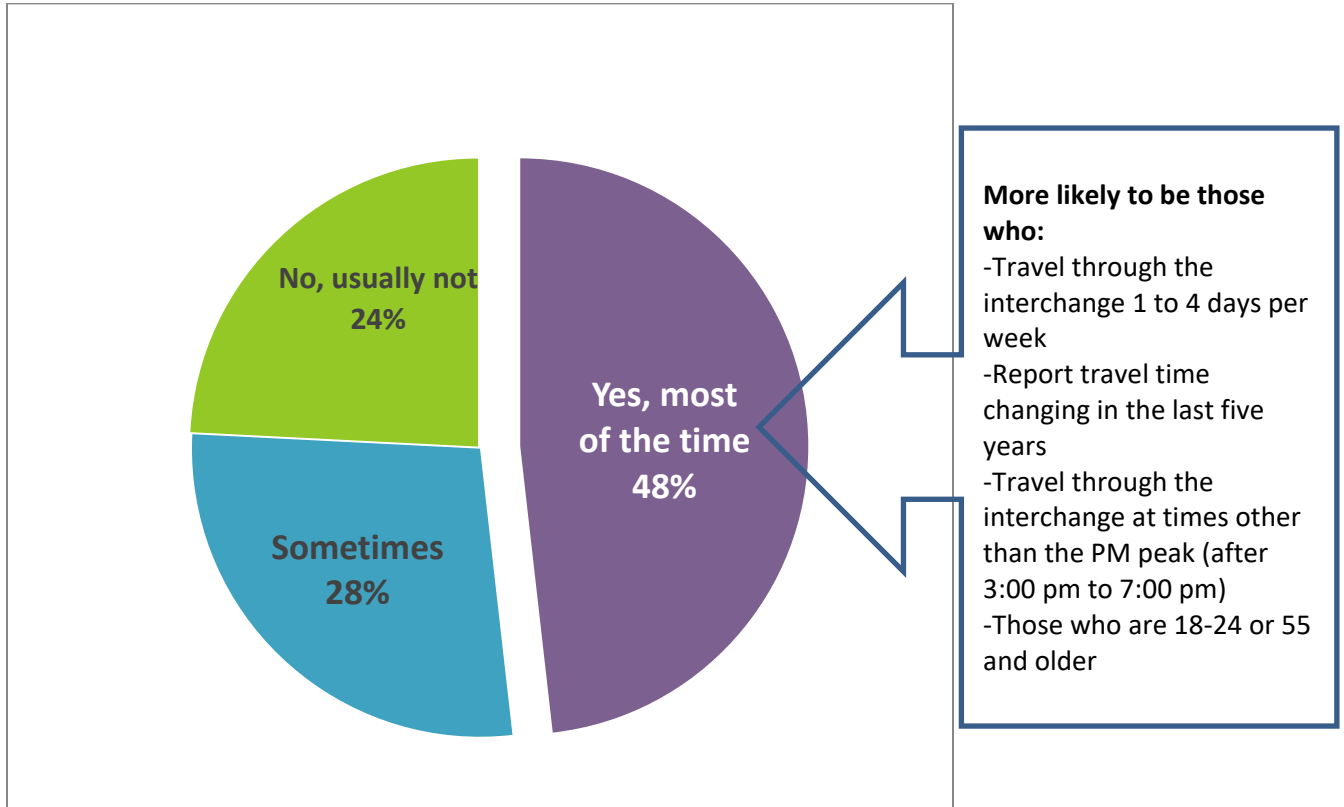
n = 2,746



Value	Percent
Increased up to 5 minutes	5.6%
Increased between 6 and 10 minutes	21.3%
Increased between 11 and 15 minutes	30.1%
Increased by 16 minutes or more	41.6%
Decreased by 5 minutes	0.3%
Decreased between 6 and 10 minutes	0.2%
Decreased between 11 and 15 minutes	0.2%
Decreased by 16 minutes or more	0.7%

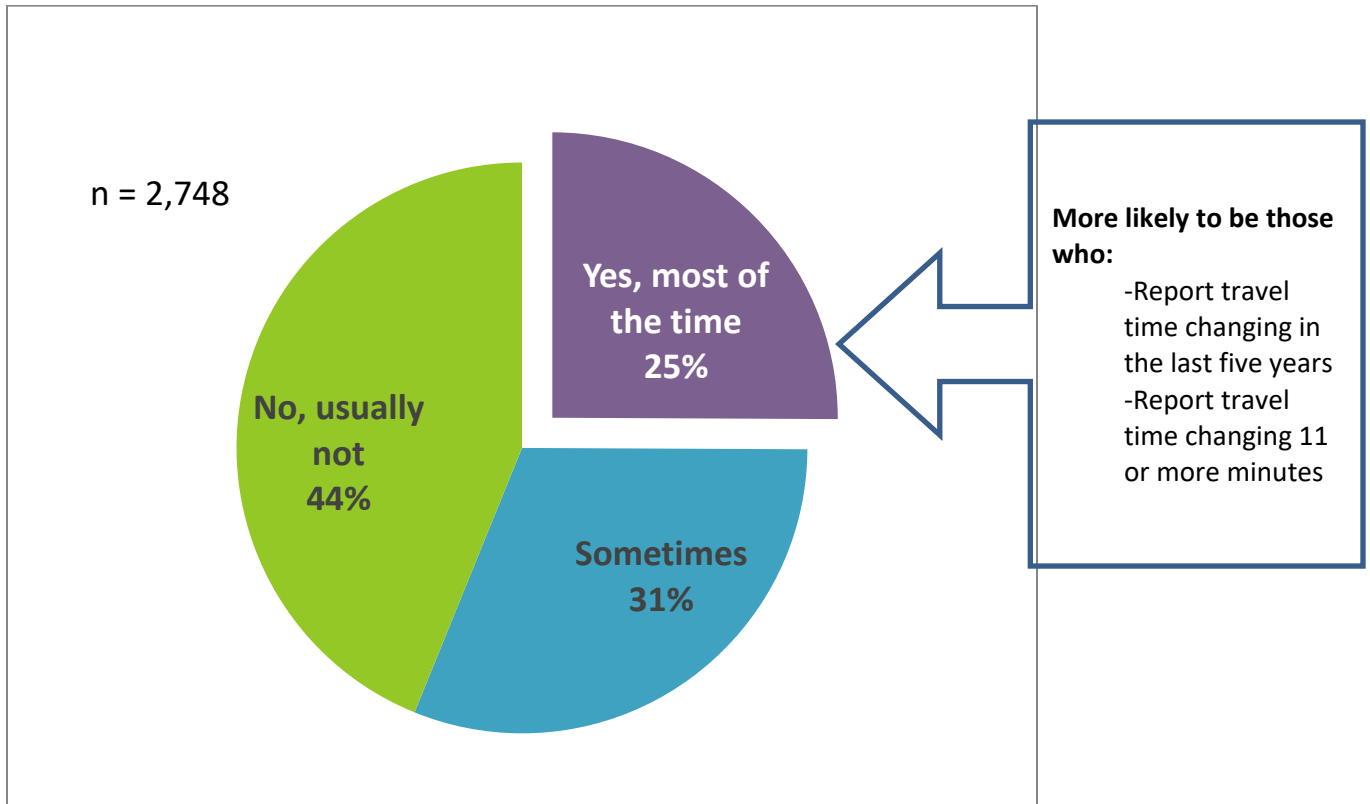
Do you purposely time your trips through the US 2, SR 204 and 20th Street SE interchange to avoid peak hours of traffic?

- Almost half (48%) reported timing their trips through the interchange *most of the time* to avoid peak hours of traffic.
- Another quarter (28%) reported doing so *sometimes*.



Do you avoid 20th Street SE or SR 204 to access the US 2 westbound trestle?

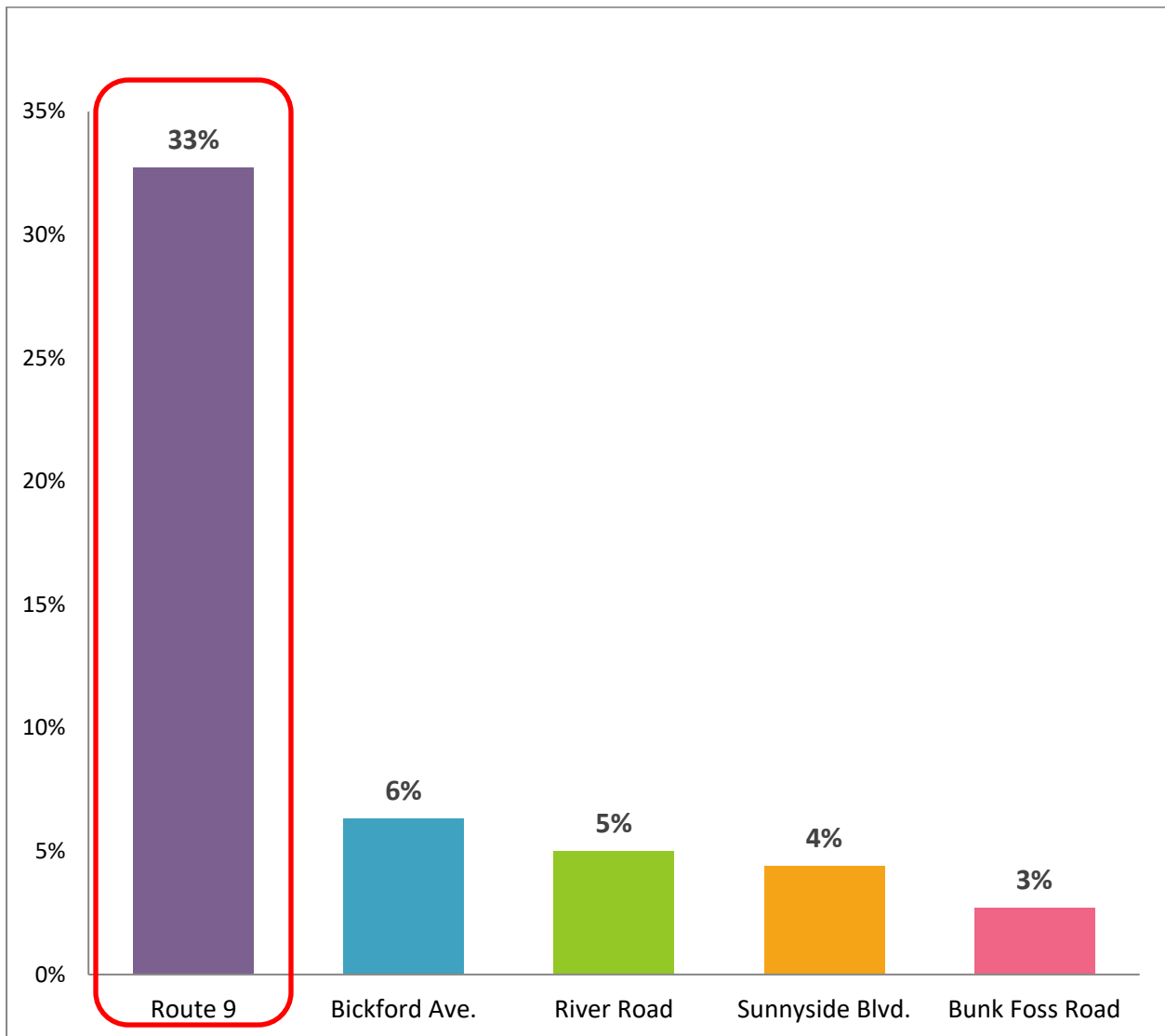
- A quarter (25%) reported avoiding 20th Street SE or SR 204 *most of the time* when accessing the US 2 westbound trestle.
- Another third (31%) reported doing so *sometimes*.
- A quarter (25%) reported avoiding 20th Street SE or SR 204 *most of the time* when accessing the US 2 westbound trestle.
- Another third (31%) reported doing so *sometimes*.



What alternate route or routes do you take to avoid 20th Street SE and SR 204 to get to westbound US 2?

- The alternate route mentioned by most respondents was Route 9 (33%)
- Other frequently mentioned alternate routes included:
 - Bickford Road (6%)
 - River Road (5%)
 - Sunnyside Blvd. (4%)
 - Bunk Foss Road (3%)

n = 898

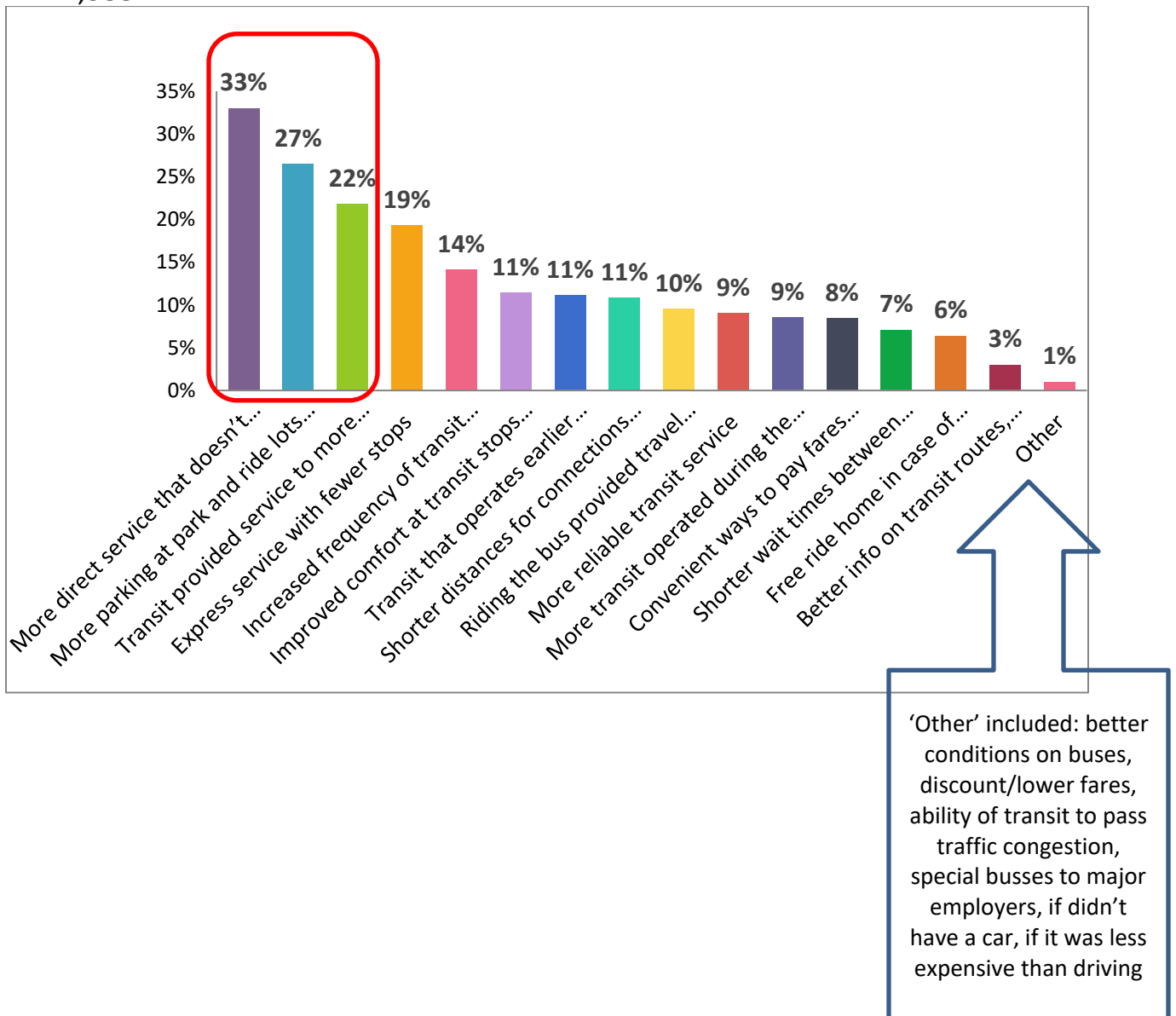


MOTIVATORS FOR USING ALTERNATIVE TRAVEL MODES

Which of the following are the top three that would motivate you to use transit (or use it more often) for your trips through the US 2, SR 204 and 20th Street SE interchange?

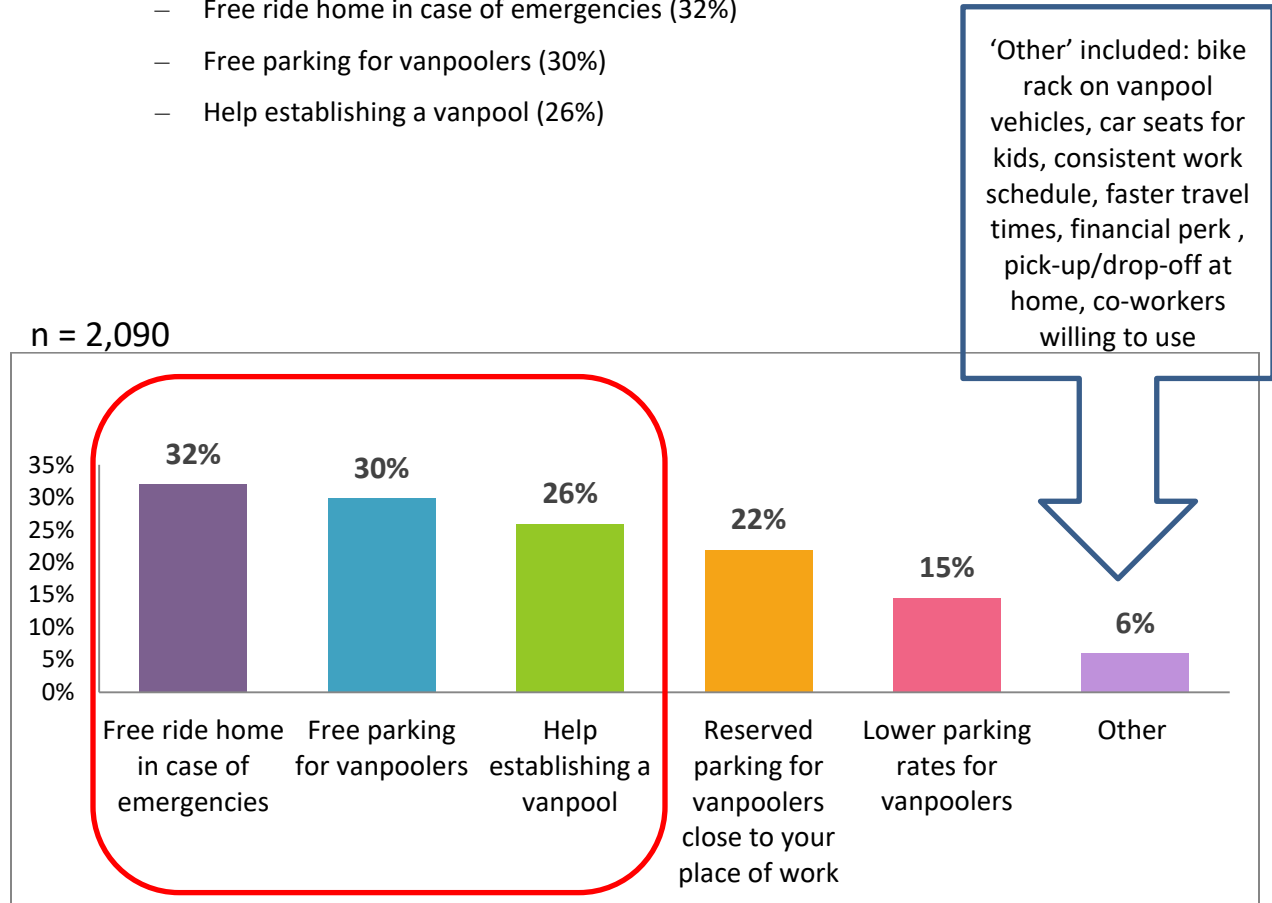
- The top things that would motivate people to use transit (or use more frequently) when traveling through the interchange are:
 - More direct service that doesn't require transfers (33%)
 - More parking at park and ride lots and transit centers (27%)
- Transit provided service to more locations (22%)

n = 2,388



Which of the following would motivate you to vanpool (or vanpool more often) for your trips through the US 2, SR 204 and 20th Street SE interchange? (check all that apply)

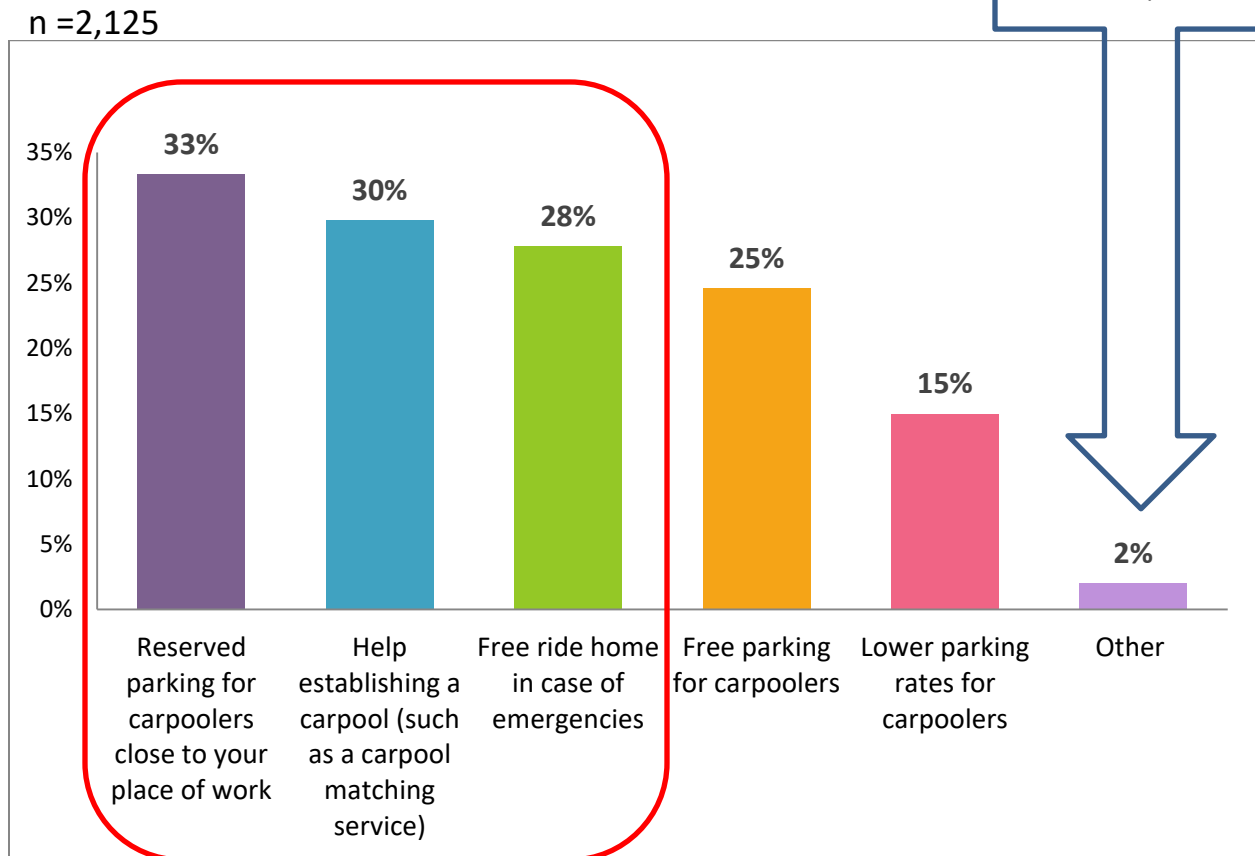
- The top things that would motivate people to vanpool (or use more frequently) when traveling through the interchange are:
 - Free ride home in case of emergencies (32%)
 - Free parking for vanpoolers (30%)
 - Help establishing a vanpool (26%)



Which of the following would motivate you to carpool (or carpool more often) for your trips through the US 2, SR 204 and 20th Street SE interchange? (check all that apply)

- The top things that would motivate people to carpool (or use more frequently) when traveling through the interchange are:
 - Reserved parking for carpools close to place of work (33%)
 - Help establishing a carpool (30%)
 - Free ride home in case of emergencies (28%)

'Other' included: friend/co-worker going to same place, carpool lane for faster trips, park & ride lot near the interchange, financial perk, if it provided a faster trip



DESIRED ROADWAY IMPROVEMENTS

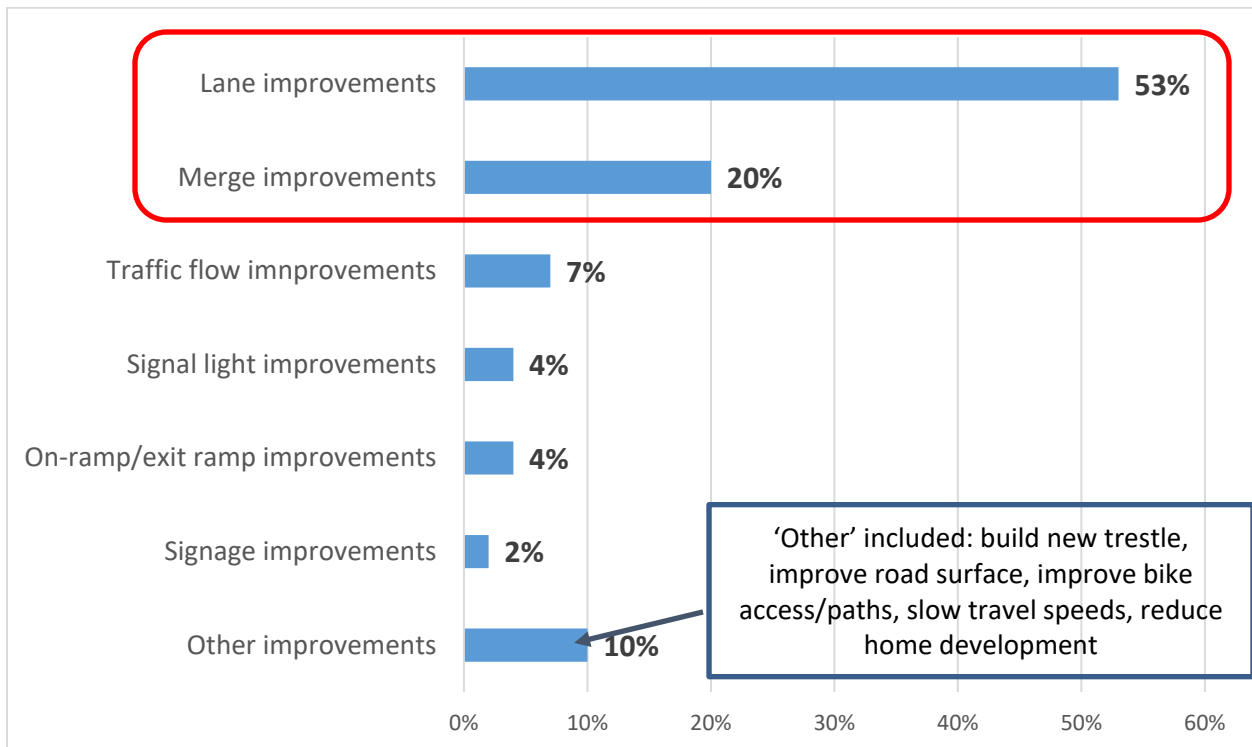
What roadway improvements would you like to see made to the US 2, SR 204 and 20th Street SE interchange?

- The major categories for improvements included:
 - Lane improvements (53%), especially:
 - Add more lanes (25%)
 - SR 204 needs its own lane (6%)
 - Add an additional westbound lane/additional roads east and west (4%)
 - 20th Street SE needs its own lane (3%)
 - Widen lanes (3%)
 - Merge improvements (20%), especially:
 - SR 204 and 20th Street SE merge -- 20th Street SE should merge, it has better/safer view for merging (9%)
 - Improve merging lanes - non-specific (6%)

“For starters you definitely need more lanes! You have three Highway's going into two lanes and there is no shoulder for anyone to pull over if they break down.”

“204 and 20th should NOT merge, especially 204 should not yield to 20th. It is very difficult to see cars coming down the hill from 20th. 204 is a highway, 20th is not. There should be a lane added for 204 to enter.”

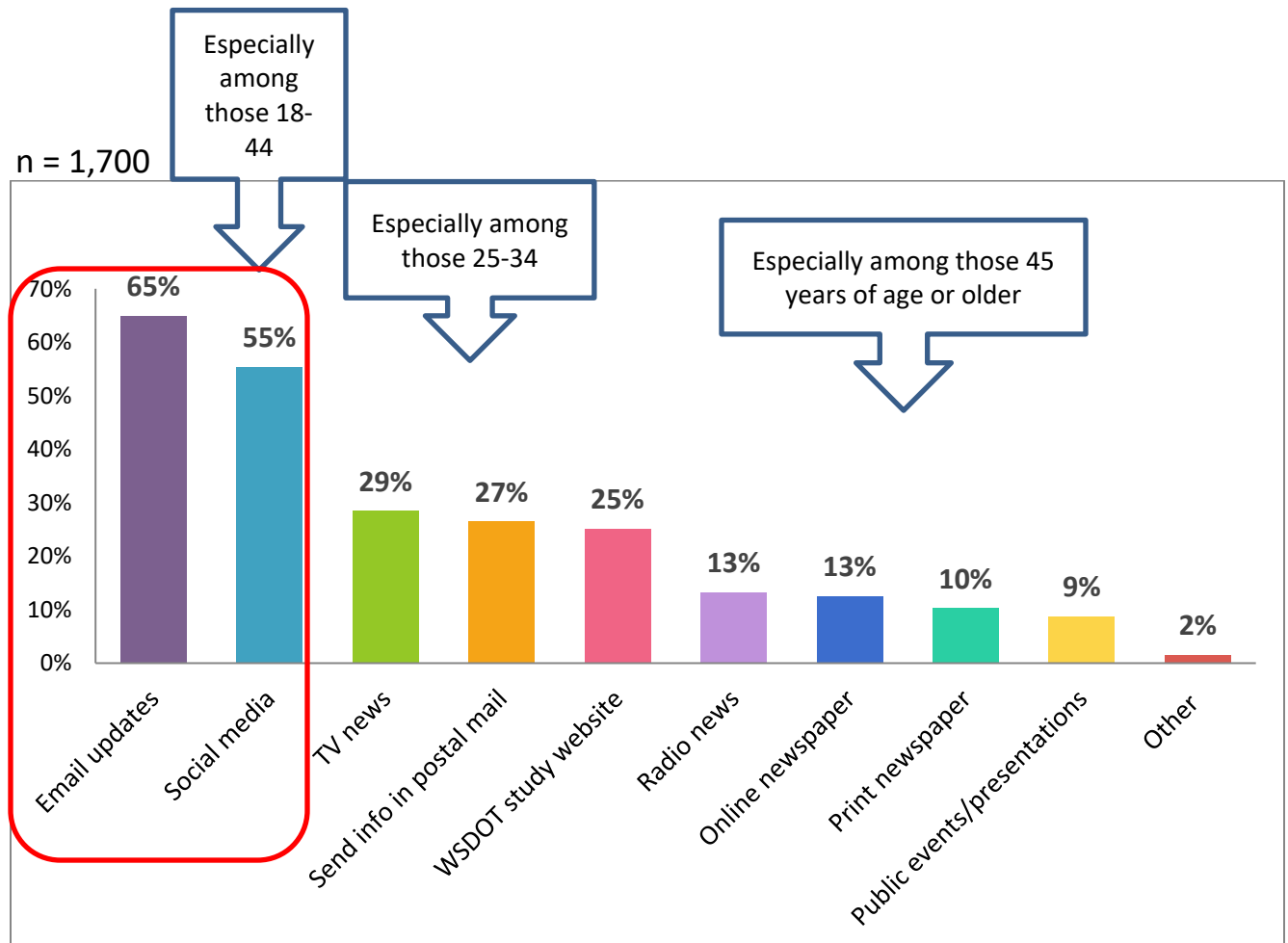
n = 1,719



FOLLOW UP WITH RESPONDENTS

As plans continue and feedback is incorporated, what are the top three best ways to keep you updated?

- Almost two-thirds (62%) indicated they wanted to be kept informed about the study, and half (50%) indicated that WSDOT could contact them further discussion. This is especially among those who:
 - Travel through the interchange 4 or more days per week
 - Whose reported travel time has changed in the last five years
 - Whose reported travel time has increased by 11 or more minutes
 - Who are 25 years of age or older
- Two methods for keeping people updated on the project are most preferred:
 - Email updates (65%)
 - Social media (55%)




TRAFFIC OPERATIONAL ANALYSIS TECHNICAL MEMORANDUM

March 2018

US 2/SR 204 Draft Operations Results Technical Memorandum

03/08/2018


Washington State
Department of Transportation
15700 Dayton Avenue N
Shoreline WA 98133-9710

Submitted by:

PARSONS

Prepared by:

Fehr & Peers

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INTRODUCTION

This memorandum describes the traffic operational results for existing year, 2040 and 2025 within the study area. The results include traffic operations using the VISSIM model and safety analyses using the Highway Safety Manual methodology.

METHODOLOGY

The Methods and Assumptions report documents the methodology used for the VISSIM analysis. Analyses for the following scenarios were developed:

- Existing AM and PM
- 2040 AM and PM No Build.
- 2040 AM and PM three (3) Build Scenarios, including Preliminary Preferred Alternative.
- 2025 AM and PM No Build.
- 2025 AM and PM Preliminary Preferred Alternative.

The traffic operations and safety analyses provide the following measures of effectiveness (MOEs):

- Travel Time- Peak 15-minute travel time between origin-destination pairs
- Intersections – level of service (LOS), average vehicle delay, and 95th percentile queues using VISSIM model
- Freeway segments – LOS, density, speed, and queues using VISSIM model
- Corridor – average travel time (by mode), average travel speed, and queues using VISSIM model
- Collisions, using Highway Safety Manual predicted crash rate calculations

The specific methods used to calculate and report these MOEs are described in the *Methods and Assumptions Report*.

EXISTING CONDITIONS

Existing Interchange

The existing study interchange is located approximately two miles east of I-5 and the city of Everett. As shown in **Figure 1**, the interchange is at a horizontal curve in US 2; WB US 2 drops to one lane before this curve. The off-ramp from WB US 2 to EB SR 204 is a left exit before the mainline curves west; the on-ramp from SR 204 and 20th Street SE joins the mainline as a single add lane downstream of the mainline US 2 curve. Prior to entering WB US 2, off-ramps from SR 204 and 20th Street SE merge to a single lane. 20th Street SE is the primary alignment, and proceeds downhill and along a straight path to join US 2. SR 204 traffic exits via a horizontal curve to the right, yielding to 20th Street SE traffic as it merges into the on-ramp. WB US 2 maintains two downstream of the study interchange across the Ebey Slough.

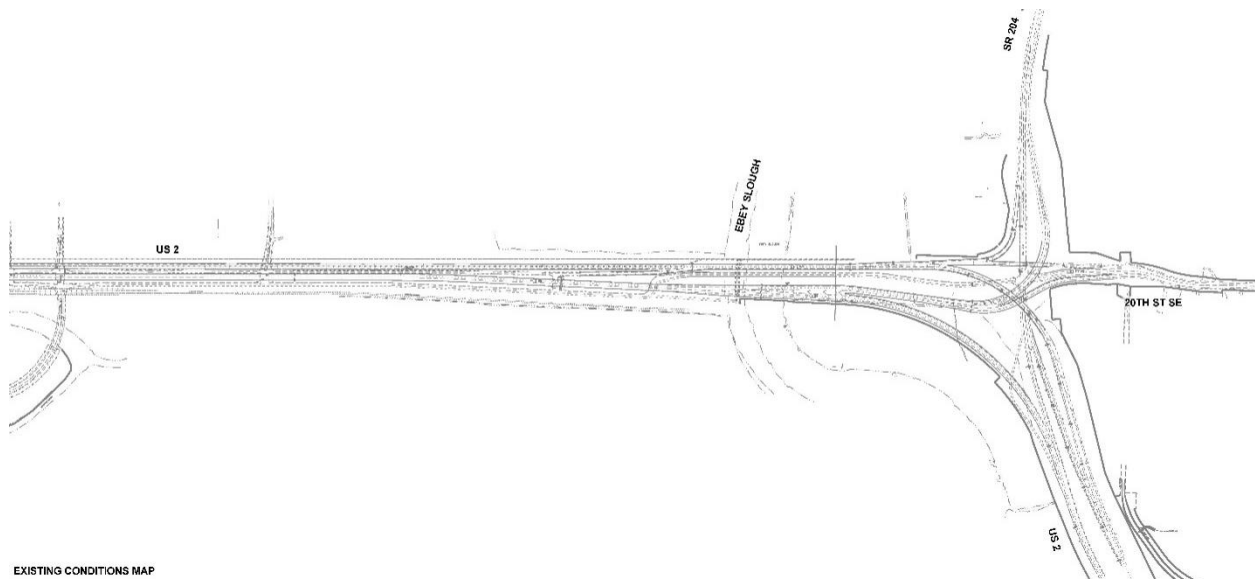
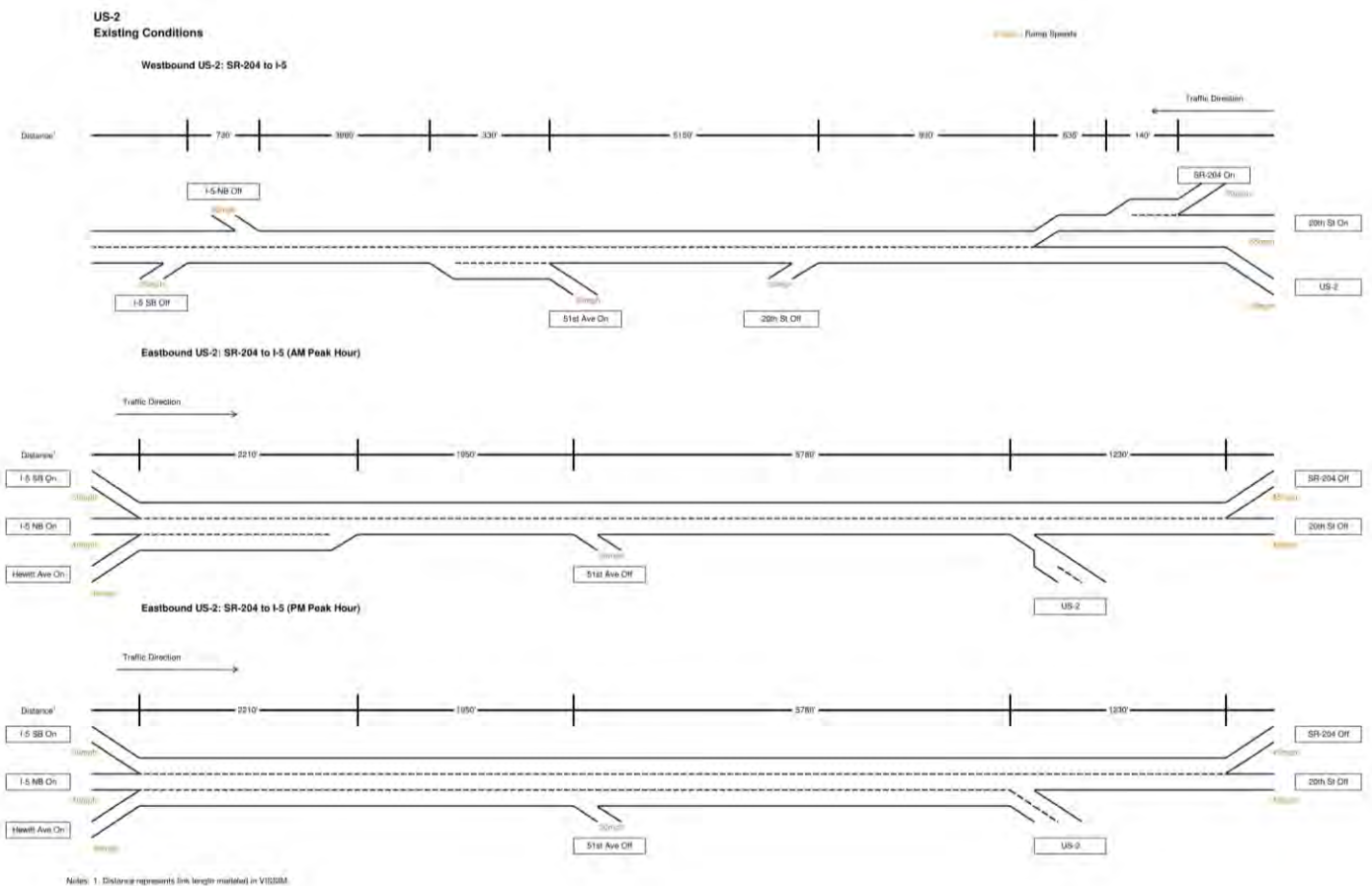


Figure 1 Existing Interchange Layout

EB US 2 is also two lanes across the Ebey Slough; at the US 2/SR 204/20th Street SE interchange, the left lane exits and separates into two flyovers toward EB SR 204 as a right-hand add lane and 20th Street SE as a right-hand merge. The right lane continues as mainline US 2 around the horizontal curve to the south, where EB SR 204 joins as an add lane to the left. The shoulder is used as a third lane during PM peak hours.

The existing corridor configuration is presented graphically in **Figure 2**. Analysis of the existing conditions focused primarily on average speed and travel time. The speeds were derived from the Vissim traffic simulation model, which was validated against traffic counts and travel time surveys conducted within the study area. **Figure 3** shows the posted speed limits within the study area to provide a frame of reference.

Figure 2 Existing Conditions Traffic Configuration



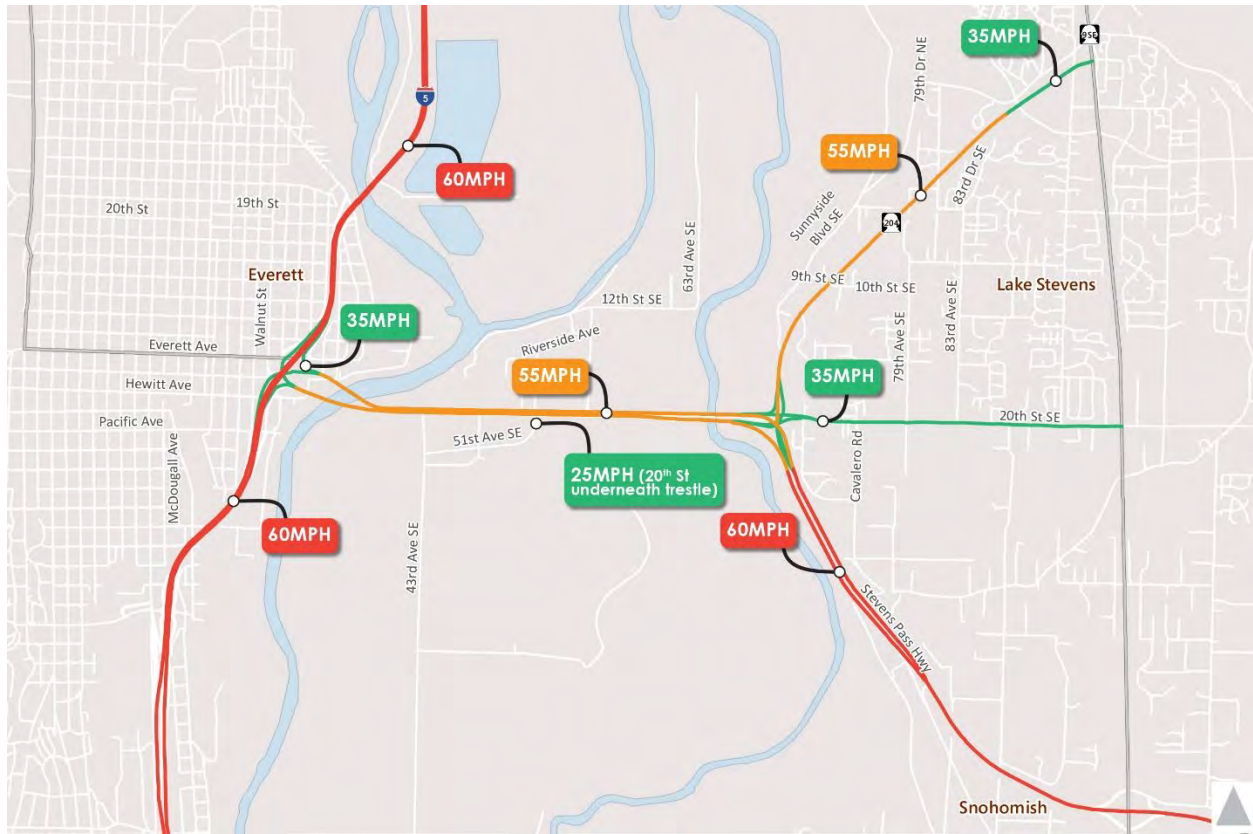


Figure 3 Existing Conditions — Posted Speeds

Existing Traffic Operations

In order to conceptualize the network experience through the study area, three “corridors” were distinguished for each of the three groups of travelers through this intersection: those originating on SR 204, those originating on 20th Street SE, and those who enter the study area on mainline US 2 as through traffic. The predominant flow of traffic along this route is toward I-5 SB, so a point on I-5 at Pacific Avenue was chosen as the corridor endpoint. All three corridors terminate at the same location to provide a means of comparison between the three locations upstream of the US 2/SR 204/20th Street SE interchange.

Traffic demand at the study interchange is highest for WB traffic during the AM peak hour. The primary demand flow is westward in the mornings and eastward in the afternoons. Current operations present severe congestion for WB traffic in the mornings, especially for those entering US 2 from SR 204. The travel time for those using SR 204 to access US 2 WB is about 150 percent of the travel time via 20th Street SE. This illustrates the disadvantage of SR 204 traffic attempting to merge with 20th Street SE traffic prior to entering US 2. Travel times for through traffic and 20th Street SE traffic are comparable, with those along mainline US 2 experiencing lower travel time due to higher speeds than those on the surface street. EB traffic experiences no delay through the corridors during the AM peak.

Instead of an equal-but-opposite flow in the afternoon, the PM peak demand at the US 2/SR 204/20th Street SE interchange is much lower than the AM peak. This is due to EB traffic being constrained on I-5 upstream of the I-5/US 2 interchange. Although travelers experience severe congestion along I-5 south of US 2, the traffic destined for SR 204 in the afternoon will experience travel times about half the duration of their westbound morning commute through the corridor.

Average travel times collected by a study vehicle making multiple runs during peak hours of a regular weekday are outlined in **Table 1**, as well as corresponding average travel speed.

Traffic on WB SR 204 and 20th Street SE approaching the interchange merge location experience speeds less than 20 miles per hour. Speeds on US 2 also slow after the lane drop west of the Bickford Avenue on-ramp. Once on the trestle, traffic generally flows faster than 35 miles per hour, although speeds were observed much slower on certain days due to congestion on I-5 or other downstream constraints.

In the PM peak hour, EB traffic flows smoothly, with some slowdowns approaching the diverge from US 2 to SR 204/20th St SE. Heavy volumes on the SR 204 EB off-ramp create slowdowns on the ramp and at the intersection at Sunnyside Boulevard SE.

TABLE 1 EXISTING (2016) CORRIDOR TRAVEL TIME

Segment	Direction	Travel Time (min)	Speed (mph)
AM Peak 15 Minutes			
From SR 204 at 81st Ave SE to I-5 at Pacific Ave	WB	13:45	19
From 20th St SE at 83rd Ave SE to I-5 at Pacific Ave	WB	9:05	25
From US 2 at Bickford Ave to I-5 at Pacific Ave	WB	8:05	30
From I-5 at Pacific Ave to SR 204 at 81st Ave SE	EB	4:55	51
From I-5 at Pacific Ave to 20th St SE at 83rd Ave SE	EB	4:55	45
From I-5 at Pacific Ave to US 2 at Bickford Ave	EB	4:55	55
PM Peak 15 Minutes			
From SR 204 at 81st Ave SE to I-5 at Pacific Ave	WB	5:00	51
From 20th St SE at 83rd Ave SE to I-5 at Pacific Ave	WB	5:00	45
From US 2 at Bickford Ave to I-5 at Pacific Ave	WB	4:25	55
From I-5 at Pacific Ave to SR 204 at 81st Ave SE	EB	7:00	36
From I-5 at Pacific Ave to 20th St SE at 83rd Ave SE	EB	6:50	32
From I-5 at Pacific Ave to US 2 at Bickford Ave	EB	6:15	43

Freeway Operations

Existing freeway operations were analyzed in VISSIM using the volume and travel time data collected. Output from VISSIM delivers a baseline to quantify existing conditions for comparison with the future no-build and build scenarios. WSDOT has established operating criteria for all highways of statewide significance. This level of service (LOS) requirement is measured on an alphabetical scale from A to F, with A being the highest LOS and therefore the safest and most comfortable for roadway users. Each letter

represents the ability of an element of the infrastructure to meet the traffic demand; on freeways, this is determined using vehicle density (defined in **Table 2**). Analysis of the existing traffic conditions revealed that the existing network is failing in several key locations.

TABLE 2 LOS CRITERIA (URBAN FREEWAYS)

LOS	Descriptor	Density (VPLPM)
A	Free Flow	0-11
B	Reasonably Free Flow	>11-18
C	Stable Flow	>18-26
D	Approaching Unstable Flow	>26-35
E	Unstable Flow	>35-45
F	Forced Flow	>45 or demand exceeds capacity

Source: Highway Capacity Manual

The established LOS operating standard for US 2 is D. As shown in **Table 3**, during the AM peak, WB US 2 fails service criteria throughout the entire study area. At no point in the study area during the morning peak hour do traffic operations on US 2 WB improve over LOS E. With the increased demand forecast through the horizon year 2040, the LOS is expected to reach LOS F along the entire WB corridor, with portions that are already LOS F exhibiting worsening.

SB I-5 also operates at LOS E and F in the area surrounding the US 2/I-5 interchange. The failing I-5 segments extend to the limits of the study area; this study does not address the US 2/I-5 interchange beyond the impact observed on the US 2/SR 204/20th Street SE interchange.

During the PM peak, WB US 2 operates within acceptable operating criteria. The existing merge of 20th Street SE and SR 204 operates at LOS E; EB US 2 also operates at LOS E and F just upstream of the SR 204/20th Street SE off-ramp. NB I-5 operates at LOS F in vicinity of the I-5/US 2 interchange.

TABLE 3 EXISTING (2016) FREEWAY OPERATIONS

Facility	Type	LOS (A-F)		Density (VPLPM)		Speed (mph)		Queue (veh)	
		AM	PM	AM	PM	AM	PM	AM	PM
US 2 WB: Bickford Ave On-ramp	Merge	B	B	19	16	48	51	10	10
US 2 WB: SR 204 EB Off-ramp	Diverge	F	B	95	19	17	53	10	0
US 2 WB: SR 204 WB/20th St On-ramp to Ebey Island Off-ramp	Weave	D	C	33	25	45	47	210	20
US 2 WB: Ebey Island Off-ramp to 50th St On-ramp	Basic	D	C	28	20	53	57	0	0
US 2 WB: Ebey Island On-ramp	Merge	D	C	34	20	48	58	20	10
US 2 WB: Ebey Island On-ramp to I-5 NB On-ramp	Basic	E	C	40	22	43	56	0	0

Facility	Type	LOS (A-F)		Density (VPLPM)		Speed (mph)		Queue (veh)	
		AM	PM	AM	PM	AM	PM	AM	PM
US 2 EB: Hewitt Ave On-ramp	Merge	B	D	14	33	50	44	40	110

US 2 EB: Ebey Island Off-ramp	Diverge	B	D	16	30	55	50	0	0
US 2 EB: Ebey Island Off-ramp to SR 204/20th St Off-ramp	Basic	B	E	15	39	55	45	0	10
US 2 EB: SR 204 EB/20th St Off-ramp	Diverge	B	F	19	53	53	32	0	10
US 2 EB: SR 204 EB/20th St Off-ramp to SR 204 WB On-ramp	Basic	B	B	11	13	56	55	0	10
US 2 EB: SR 204 WB On-ramp	Merge	B	B	11	13	54	54	40	0
US 2 EB: SR 204 WB On-ramp to Bickford Ave Off-ramp	Basic	A	B	10	13	58	58	0	0
US 2 EB: Bickford Ave Off-ramp	Diverge	B	B	10	14	58	58	0	0
I-5 NB: Pacific Ave Off-ramp	Diverge	C	F	24	83	52	24	0	170
I-5 NB: US 2 EB Off-ramp	Diverge	B	F	18	71	52	33	0	20
I-5 NB: US 2 EB Off-ramp to US 2 WB/Everett Ave On-ramp	Basic	B	C	15	19	56	53	0	0
I-5 NB: US 2 WB/Everett Ave On-ramp to Marine View Dr Off-ramp	Weave	B	E	20	38	52	37	30	10
I-5 SB: Marine View Dr On-ramp to US 2 EB/Everett Ave Off-ramp	Weave	F	C	51	27	31	49	280	0
I-5 SB: US 2 EB/Everett Ave Off-ramp to US 2 WB On-ramp	Basic	D	C	29	21	52	57	10	10
I-5 SB: US 2 WB On-ramp	Merge	D	C	33	23	51	60	150	10
I-5 SB: Pacific Ave On-ramp	Merge	E	D	35	32	46	45	10	40

The existing congestion conditions are illustrated in **Figure 4** and **Figure 5**.

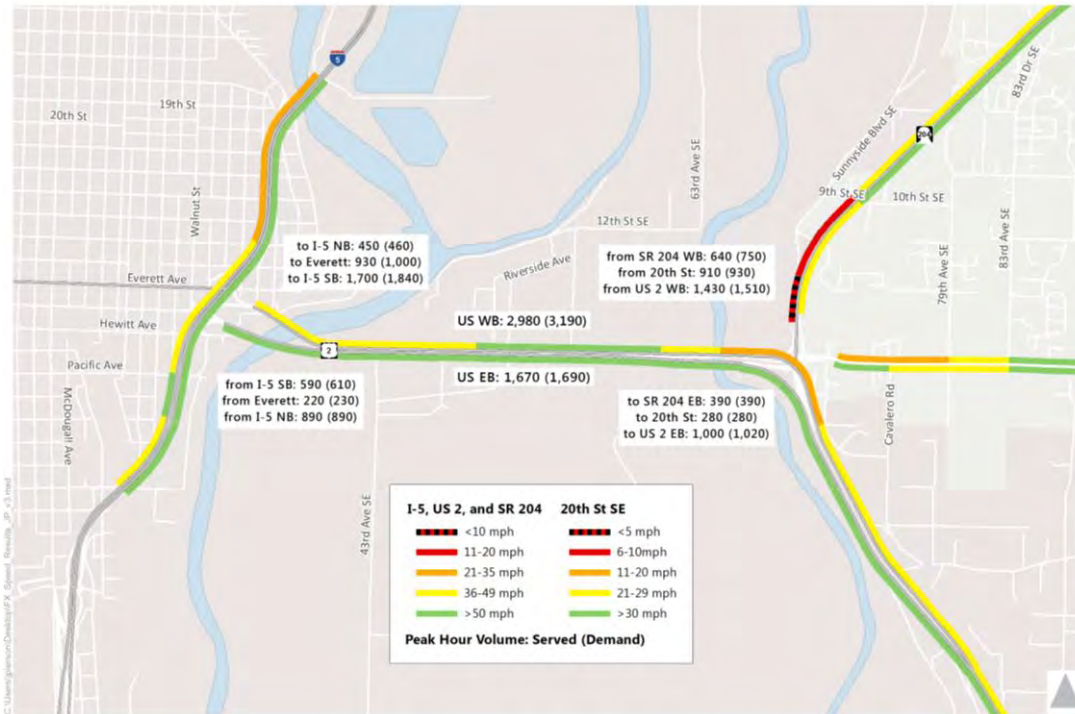


Figure 4 Existing (2016) Speeds - AM

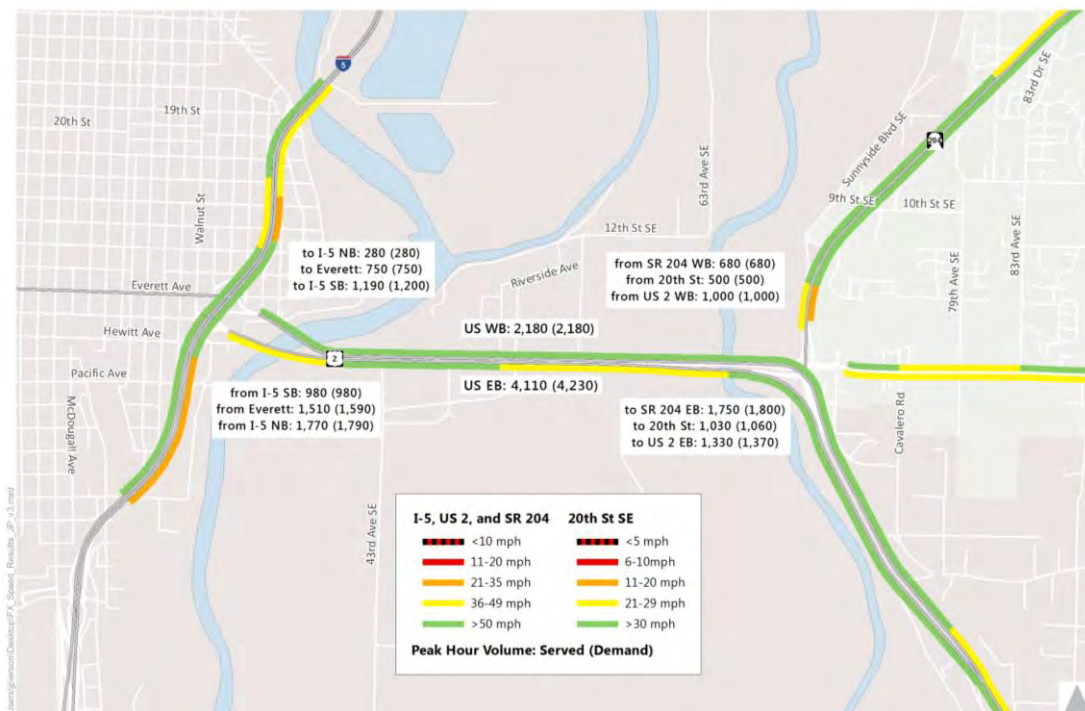


Figure 5 Existing (2016) Speeds - PM

Operations at Arterial Intersections

The local roadway network at the study interchange consists of the intersection of SR 204 and 20th Street SE directly below the interchange; there are several intersections along 20th Street SE east of the interchange, and several minor non-signalized intersections along SR 204. As shown in **Table 4**. The intersections currently operate at acceptable levels of service except for the Cavallero Road intersection, which experiences long delays in the AM peak, and Sunnyside Blvd, which experiences severe delays in the AM peak and also operates poorly in the afternoon. In the AM peak hour the delays and queues on Sunnyside Blvd are severe approaching SR 204 waiting for a gap in traffic on SR 204 to merge into the already slow queue of vehicles approaching the SR 204/20th St SE merge onto US 2.

TABLE 4 EXISTING (2016) INTERSECTION OPERATIONS

Intersection	Control Type	LOS		Delay (sec)	
		AM	PM	AM	PM
SR204/20th St SE	All-way stop	A	D	10	34
SR 204/Sunnyside	Side-street stop	F	E	481	35
SR 204/9th	Side-street stop	B	A	15	10
Cavallero/20th St SE	Signal	E	B	62	20
Ebey Island WB ramps	All-way stop	A	A	5	3
Ebey Island EB ramps	All-way stop	A	B	9	12
79th Ave SE/20th St SE	Signal	D	B	53	12
83rd Ave SE/20th St SE	Signal	D	B	39	12
91st Ave SE/20th St SE	Signal	A	B	9	11
Note: LOS at intersections is determined using average vehicle delay.					

Existing Queues

Queuing along I-5, US 2, SR 204, and 20th Street SE was observed on Wednesday November 16, 2016 and Thursday November 17, 2016, during the AM (7:00 AM – 8:30 AM) and PM (4:00 PM – 5:30 PM) peak periods. The observations were taken at the following locations:

- I-5 / US 2 interchange
- US 2 / SR 204 interchange
- US 2 / 20th Street SE off-ramp
- 20th Street SE / Cavallero Road
- 20th Street SE / 79th Avenue SE
- 20th Street SE / 83rd Avenue SE

Observed volumes during the AM peak period indicate queuing along 20th Street SE and SR 204 in the westbound directions as well as at the US 2 / SR 204 / 20th Street on-ramp and interchange. Based on our

observations, all vehicles in a queue waiting at a signal along 20th Street SE were able to progress through the intersection without any additional delay during the AM peak period. However, the queue did extend from the freeway interchange to Cavalero Road and from Cavalero Road to 79th Avenue SE. Along SR 204, the queue from the interchange extends past 81st Avenue NE. The queues during the AM peak period are generally representative of the travel patterns as a majority of commuters travel towards the City of Everett and I-5 in the mornings.

During the PM peak period, there is high demand for the eastbound movements at both the I-5 / US 2 interchange and US 2 / SR 204 / 20th Street SE interchange. This results in substantial queuing through along I-5 and slowing on the US 2 Trestle. Vehicles attempting to merge onto eastbound US 2 begin queuing in the along I-5 northbound past 41st Street.

The 20th Street SE / Cavalero Road intersection also experiences some PM peak period queueing with the eastbound queue extending back to the US 2 / 20th Street SE off-ramp. Drivers traveling east begin slowing on the US 2 Trestle and even have to come to a stop on US 2. The queues are representative of the travel patterns as a majority of commuters return to this area from the west in the PM peak period.

Turning movement counts at each intersection are provided in **Figure 6**. Intersection queues were also reported by VISSIM for average, minimum and maximum values. These results are provided in the Appendix.

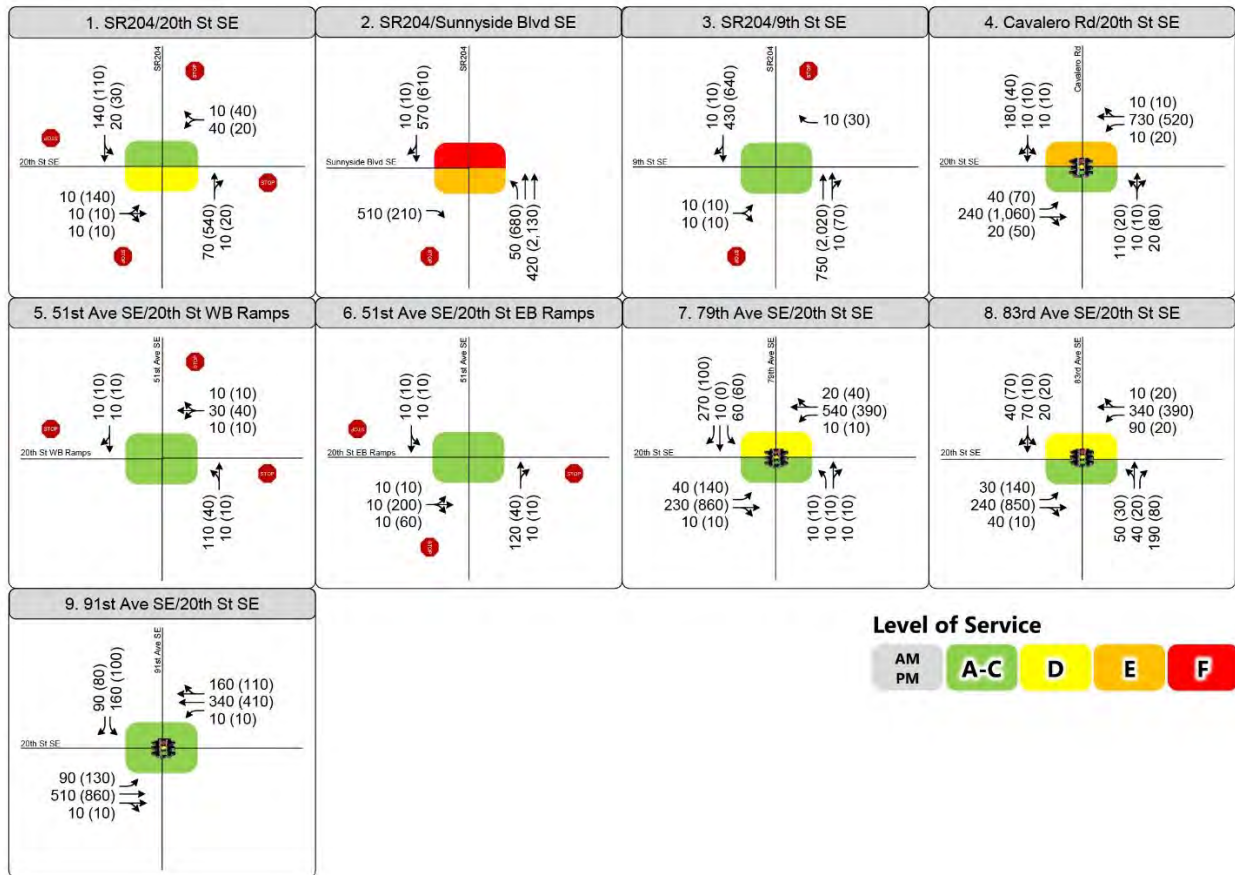


Figure 6 Existing (2016) Intersection Turning Movements

TRAFFIC OPERATIONS- 2040 NO-BUILD AND BUILD ALTERNATIVES

The following sub-sections describe the results of the traffic operations analysis for 2040 No Build and each of the three Build Alternatives:

- Speed
- Freeway Level of Service
- Intersection Level of Service
- Travel Time

The Appendix contains additional details regarding the speed, LOS and queuing results.

Interchange Configuration

No-Build

As shown in **Figure 7**, the no-build model for 2040 assumes that the US 2 WB Ebey Slough trestle will have been replaced with a wider structure capable of supporting four-lane operations during the peak hour. Mainline US 2 remains a single lane upstream of the study interchange.

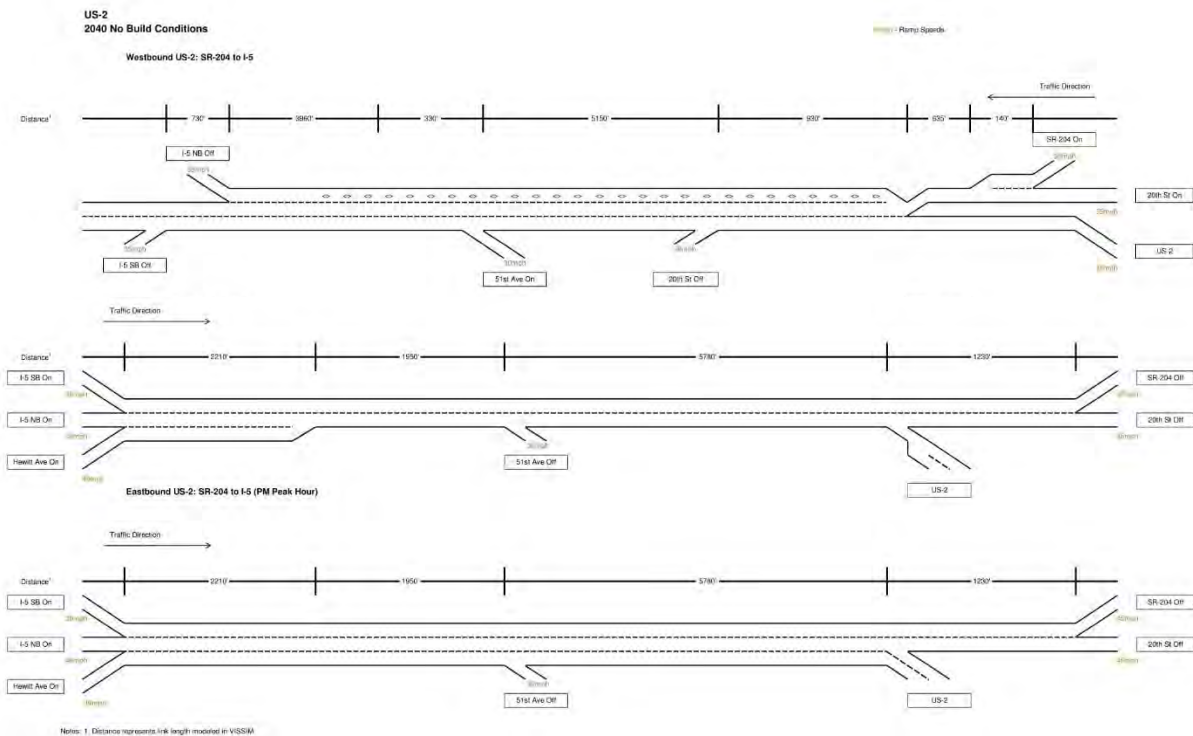


Figure 7 No-Build 2040 Traffic Configuration

Corridor Operations

The increase in demand from present day to 2040 no-build results in increased travel times for WB traffic during the AM peak. Travel times are expected to increase by more than twice the duration of existing travel times for those originating on SR 204, and three times the travel time for those originating on 20th Street SE. Corridor travel times for mainline US 2 WB traffic are estimated to increase by 75 percent. This result includes the assumption that the traffic signals in the City of Everett will be optimized to avoid traffic back-ups entering the downtown street system. This assumption was also applied to each of the build alternatives. Conversely, EB traffic during the AM peak will see only minimal increase in travel time from present-day conditions.

During the PM peak, WB travel times are most pronounced for those traveling on mainline US 2. While SR 204 and 20th Street SE travelers experience moderate increase in travel time, the mainline travel times increase from 4:25 to 12:00 minutes. Travel times for EB traffic in the PM peak decrease for those exiting at the US 2/SR 204/20th Street SE interchange and are approximately the same for mainline US 2.

There is no travel-time benefit for transit or HOV traffic in the no-build configuration because the US 2 trestle operates relatively smoothly due to upstream constraints. There is little or no time advantage for HOVs/transit on the trestle HOV lane.

Forecast travel times through the study corridor are listed in **Table 5**.

TABLE 5 NO-BUILD (2040) CORRIDOR TRAVEL TIME

Segment	Direction	Travel Time (min)	Speed (mph)
AM Peak 15 Minutes			
From SR 204 at 81st Ave SE to I-5 at Pacific Ave	WB	32:00	8
From 20th St SE at 83rd Ave SE to I-5 at Pacific Ave	WB	28:05	8
From US 2 at Bickford Ave to I-5 at Pacific Ave	WB	14:20	17
From I-5 at Pacific Ave to SR 204 at 81st Ave SE	EB	5:05	50
From I-5 at Pacific Ave to 20th St SE at 83rd Ave SE	EB	5:35	39
From I-5 at Pacific Ave to US 2 at Bickford Ave	EB	5:00	53
PM Peak 15 Minutes			
From SR 204 at 81st Ave SE to I-5 at Pacific Ave	WB	6:20	41
From 20th St SE at 83rd Ave SE to I-5 at Pacific Ave	WB	8:15	27
From US 2 at Bickford Ave to I-5 at Pacific Ave	WB	12:00	20
From I-5 at Pacific Ave to SR 204 at 81st Ave SE	EB	6:35	39
From I-5 at Pacific Ave to 20th St SE at 83rd Ave SE	EB	6:30	34
From I-5 at Pacific Ave to US 2 at Bickford Ave	EB	6:20	42

Freeway Operations

By 2040, speeds deteriorate substantially in the AM peak hour along each of the WB approach routes to the US 2/SR 204/20th Street SE interchange, as shown in **Figure 8**. Levels of service also deteriorate, as listed in **Table 6**. Increasing traffic demands continue to be constrained by the limited merging capacity for SR 204 and 20th St SE at the study interchange, resulting in travel speeds less than 10 miles per hour. Since more traffic cannot pass through this merge point, the delays and queues on both SR 204 and 20th St SE will continue to increase. The addition of the HOV lane on the WB trestle and constrained traffic demands result in good speeds on the trestle approaching downtown Everett and I-5.

The US 2/SR 204/20th Street SE interchange is not forecasted to be able to serve any additional westbound demand during the AM peak hour in the 2040 No Build scenario; therefore the LOS on US 2 degrades upstream of the US 2/Bickford Ave interchange. Downstream of the study interchange, forecast 2040 LOS is similar to existing conditions. The average vehicle density at the Bickford Ave on-ramp merge section increases by over six times. This results from increased demand and a change in the geometry at the ramp from an add lane to a merge condition.

This condition also exists during the PM peak hour with the demand from westbound US 2 increasing by 50% compared with the existing demand (**Figure 9**). Similarly, not all of the westbound demand during the PM peak hour can be served through the study interchange. Also during the PM peak hour, and similar to the 2025 No Build scenario, the eastbound merge section from I-5 and Hewitt Ave is forecasted to degrade from LOS D to LOS F due to increased demand.

West of the study intersection, speeds improve for vehicles as they continue WB beyond the bottleneck point – the constraint at the study interchange limits access to WB US 2 to the extent that the downstream freeway segments operate at better levels of service than existing conditions.

The forecast analysis for the design year (2040) shows slightly improved operations along the WB trestle, due to the planned trestle widening and resulting increased capacity along US 2. However, the increased demand at the study interchange causes worse congestion along the surface streets and mainline US 2 upstream of the interchange, with backups extending beyond the limits of the study. Without any improvement to the US 2/SR 204/20th Street SE interchange, throughput measured at the interchange remains the same, while demand is expected to increase by almost 30 percent.

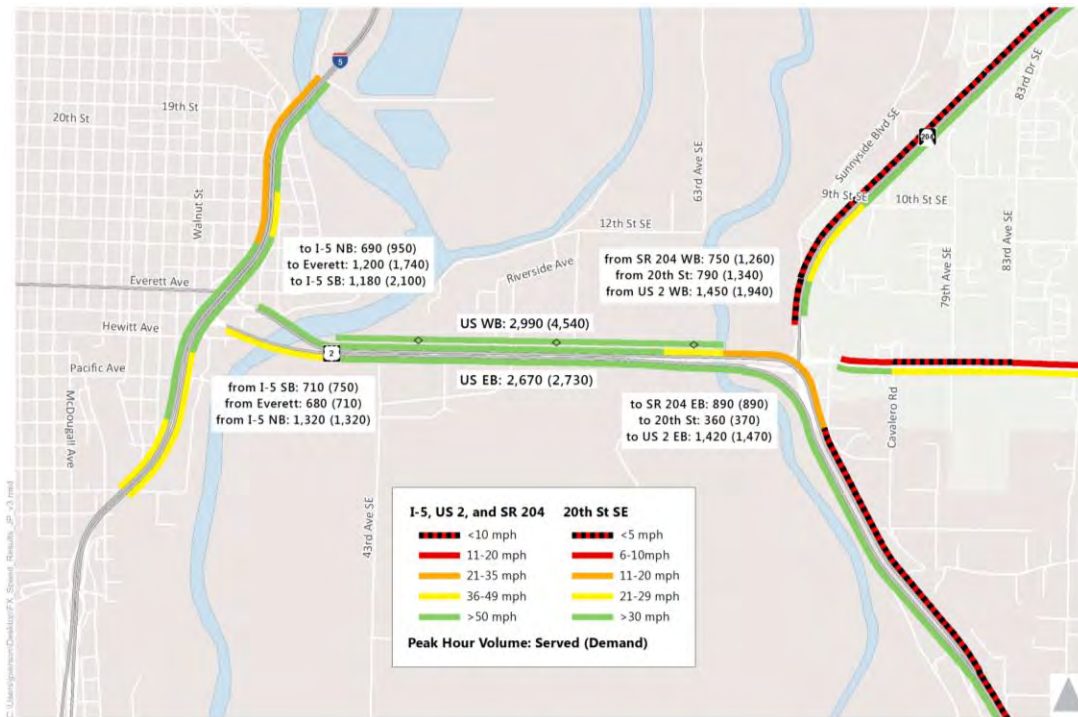


Figure 8 No-Build (2040) Speeds - AM

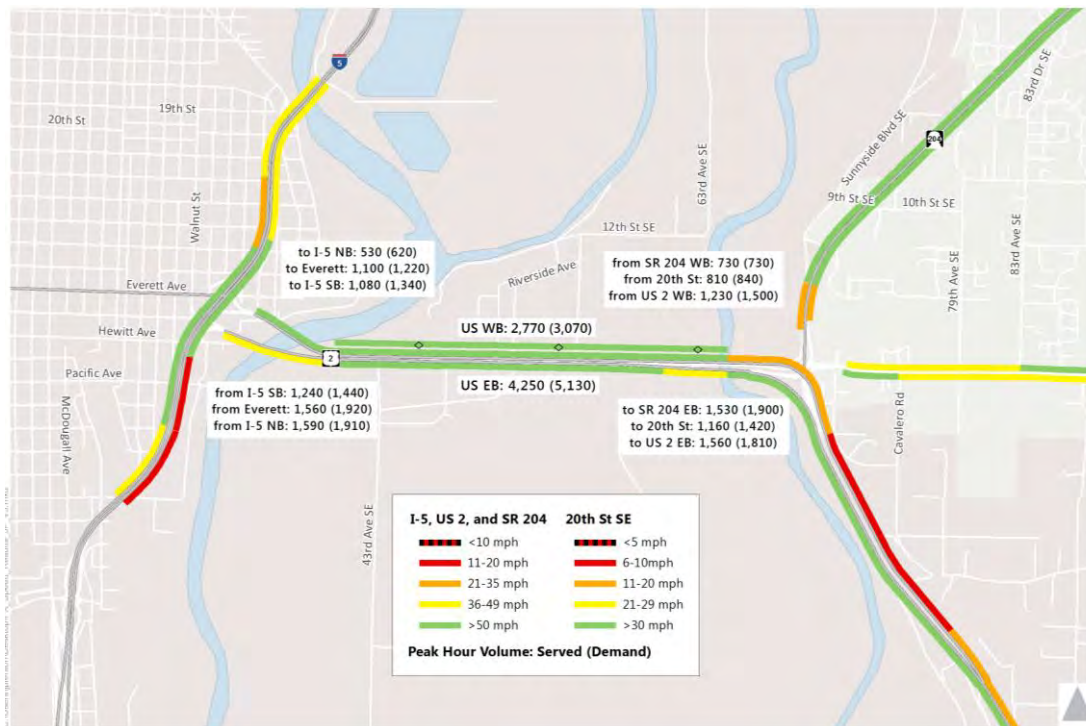


Figure 9 No-Build (2040) Speeds - PM

TABLE 6 NO-BUILD (2040) FREEWAY OPERATIONS

Facility	Type	LOS (A-F)		Density (VPLPM)		Speed (mph)		Queue (veh)	
		AM	PM	AM	PM	AM	PM	AM	PM
US 2 WB: Bickford Ave On-ramp	Merge	F	F	141	138	4	5	500	250
US 2 WB: SR 204 EB Off-ramp	Diverge	F	F	121	108	7	8	10	110
US 2 WB: SR 204 WB/20th St On-ramp to 20th St Off-ramp	Weave	D	D	31	29	44	45	1,060	40
US 2 WB: 20th St Off-ramp to 50th St On-ramp	Basic	C	C	23	19	53	57	10	0
US 2 WB: 50th St On-ramp	Merge	D	C	30	23	50	56	220	230
US 2 WB: 50th St On-ramp to I-5 NB On-ramp	Basic	D	C	29	23	52	57	20	10
US 2 WB: I-5 NB On-ramp	Diverge	C	C	25	20	52	56	0	0
US 2 WB: I-5 SB On-ramp	Diverge	D	C	28	24	47	51	0	0
US 2 EB: Hewitt Ave On-ramp	Merge	B	F	19	43	48	35	50	880
US 2 EB: 50th St Off-ramp	Diverge	B	C	17	28	55	54	0	0
US 2 EB: 50th St Off-ramp to SR 204/20th St Off-ramp	Basic	C	D	20	27	54	52	10	10
US 2 EB: SR 204 EB/20th St Off-ramp	Diverge	C	F	20	45	53	37	0	0
US 2 EB: SR 204 EB/20th St Off-ramp to SR 204 WB On-ramp	Basic	B	B	13	14	56	55	0	0
US 2 EB: SR 204 WB On-ramp	Merge	B	B	15	16	52	50	150	0
US 2 EB: SR 204 WB On-ramp to Bickford Ave Off-ramp	Basic	B	B	14	16	57	57	0	0
US 2 EB: Bickford Ave Off-ramp	Diverge	B	B	15	17	57	57	0	0
I-5 NB: Pacific Ave Off-ramp	Diverge	E	F	42	106	40	18	10	1,220
I-5 NB: US 2 EB Off-ramp	Diverge	C	F	28	88	46	19	0	0
I-5 NB: US 2 EB Off-ramp to US 2 WB/Everett Ave On-ramp	Basic	C	C	19	19	55	50	0	0
I-5 NB: US 2 WB/Everett Ave On-ramp to Marine View Dr Off-ramp	Weave	C	C	25	28	45	43	260	450
I-5 SB: Marine View Dr On-ramp to US 2 EB/Everett Ave Off-ramp	Weave	E	F	40	49	43	33	480	320
I-5 SB: US 2 EB/Everett Ave Off-ramp to US 2 WB On-ramp	Basic	D	D	31	28	54	52	0	0
I-5 SB: US 2 WB On-ramp	Merge	D	D	29	29	54	54	800	80
I-5 SB: Pacific Ave On-ramp	Merge	D	F	35	50	45	34	10	150

Operations at Crossroad Intersections

For the no-build analysis, intersections were analyzed using the Vissim traffic simulation assuming optimized signal operations. The no-build analysis of the local network in 2040 shows all intersections along the approach corridors operating at LOS F during the AM peak, as shown in **Table 7** and diagrammed in **Figure 10**. This is primarily due to the severe congestion at the interchange resulting in queues and delays extending upstream through the arterial intersections.

During the PM peak, the intersection of SR 204 and 20th Street SE would also operate at LOS F, since it is assumed to be an all-way stop operation.

TABLE 7 NO-BUILD (2040) INTERSECTION OPERATIONS

Intersection	Control Type	LOS		Delay (s)	
		AM	PM	AM	PM
SR204/20th St	All-way stop	B	F	13	89
SR 204/Sunnyside	Side-street stop	F	D	101	34
SR 204/9th	Side-street stop	F	B	197	11
Cavalero/20th St	Signal	F	C	229	27
Ebey Island WB ramps	All-way stop	A	A	5	5
Ebey Island EB ramps	All-way stop	B	C	11	19
79th Ave SE/20th St SE	Signal	F	B	464	14
83rd Ave SE/20th St SE	Signal	F	B	329	18
91st Ave SE/20th St SE	Signal	F	C	131	20

AM Peak Hour

During the AM peak hour, the following intersection movements have extended queues. In some cases, these queues extend beyond the limits of the VISSIM model network:

- SR 204/Sunnyside Blvd SE- eastbound queue on Sunnyside Blvd.
- 20th St SE/Cavalero Road- Southbound approach to Cavalero Rd
- 20th St SE/79th Ave SE- Southbound approach queues on 79th Ave SE. Westbound movement extends to 83rd Ave SE
- 20th St SE/83rd Ave SE- Northbound right turn exceeds pocket length. Southbound left turn exceeds pocket length.
- 20th St SE/91st Ave SE- Southbound left turn exceeds pocket length.
- Ebey Island /SR 204 WB on-ramp- Northbound traffic extends through the intersection with the EB off-ramp (Note: these are relatively low-volume movements, but the storage distance is short)

Westbound queues are much shorter along 20th St SE due to the addition of a lane in each direction assumed for 2040.

PM Peak Hour

During the PM peak hour, the following intersection movements have extended queues. In some cases, these queues extend beyond the limits of the VISSIM model network:

- SR 204/ 20th St SE (lower roadway)- Northbound movement on SR 204 extends back to off-ramp from westbound US 2
- SR 204/Sunnyside Blvd SE- Northbound left turn exceeds pocket length
- 20th St SE/79th Ave SE- Southbound left turn exceeds pocket length
- 20th St SE/83rd Ave SE- Northbound right turn exceeds pocket length
- 20th St SE/91st Ave SE- Southbound left turn exceeds pocket length
- Ebey Island /SR 204 WB on-ramp- Northbound traffic extends through the intersection with the EB off-ramp (Note: these are relatively low-volume movements, but the storage distance is short)

Additional detail regarding intersection analysis is available in the Appendix.

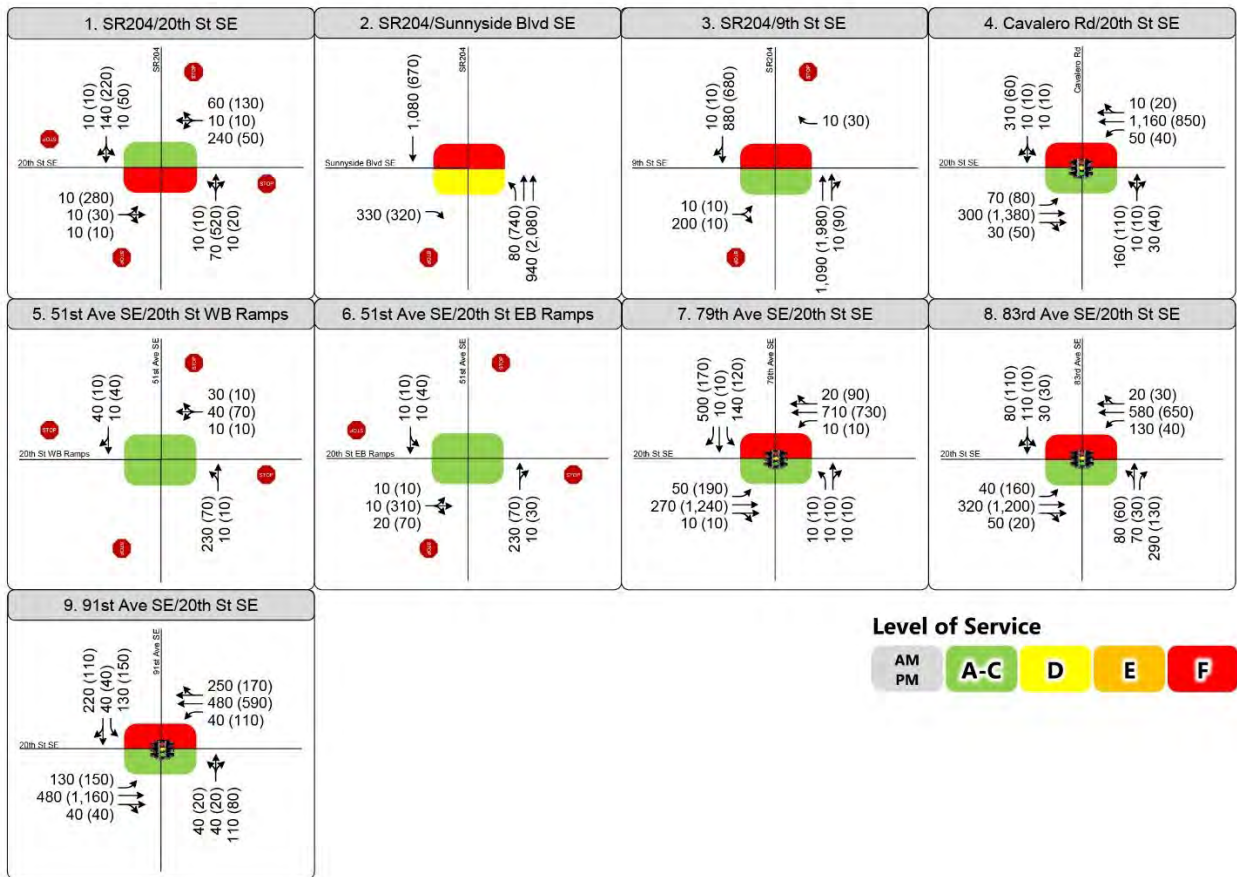


Figure 10 No Build (2040) Intersection Turning Movements

Alternatives Analysis

This section provides a brief overview of the alternatives description and summarizes traffic operations for each of the build alternatives. Details of the analysis results are contained in subsequent sections.

Interchange Configuration

Alternative 1

Alternative 1 assumes a similar interchange configuration as the existing conditions except that all three ramp lanes join the US 2 trestle as an add lane. This configuration assumes that the westbound US 2 trestle will consist of three lanes with one HOV lane and two general-purpose lanes. Because the realignment of the study interchange would limit access from SR 204 and 20th Street to the westbound off-ramp to Ebey Island, the IJR Support Team proposed that the off-ramp function be relocated to the lower roadway intersection between SR 204 and 20th Street SE. I was then assumed that the existing one-way Ebey Slough bridge (**Figure 11**) would be reconfigured to accommodate two way traffic and included pedestrian access.

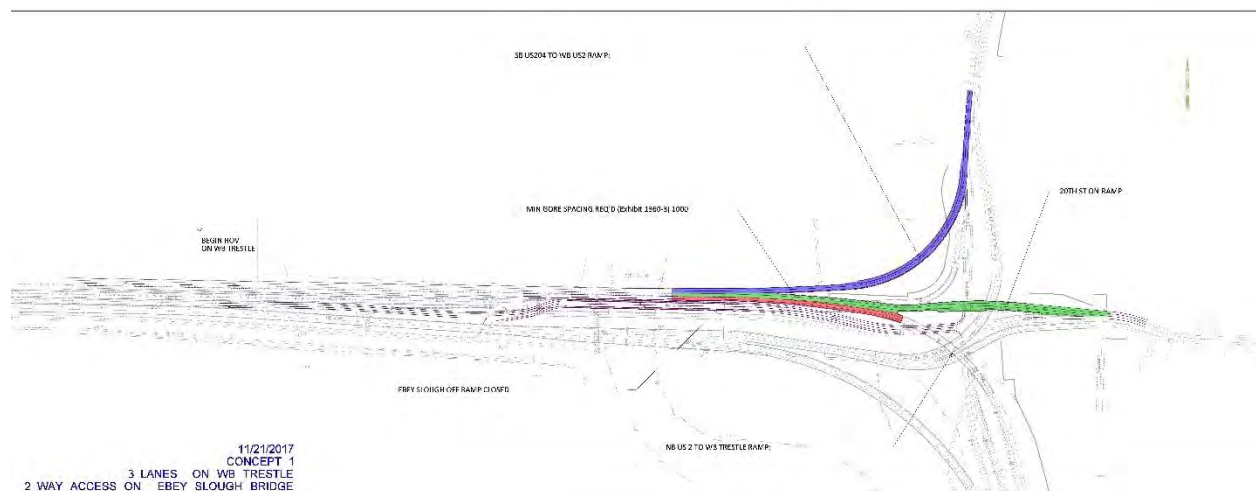


Figure 11 Alternative 1 Layout

There are improvements in congestion on SR 204 and 20th Street SE, but US 2 is as congested or worse than the no-build because there is not enough capacity on the trestle at the merge point with US 2, SR 204, and 20th Street SE to manage the increased demand that could get through the interchange and access US 2. There is some additional demand on 20th Street SE due to the backup on westbound US 2, but the shift in AM Peak traffic was less than 100 vehicles. The concept analysis includes assumed future Community Transit service that is consistent with the Snohomish County travel demand modeling assumptions and assumes buses travel near full at 40 passengers per bus.

Alternative 3

Alternative 3 assumes that the SR 204 corridor would maintain a single on-ramp add lane to the US 2 westbound trestle. The 20th Street SE on-ramp would also join the trestle as an add lane, but it would be configured to add to the outside (Northside) of the trestle. To accomplish this layout, the 20th Street SE on-ramp would fly over the SR 204 on-ramp and join the US 2 corridor just east of the Ebey Slough. US 2 would maintain a two lane configuration from east of Bickford onto the westbound trestle. This alternative assumes the US 2 trestle would provide a four lane cross section to operate as analyzed. See **Figure 13** for the configuration layout.

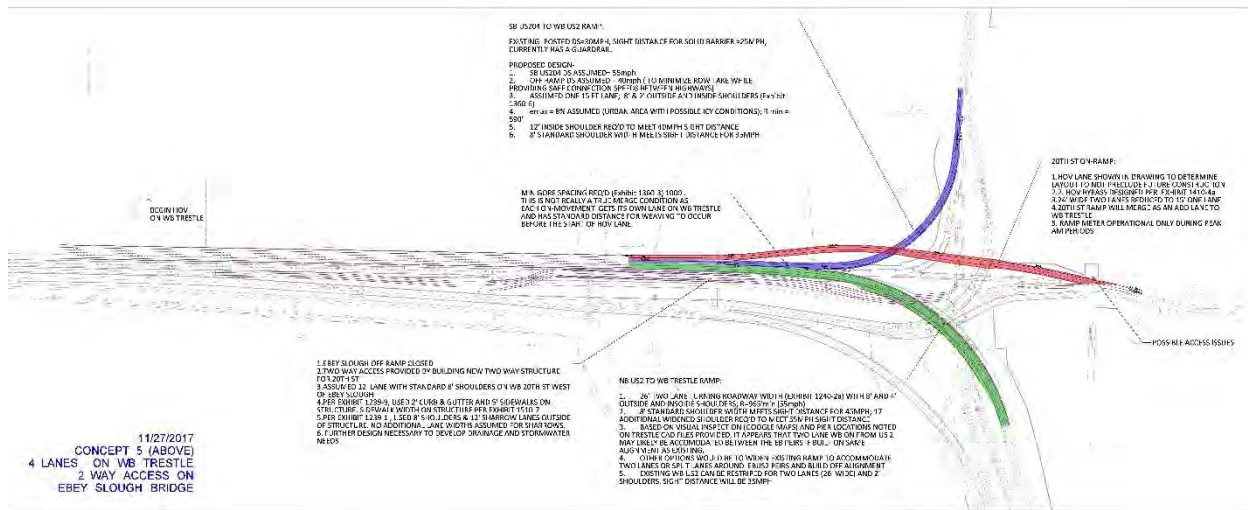


Figure 13 Alternative 3 Layout

Corridor Operations

Table 8 summarizes observed and predicted travel times through the study area. This offers a quick snapshot of how well traffic is moving through the area.

TABLE 8. ALTERNATIVE TRAVEL TIME COMPARISON

US 2 / SR 204 IJR Travel Time - AM Peak Hour

Peak 15 Minute Travel Time (minutes)		2017	2040 No Build		2040 Alt 1		2040 Alt 2		2040 Alt 3	
		Time	Time	Delta	Time	Delta	Time	Delta	Time	Delta
WB Trestle	SR 204 at 81 st Ave SE to I-5 at Pacific Ave	13:45	32:00	18:15	12:30	-19:30	14:35	-17:25	15:40	-16:20
	20 th St SE at 83 rd Ave SE to I-5 at Pacific Ave	9:05	28:05	19:00	14:25	-13:40	18:35	-9:30	17:35	-10:30
	US 2 at Bickford Ave to I-5 at Pacific Ave	8:05	14:20	6:15	22:40	8:20	14:20	0:00	14:30	0:10
EB Trestle	I-5 at Pacific Ave to SR 204 at 81 st Ave SE	4:55	5:05	0:10	5:00	-0:05	5:00	-0:05	5:00	-0:05
	I-5 at Pacific Ave to 20 th St SE at 83 rd Ave SE	4:55	5:35	0:40	5:30	-0:05	5:35	0:00	5:30	-0:05
	I-5 at Pacific Ave to US 2 at Bickford Ave	4:55	5:00	0:05	5:10	0:10	5:10	0:10	5:10	0:10

US 2 / SR 204 IJR Travel Time - PM Peak Hour

Peak 15 Minute Travel Time (minutes)		2017	2040 No Build		2040 Alt 1		2040 Alt 2		2040 Alt 3	
		Time	Time	Delta	Time	Delta	Time	Delta	Time	Delta
WB Trestle	SR 204 at 81 st Ave SE to I-5 at Pacific Ave	5:00	6:20	1:20	4:55	-1:25	5:20	-1:00	5:30	-0:50
	20 th St SE at 83 rd Ave SE to I-5 at Pacific Ave	5:00	8:15	3:15	5:05	-3:10	5:45	-2:30	5:40	-2:35
	US 2 at Bickford Ave to I-5 at Pacific Ave	4:25	12:00	7:35	9:50	-2:10	5:15	-6:45	5:25	-6:35
EB Trestle	I-5 at Pacific Ave to SR 204 at 81 st Ave SE	7:00	6:35	-0:25	6:15	-0:20	6:25	-0:10	6:15	-0:20
	I-5 at Pacific Ave to 20 th St SE at 83 rd Ave SE	6:50	6:30	-0:20	6:25	-0:05	6:20	-0:10	6:20	-0:10
	I-5 at Pacific Ave to US 2 at Bickford Ave	6:15	6:20	0:05	6:15	-0:05	6:15	-0:05	6:20	0:00

AM Peak Hour

As is shown in **Table 8** and illustrated graphically in **Figure 14**, peak direction (westbound) travel times increase between 2017 and 2040. Each of the build alternatives substantially improve the WB travel times. Note that the travel time data are only available for the vehicles within the Vissim model limits.

Eastbound travel times in the AM peak hour are also shown in Table 8 and illustrated in **Figure 15**. The eastbound travel times experience only a slight increase over existing durations. Eastbound travel times are constrained by the I-5 traffic operations, as discussed above. This capacity-limited entrance to US 2 ensures that the number of vehicles traveling eastbound will not experience additional delays due to increased traffic on US 2 EB. The additional travel time experienced by eastbound travelers is attributed to delays on I 5 between Pacific Ave and delay exiting at the US 2 / SR 204 / 20th Street SE interchange.

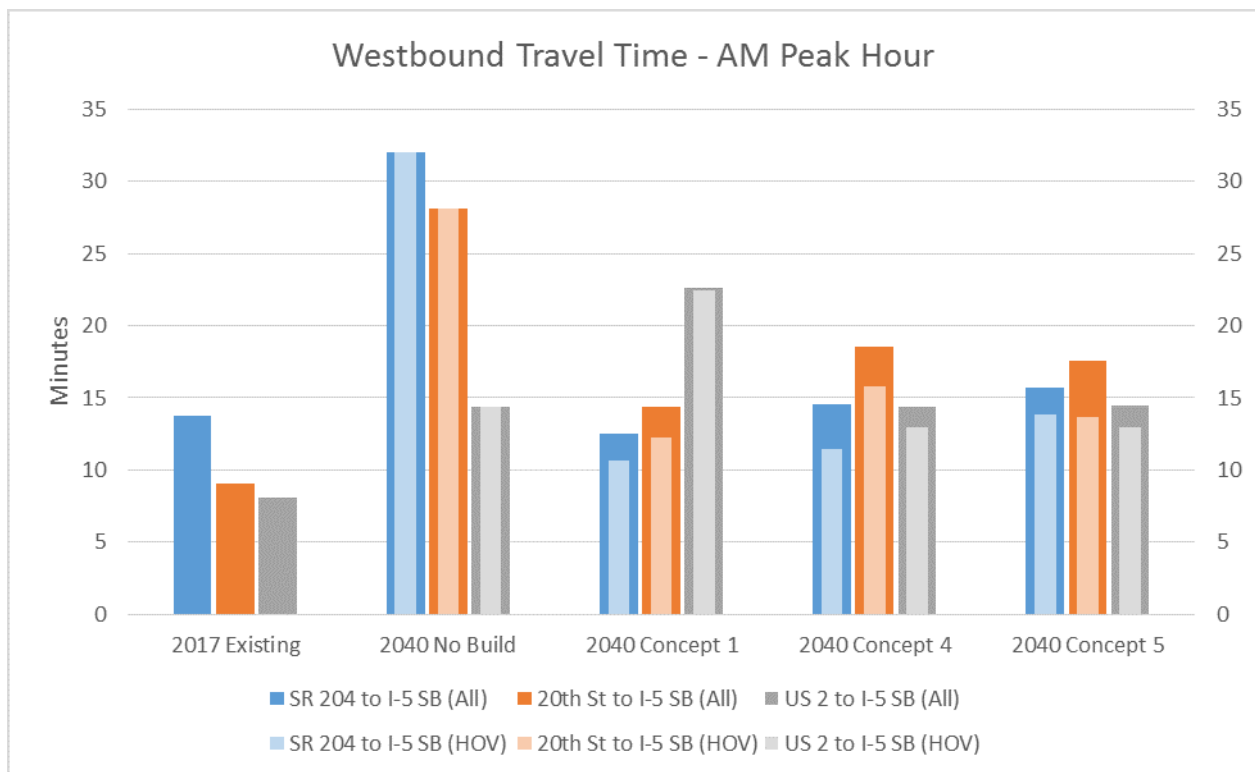


Figure 14 Travel Time Comparison - Westbound

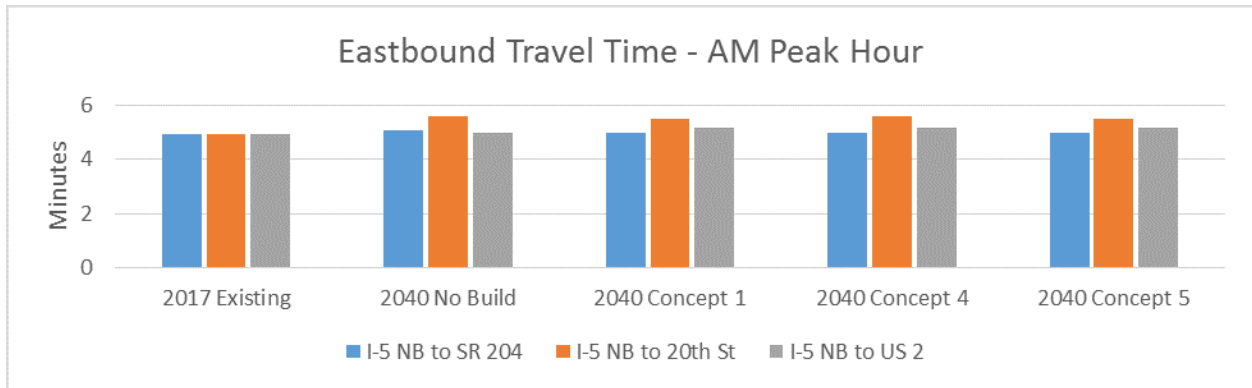


Figure 15 Travel Time Comparison - Eastbound

PM Peak Hour

PM peak hour travel times are shown in Table 8. In the peak eastbound direction, travel times stay relatively constant, because of the constrained capacity on I-5 approaching US 2. The travel times for the alternatives are also similar to the No Build conditions.

In the westbound direction, no build travel time increase from 2017 to 2040. This is due to increased travel demand and the no build constraints at the US 2/20th St SE/SR 204 interchange. Similar to the AM peak hour, each of the build alternatives improve WB travel times.

Speed

Average speeds were derived from the Vissim runs for several freeway segments within the study area. These segments consist of four freeway types- basic, merge, diverge, and weave. The average speeds in these segments are summarized in **Table 9** (AM peak hour) and **Table 10** (PM peak hour). The 2040 conditions are compared with existing speeds obtained from the Vissim model, which was validated to observed conditions. .

For Alternative 1, AM WB speeds improve on the arterial connections (SR 204 and 20th St SE), but result in lower speeds on US 2 from the Bickford Ave on-ramps to the I-5 and downtown Everett off-ramps. This is caused by more traffic being able to enter the WB trestle from SR 204 and 20th St SE, but resulting in constraints upstream on US 2. Alternative 1 also results in a net increase in AM peak WB traffic throughput across the trestle which results in additional traffic demands and slower speeds onto NB and SB I-5 and a speed reduction on SB I-5 between Marine View Dr and US 2. There is also a speed reduction on the ramp from Hewitt Ave onto EB US 2, which is likely an anomaly in how the Vissim model processes demand.

Alternatives 2 and 3 produce similar results in the AM peak hour, except along WB US 2. WB US 2 speeds increase from Bickford Avenue to the SR 204/20th St SE interchange due to the added WB lane but they then decrease across the trestle due to the added traffic demands. As described previously with Figure 14, there is a net improvement in corridor travel times, even though the speeds on the WB trestle are lower with Alternatives 2 and 3.

In the PM peak hour (Table 10), speed changes are similar among the alternatives, as in the AM peak. It is noted that PM speeds increase for each alternative on WB US 2 between the Bickford Ave on-ramp to the off-ramp to SR 204/20th St SE. This would be expected for Alternatives 2 and 3, which add a lane to US 2 in this section. For Alternative 1 the slight increase in US 2 speeds is likely due to the improvement in the SR 204/20th St SE merge conditions and overall lower WB demand along US 2 that does not create a traffic constraint similar to what occurs during the AM peak hour.

TABLE 9 FREEWAY SPEEDS (2040) - AM PEAK HOUR

Freeway Speed Comparison (AM)						
Location	Facility Type	Existing	2040			
			NB	Alt 1	Alt 2	Alt 3
I-5 NB off to Pacific Ave	Diverge	52.3	39.6	39.5	34.9	35.2
I-5 NB off to US-2	Diverge	52.3	45.5	44.8	44.6	44.7
I-5 NB from US-2 off to Everett Ave/US-2 on	Basic	55.5	54.6	54.5	54.4	54.3
I-5 NB from US-2/Everett Ave on and E Marine View Dr	Weave	51.6	45.4	45.7	42.9	43.2
I-5 SB from Marine View Dr to Everett Ave/US-2	Weave	31.3	43.4	31.4	31.2	30.5
I-5 SB from Everett Ave/US-2 off to US-2 on	Basic	51.8	53.8	53.5	52.1	54.4
I-5 SB on from US-2	Merge	51.3	53.6	52.5	50.6	51.3
I-5 SB on from Pacific Ave	Merge	45.7	44.5	41.0	42.9	42.6
US-2 EB on from Hewitt Ave	Merge	50.3	48.2	38.8	39.2	39.1
US-2 EB off to 50th St	Diverge	55.3	55.4	55.5	55.5	55.4
US2 EB from 50th to SR-204/20th St	Basic	54.5	54.4	54.5	54.5	54.5
US-2 EB off to SR-204/20th St	Diverge	52.6	53.4	54.2	54.3	54.3
US-2 EB on from SR-204/20th St	Merge	53.6	51.9	50.1	50.1	51.0
US-2 EB from SR-204/20th St to Bickford Ave	Basic	58.2	57.3	57.0	57.1	57.0
US-2 EB Off to Bickford Ave	Diverge	58.3	57.5	57.3	57.3	57.3
US-2 EB off rom Bickford Ave off to on	Basic	58.9	58.6	58.6	58.4	58.5
US-2 EB on from Bickford Ave	Merge	55.4	55.5	55.7	55.5	55.5
US-2 WB on from Bickford	Merge	48.5	4.5	3.4	39.7	39.7
US-2 WB off to SR-204/20th St	Diverge	17.3	6.6	5.1	49.1	47.5
US-2 WB from SR-204/20th St on to 20th St off	Weave	45.2	44.2	10.6	12.3	15.5
US-2 WB on from 50th Ave	Merge	48.2	50.4	20.5	10.9	10.6
US-2 WB from 50th Ave to I-5	Basic	42.6	52.4	24.7	11.8	11.8
US-2 WB Off to I-5 NB	Diverge	46.5	52.2	24.9	13.4	15.2
US2 WB off to I-5 SB	Diverge	47.5	47.3	30.7	16.8	17.4
20th St merge with SR-204 WB	Merge	21.6	14.4		13.4	
US-2 EB from SR-204/20th St Off to On	Basic	56.1	55.5	55.5	55.8	55.7
US-2 WB from 20th St to 50th Ave	Basic	52.6	52.8	20.8	10.6	10.2
US-2 WB on from 20th St	Merge					9.3

TABLE 10 FREEWAY SPEEDS (2040) - PM PEAK HOUR

Freeway Speed Comparison (PM)						
Location	Facility Type	2040				
		Existing	NB	Alt 1	Alt 2	Alt 3
I-5 NB off to Pacific	Diverge	23.9	17.9	17.9	17.2	17.8
I-5 NB off to US-2	Diverge	33.2	19.5	19.3	17.9	18.9
I-5 NB from US-2 off to Everett Ave/US-2 on	Basic	53.4	50.4	49.9	50.1	50.4
I-5 NB from US-2/Everett Ave on and E Marine View Dr	Weave	36.7	42.8	42.6	43.1	43.1
I-5 SB from Marine View Dr to Everett Ave/US-2	Weave	48.5	33.1	34.3	35.6	34.5
I-5 SB from Everett Ave/US-2 off to US-2 on	Basic	57.3	52.3	53.7	53.8	52.0
I-5 SB on from US-2	Merge	59.7	53.7	55.4	54.0	52.8
I-5 SB on from Pacific Ave	Merge	45.3	33.7	33.6	32.9	34.2
US-2 EB on from Hewitt Ave	Merge	44.4	35.4	35.7	35.8	35.8
US-2 EB off to Ebey Island	Diverge	49.9	54.3	54.3	54.1	54.0
US2 EB from 50th to SR-204/20th St	Basic	44.8	52.0	54.2	54.1	54.1
US-2 EB off to SR-204/20th St	Diverge	31.6	37.4	43.1	46.2	46.5
US-2 EB on from SR-204/20th St	Merge	54.0	50.5	50.5	50.8	49.9
US-2 EB from SR-204/20th St to Bickford Ave	Basic	57.8	56.8	56.8	56.9	56.8
US-2 EB Off to Bickford Ave	Diverge	57.8	57.0	57.2	57.0	57.3
US-2 EB off rom Bickford Ave off to on	Basic	58.6	58.6	58.6	58.4	58.6
US-2 EB on from Bickford Ave	Merge	55.8	55.2	55.4	55.3	55.4
US-2 WB on from Bickford	Merge	51.1	5.0	8.4	36.4	36.4
US-2 WB off to SR-204/20th St	Diverge	53.1	7.9	9.9	45.8	45.8
US-2 WB from SR-204/20th St on to 20th St off	Weave	46.9	45.4	51.4	53.8	55.9
US-2 WB on from 50th Ave	Merge	57.6	55.8	55.8	54.9	57.7
US-2 WB from 50th Ave to I-5	Basic	55.7	56.9	56.4	49.0	53.3
US-2 WB Off to I-5 NB	Diverge	55.1	56.3	54.8	36.6	35.6
US2 WB off to I-5 SB	Diverge	55.5	51.4	46.1	39.0	38.8
20th St merge with SR-204 WB	Merge	26.0	15.1		48.0	
US-2 EB from SR-204/20th St Off to On	Basic	55.2	54.8	55.5	55.0	55.0
US-2 WB from 20th St to 50th Ave	Basic	57.3	57.1	57.2	55.1	58.4
US-2 WB on from 20th St	Merge					56.4

In addition to the freeway speeds, average speeds were extracted from VISSIM for the two arterial segments- SR 204 and 20th St SE. These speeds were not tabulated, but they are shown in visual form along with the freeway speeds in the following subsections.

AM Peak Hour

Figures 16 through 18 show the AM peak hour speeds for the three build alternatives. Figure 16 (Alternative 1) shows the improvements in speeds along SR 204 and 20th St SE at the expense of US 2 approaching the trestle. **Figures 17 and 18** (Alternatives 2 and 3) show that travel speeds improve on each of the westbound approach roadways, although speeds reduce on the westbound trestle approaching I-5.

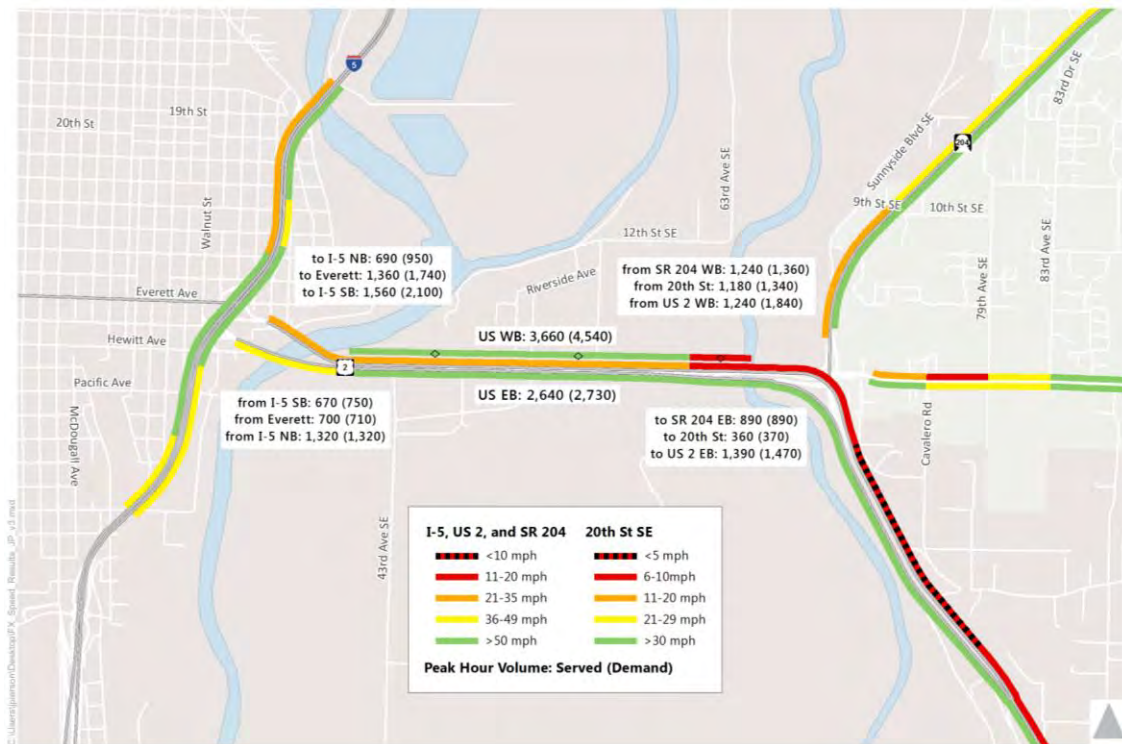


Figure 16 Alternative 1 Operations: 2040 AM Peak

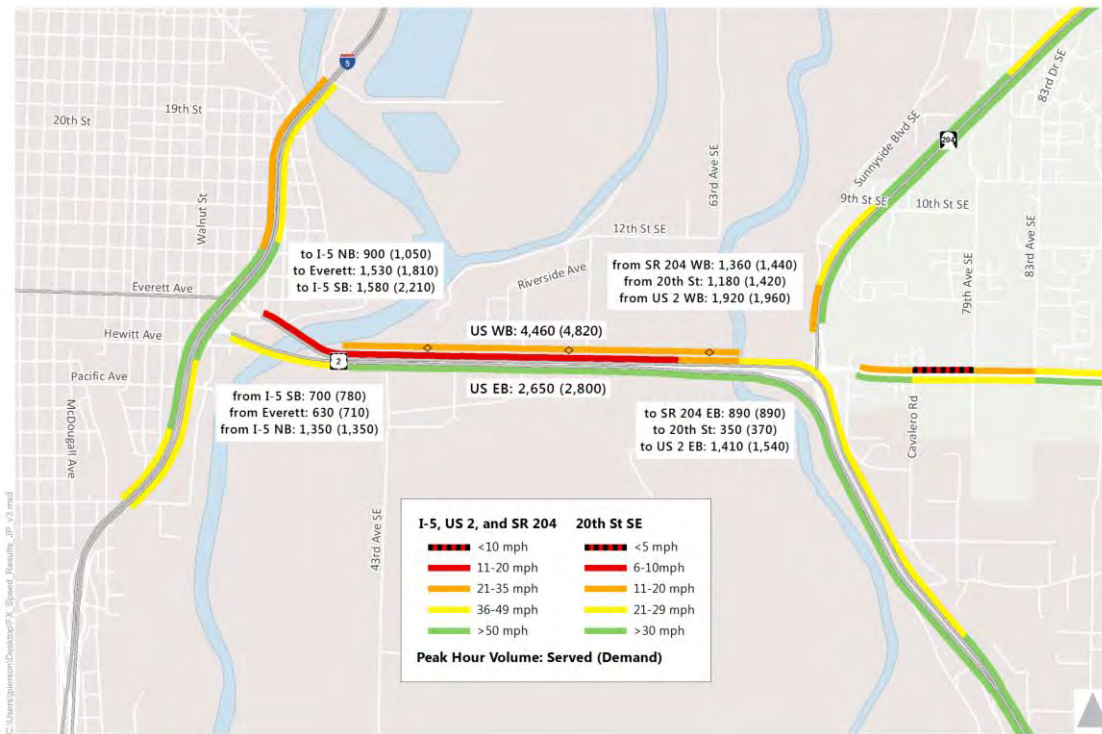


Figure 17 Alternative 2 Operations: 2040 AM Peak

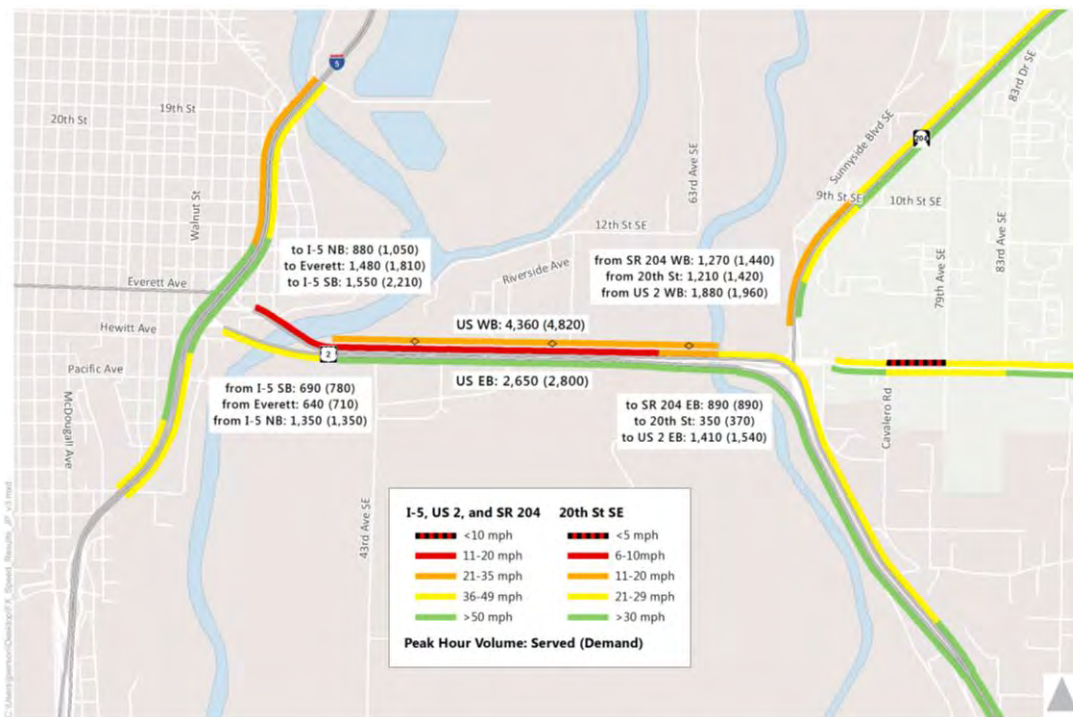


Figure 18 Alternative 3 Operations: 2040 AM Peak

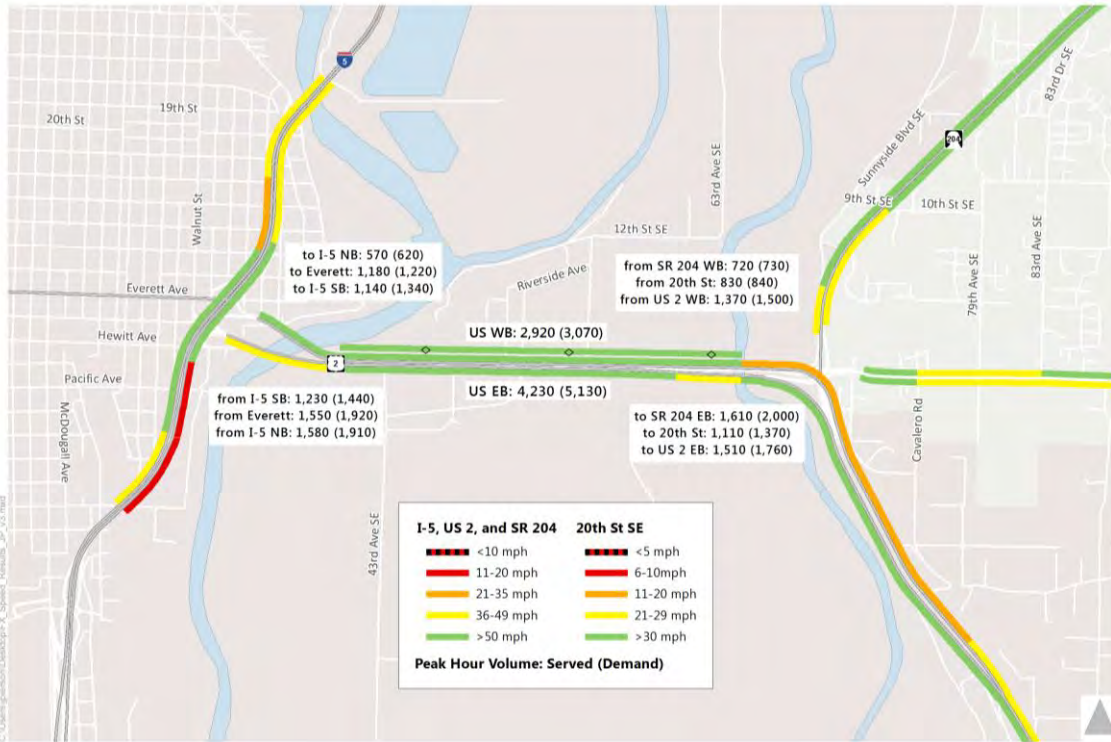


Figure 19 Alternative 1 Operations: 2040 PM Peak

PM Peak Hour

Figures 19 through 21 show the PM peak hour speeds for the three build alternatives. Figure 19 (Alternative 1) shows similar speeds westbound along SR 204 and 20th St SE, along with improvements in speed on US 2 approaching the trestle. Eastbound conditions remain similar to No Build. Figures 20 and 21 (Alternatives 2 and 3) show good travel speeds in both directions through the interchange.

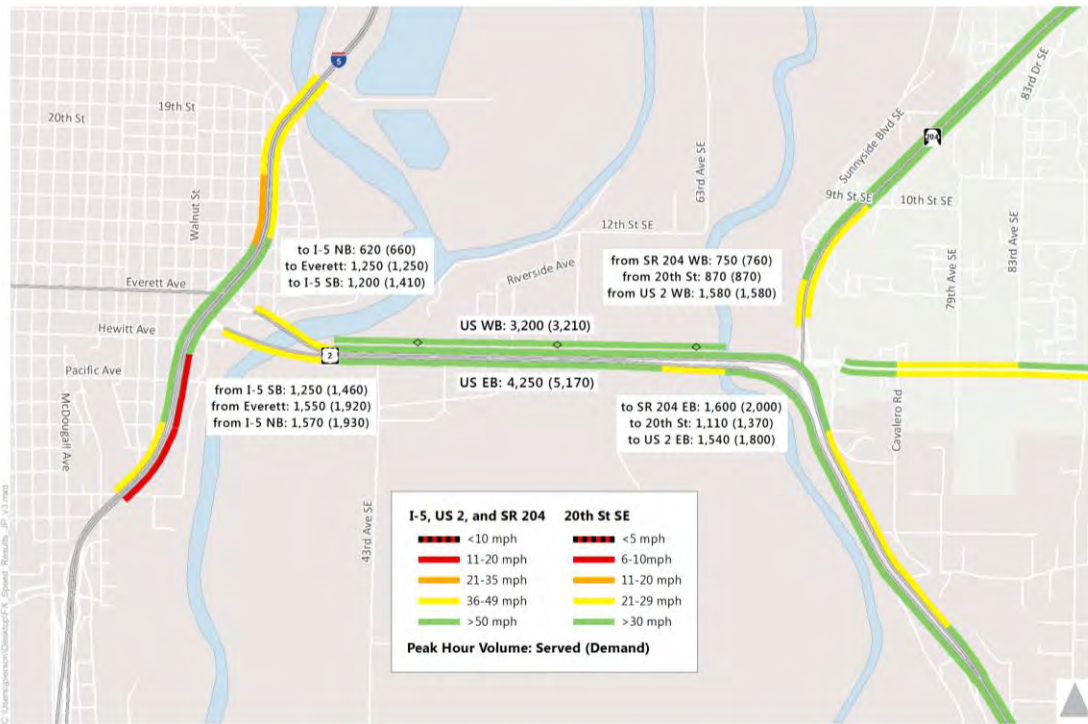


Figure 20 Alternative 2 Operations: 2040 PM Peak

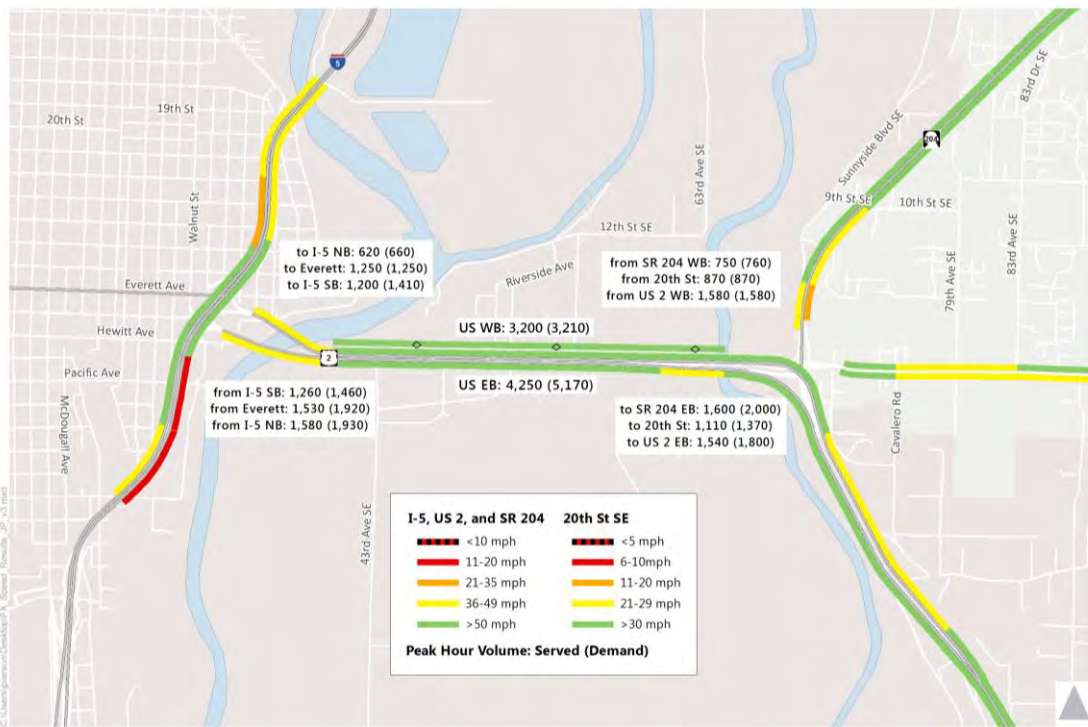


Figure 21 Alternative 3 Operations: 2040 PM Peak

Freeway Level of Service

Freeway Levels of Service (LOS) are shown in **Table 11** (AM peak hour) and **Table 12** (PM peak hour) for existing conditions and in 2040 for the No Build and each of the three alternatives. The freeway LOS is derived from vehicle density calculations, as described in the Methods and Assumptions report. While freeway LOS is generally consistent with the speeds shown in Figures 16 through 21, there are situations where the density calculations show a poor LOS, but the segment speeds may be relatively good. This is due to the more detailed nature of the Vissim model, which simulates traffic operations through a network, taking into account constraints such as freeway merges, diverges, and weaves.

The primary changes in LOS between alternatives occurs westbound in the AM peak hour along US 2. Alternative 1 creates additional congestion in the AM Peak Hour on WB US 2 from Bickford to I-5 due to the increase in capacity provided to both SR 204 and 20th Street. More capacity provided to both SR 204 and 20th St SE tends to constrict the ability of US 2 traffic to freely flow onto the trestle. Alternatives 2 and 3 add a lane to westbound US 2 and relieves the congestion on US 2 from the Bickford ramps to the SR 204/20th Street interchange. Further west, congestion remains along US 2 across the trestle due to increased demand being able to access the trestle portion combined with the downstream constraints leaving the trestle onto I-5 and downtown Everett streets.

Tables 11 and 12 show changes in LOS for individual freeway segments and ramps. These are due to shifts in traffic demands approaching the WB US 2 Trestle created by the physical and operational changes with each of the build alternatives. Most of these changes are shown on WB US 2 along the trestle and approaches to the I-5 interchange.

TABLE 11 FREEWAY LEVEL OF SERVICE- 2040 AM PEAK

Freeway Level of Service Comparison (AM)						
Location	Facility Type	Existing	2040			
			NB	Alt 1	Alt 2	Alt 3
I-5 NB off to Pacific	Diverge	C	E	E	F	F
I-5 NB off to US-2	Diverge	B	C	D	D	D
I-5 NB from US-2 off to Everett Ave/US-2 on	Basic	B	C	C	C	C
I-5 NB from US-2/Everett Ave on and E Marine View Dr	Weave	B	C	C	D	C
I-5 SB from Marine View Dr to Everett Ave/US-2	Weave	F	E	F	F	F
I-5 SB from Everett Ave/US-2 off to US-2 on	Basic	D	D	D	D	D
I-5 SB on from US-2	Merge	D	D	D	D	D
I-5 SB on from Pacific Ave	Merge	E	D	E	E	E
US-2 EB on from Hewitt Ave	Merge	B	B	C	C	C
US-2 EB off to 50th St	Diverge	B	B	B	B	B
US2 EB from 50th to SR-204/20th St	Basic	B	C	B	B	B
US-2 EB off to SR-204/20th St	Diverge	B	C	C	C	C
US-2 EB on from SR-204/20th St	Merge	B	B	B	B	B
US-2 EB from SR-204/20th St to Bickford Ave	Basic	A	B	B	B	B
US-2 EB Off to Bickford Ave	Diverge	B	B	B	B	B
US-2 EB off rom Bickford Ave off to on	Basic	A	A	A	A	A
US-2 EB on from Bickford Ave	Merge	A	A	B	B	B
US-2 WB on from Bickford	Merge	B	F	F	C	C
US-2 WB off to SR-204/20th St	Diverge	F	F	F	C	C
US-2 WB from SR-204/20th St on to 20th St off	Weave	D	D	F	F	F
US-2 WB on from 50th Ave	Merge	D	D	F	F	F
US-2 WB from 50th Ave to I-5	Basic	E	D	F	F	F
US-2 WB Off to I-5 NB	Diverge	E	C	F	F	F
US2 WB off to I-5 SB	Diverge	D	D	F	F	F
20th St merge with SR-204 WB	Merge	F	F		F	
US-2 EB from SR-204/20th St Off to On	Basic	B	B	B	B	B
US-2 WB from 20th St to 50th Ave	Basic	D	C	F	F	F
US-2 WB on from 20th St	Merge					F

TABLE 12 FREEWAY LEVEL OF SERVICE- 2040 PM PEAK

Freeway Level of Service Comparison (PM)						
Location	Facility Type	2040				
		Existing	NB	Alt 1	Alt 2	Alt 3
I-5 NB off to Pacific	Diverge	F	F	F	F	F
I-5 NB off to US-2	Diverge	F	F	F	F	F
I-5 NB from US-2 off to Everett Ave/US-2 on	Basic	C	C	C	C	C
I-5 NB from US-2/Everett Ave on and E Marine View Dr	Weave	E	C	D	C	C
I-5 SB from Marine View Dr to Everett Ave/US-2	Weave	C	F	F	F	F
I-5 SB from Everett Ave/US-2 off to US-2 on	Basic	C	D	D	D	D
I-5 SB on from US-2	Merge	C	D	D	D	D
I-5 SB on from Pacific Ave	Merge	D	F	F	F	F
US-2 EB on from Hewitt Ave	Merge	D	F	E	E	E
US-2 EB off to Ebey Island	Diverge	D	C	C	C	C
US2 EB from 50th to SR-204/20th St	Basic	E	D	D	D	D
US-2 EB off to SR-204/20th St	Diverge	F	F	E	E	E
US-2 EB on from SR-204/20th St	Merge	B	B	B	B	B
US-2 EB from SR-204/20th St to Bickford Ave	Basic	B	B	B	B	B
US-2 EB Off to Bickford Ave	Diverge	B	B	B	B	B
US-2 EB off rom Bickford Ave off to on	Basic	A	A	A	A	A
US-2 EB on from Bickford Ave	Merge	A	B	B	B	B
US-2 WB on from Bickford	Merge	B	F	F	D	D
US-2 WB off to SR-204/20th St	Diverge	B	F	F	C	C
US-2 WB from SR-204/20th St on to 20th St off	Weave	C	D	C	B	B
US-2 WB on from 50th Ave	Merge	C	C	C	B	B
US-2 WB from 50th Ave to I-5	Basic	C	C	C	C	C
US-2 WB Off to I-5 NB	Diverge	C	C	C	F	E
US2 WB off to I-5 SB	Diverge	C	C	D	C	C
20th St merge with SR-204 WB	Merge	E	F		B	
US-2 EB from SR-204/20th St Off to On	Basic	B	B	B	B	B
US-2 WB from 20th St to 50th Ave	Basic	C	C	C	C	B
US-2 WB on from 20th St	Merge					B

Intersection Level of Service

Intersection Levels of Service are shown in **Table 13** (AM and PM peak hours) for existing conditions and in 2040 for the No Build and each of the three alternatives. The intersection LOS is derived from vehicle delay calculations, as described in the Methods and Assumptions report. Overall, the alternatives generally improve the AM peak hour intersection LOS conditions along 20th Street SE by reducing the westbound queues from the interchange. The intersection at Cavalero would continue to operate at LOS F conditions, although average delays would decrease compared to the no build alternative. LOS conditions at other intersections vary based on changes in travel demands resulting from the alternatives.

TABLE 13 INTERSECTION LEVEL OF SERVICE- 2040 ALTERNATIVES

Intersection Level of Service Comparison (AM)						
Intersection	Control	Existing	2040			
			NB	Alt 1	Alt 2	Alt 3
SR204/20th ST	All-way Stop	A	B	A	A	A
SR 204/Sunnyside	Side-street Stop	F	F	F	C	F
SR 204/9th	Side-street Stop	B	F	E	C	F
Cavalero/20th St	Signal	E	F	F	F	F
Ebey Island WB Ramps	All-way Stop	A	A	A	A	A
Ebey Island EB Ramps	All-way Stop	A	B	B	B	B
79th Ave SE/20th St SE	Signal	D	F	E	F	F
83rd Ave SE/20th St SE	Signal	D	F	D	D	D
91st Ave SE/20th St SE	Signal	A	F	C	C	C

Intersection Level of Service Comparison (PM)						
Intersection	Control	Existing	2040			
			NB	Alt 1	Alt 2	Alt 3
SR204/20th ST	All-way Stop	D	F	B	B	C
SR 204/Sunnyside	Side-street Stop	E	D	C	A	E
SR 204/9th	Side-street Stop	A	B	C	D	B
Cavalero/20th St	Signal	B	C	B	B	B
Ebey Island WB Ramps	All-way Stop	A	A	A	A	A
Ebey Island EB Ramps	All-way Stop	B	C	C	C	C
79th Ave SE/20th St SE	Signal	B	B	B	B	B
83rd Ave SE/20th St SE	Signal	B	B	C	B	C
91st Ave SE/20th St SE	Signal	B	C	B	B	B

TRAFFIC OPERATIONS - 2025 NO-BUILD AND PPA

The following sub-sections describe the results of the traffic operations analysis for 2025 No Build and for Alternative 3 (preliminary preferred alternative- PPA):

- Speed
- Freeway Level of Service
- Intersection Level of Service
- Travel Time

The Appendix contains additional details regarding the speed, LOS and queuing results.

Interchange Configuration

No-Build

The interchange configuration along US 2 through the study area for the forecast year 2025 remains the same as existing conditions. (See **Figure 2**)

Preliminary Preferred Alternative (PPA)

As shown in **Figure 22**, the PPA assumes that the WB US 2 trestle structure has not yet been replaced in 2025. The completed US 2/SR 204/20th Street SE interchange will be supplemented with temporary roadway elements to transition the new interchange to the original alignment and drop the two new lanes brought by SR 204 and 20th Street SE.

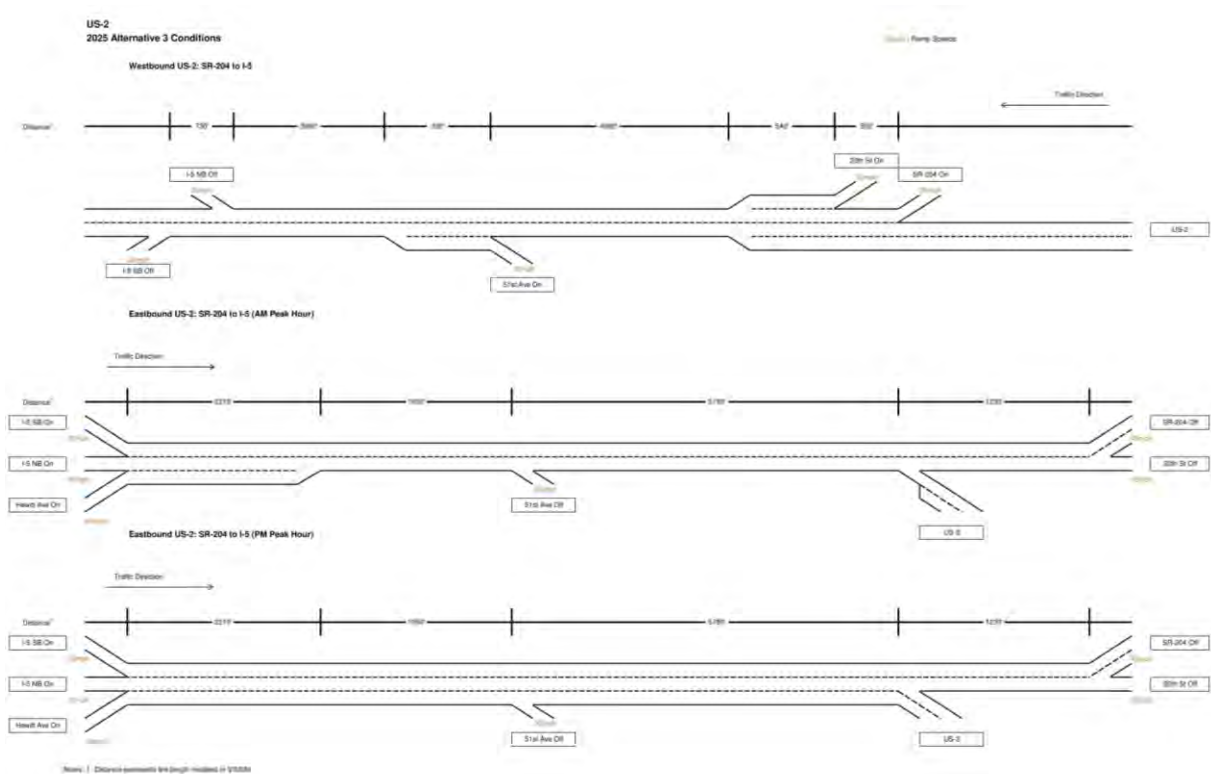


Figure 22 PPA 2025 Traffic Configuration

Corridor Operations

No Build

The existing network was analyzed with forecast traffic volumes for the opening year to establish a baseline for comparison of the PPA. During the AM peak hour, there is an expected increase in travel time for vehicles through the WB SR 204 corridor for SR 204 and 20th St SE compared to existing conditions while travel times for US 2 would remain relatively constant due to existing capacity constraints. Travel times will remain similar to existing conditions (within 10 percent) for all PM peak hour traffic and EB traffic in the AM peak. See **Table 14** No-build (2025) Corridor for a summary of forecast no-build corridor operations.

TABLE 14 NO-BUILD (2025) CORRIDOR TRAVEL TIME

Segment	Direction	Travel Time (min)	Speed (mph)
AM Peak 15 Minutes			
From SR 204 at 81st Ave SE to I-5 at Pacific Ave	WB	17:20	15
From 20th St SE at 83rd Ave SE to I-5 at Pacific Ave	WB	12:05	18
From US 2 at Bickford Ave to I-5 at Pacific Ave	WB	8:30	29
From I-5 at Pacific Ave to SR 204 at 81st Ave SE	EB	5:20	48
From I-5 at Pacific Ave to 20th St SE at 83rd Ave SE	EB	5:30	40
From I-5 at Pacific Ave to US 2 at Bickford Ave	EB	5:20	50
PM Peak 15 Minutes			
From SR 204 at 81st Ave SE to I-5 at Pacific Ave	WB	5:25	48
From 20th St SE at 83rd Ave SE to I-5 at Pacific Ave	WB	5:05	44
From US 2 at Bickford Ave to I-5 at Pacific Ave	WB	5:00	49
From I-5 at Pacific Ave to SR 204 at 81st Ave SE	EB	6:55	36
From I-5 at Pacific Ave to 20th St SE at 83rd Ave SE	EB	7:25	30
From I-5 at Pacific Ave to US 2 at Bickford Ave	EB	6:35	41

Review of the forecast 2025 speeds shows a similar level of congestion to existing conditions. See **Figure 23** and **Figure 24** for visual representation of the no-build operations.

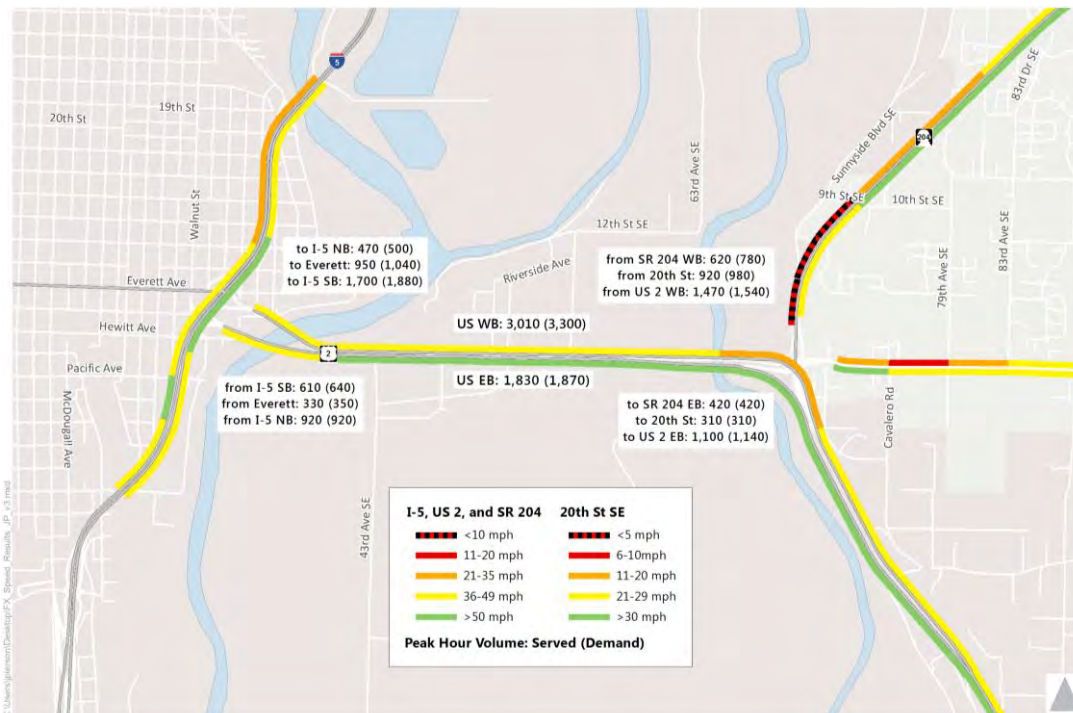


Figure 23 No-Build (2025) Speed Diagram - AM

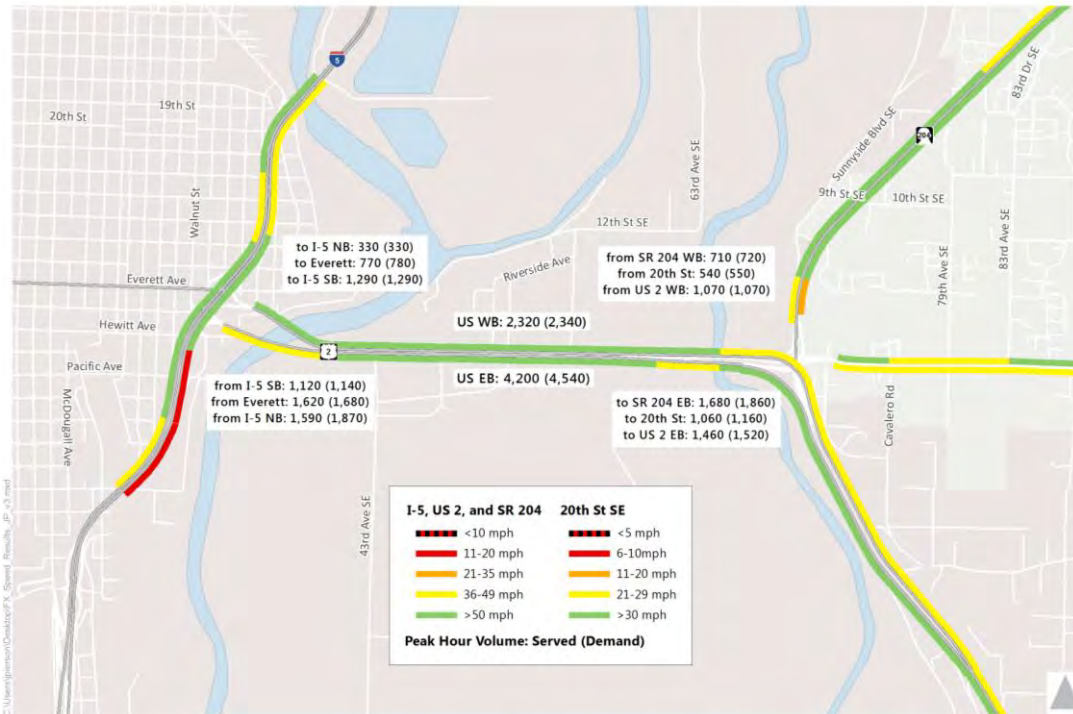


Figure 24 No-Build (2025) Speed Diagram - PM

Freeway Operations

Freeway operations for the no-build opening year scenario are summarized in **Table 15** No-Build (2025) Freeway Operations. The freeway LOS results are relatively consistent between the 2016 Existing and 2025 No Build scenarios. On westbound US 2 during the AM peak hour, the LOS at the Bickford Ave on-ramp merge section degrades from LOS B to LOS F as a result of higher demand volumes and the queue extending further back from the SR 204 eastbound off-ramp. The merge section after the 20th St on-ramp also changes from operating at LOS D in 2016 to forecasted operations of LOS F in 2025 with increased demand on that on-ramp. On eastbound US 2 during the PM peak hour, the merge section from the I-5 and Hewitt Ave on-ramp is forecasted to operate at LOS D in 2025 due to increased demand on US 2 from downtown Everett. After this merge section, the segment LOS is consistent with 2016 existing conditions.

TABLE 15 NO-BUILD (2025) FREEWAY OPERATIONS

Facility	Type	LOS (A-F)		Density (VPLPM)		Speed (mph)		Queue (veh)	
		AM	PM	AM	PM	AM	PM	AM	PM
US 2 WB: Bickford Ave On-ramp	Merge	F	B	56	19	28	46	10	0
US 2 WB: SR 204 EB Off-ramp	Diverge	F	D	120	30	9	35	20	0
US 2 WB: SR 204 WB/20th St On-ramp to 20th St Off-ramp	Weave	D	C	33	28	43	45	260	20

US 2 WB: 20th St Off-ramp to 50th St On-ramp	Basic	D	C	35	21	46	57	0	0
US 2 WB: 50th St On-ramp	Merge	F	C	50	27	36	55	20	0
US 2 WB: 50th St On-ramp to I-5 NB On-ramp	Basic	E	C	42	22	45	57	0	0
US 2 WB: I-5 NB On-ramp	Diverge	D	C	34	22	50	57	0	0
US 2 WB: I-5 SB On-ramp	Diverge	D	C	31	25	51	51	0	0
US 2 EB: Hewitt Ave On-ramp	Merge	D	E	32	41	47	36	40	370
US 2 EB: 50th St Off-ramp	Diverge	C	C	26	27	40	54	0	0
US 2 EB: 50th St Off-ramp to SR 204/20th St Off-ramp	Basic	B	D	17	26	54	54	0	0
US 2 EB: SR 204 EB/20th St Off-ramp	Diverge	C	E	21	39	53	41	0	0
US 2 EB: SR 204 EB/20th St Off-ramp to SR 204 WB On-ramp	Basic	B	B	14	14	55	55	0	0
US 2 EB: SR 204 WB On-ramp	Merge	C	B	21	14	45	53	150	0
US 2 EB: SR 204 WB On-ramp to Bickford Ave Off-ramp	Basic	B	B	14	15	51	57	0	0
US 2 EB: Bickford Ave Off-ramp	Diverge	B	B	12	13	50	58	0	0
I-5 NB: Pacific Ave Off-ramp	Diverge	E	F	40	112	39	17	0	1,050
I-5 NB: US 2 EB Off-ramp	Diverge	C	F	22	97	50	19	0	10

Facility	Type	LOS (A-F)		Density (VPLPM)		Speed (mph)		Queue (veh)	
		AM	PM	AM	PM	AM	PM	AM	PM
I-5 NB: US 2 EB Off-ramp to US 2 WB/Everett Ave On-ramp	Basic	E	C	38	18	43	51	0	0
I-5 NB: US 2 WB/Everett Ave On-ramp to Marine View Dr Off-ramp	Weave	D	D	31	30	43	41	20	100
I-5 SB: Marine View Dr On-ramp to US 2 EB/Everett Ave Off-ramp	Weave	F	D	51	30	31	47	460	30
I-5 SB: US 2 EB/Everett Ave Off-ramp to US 2 WB On-ramp	Basic	D	C	32	22	47	56	10	0
I-5 SB: US 2 WB On-ramp	Merge	D	C	31	24	53	59	180	0
I-5 SB: Pacific Ave On-ramp	Merge	E	E	37	39	44	41	0	20

Operations at Crossroad Intersections

From 2016 to 2025, local network operations are expected to degrade at all intersections along 20th Street SE approaching the study interchange during the AM peak hour (**Table 16**). This is a result of queueing

extending further along local roads, as the US 2/SR 204/20th Street SE interchange has already reached capacity and is unable to accommodate the additional demand. Operations in the PM peak are similar to existing conditions. **Figure 25** shows the intersection turning volumes and depicts LOS.

TABLE 16 NO-BUILD (2025) INTERSECTION OPERATIONS

Intersection	Control Type	LOS		Delay (seconds)	
		AM	PM	AM	PM
SR 204 / 20th St SE	All-way stop	C	E	25	42
SR 204 / Sunnyside Blvd SE	Side-street stop	F	D	496	31
SR 204 / 9th St SE	Side-street stop	F	B	103	13
Cavalero Rd /20th St SE	Signal	E	C	64	22
Ebey Island / SR 204 WB On-ramp	All-way stop	A	A	5	4
Ebey Island / SR 204 EB Off-ramp	All-way stop	A	B	10	12
79th Ave SE / 20th St SE	Signal	E	B	73	17
83rd Ave SE / 20th St SE	Signal	F	B	92	13
91st Ave SE / 20th St SE	Signal	C	C	20	27

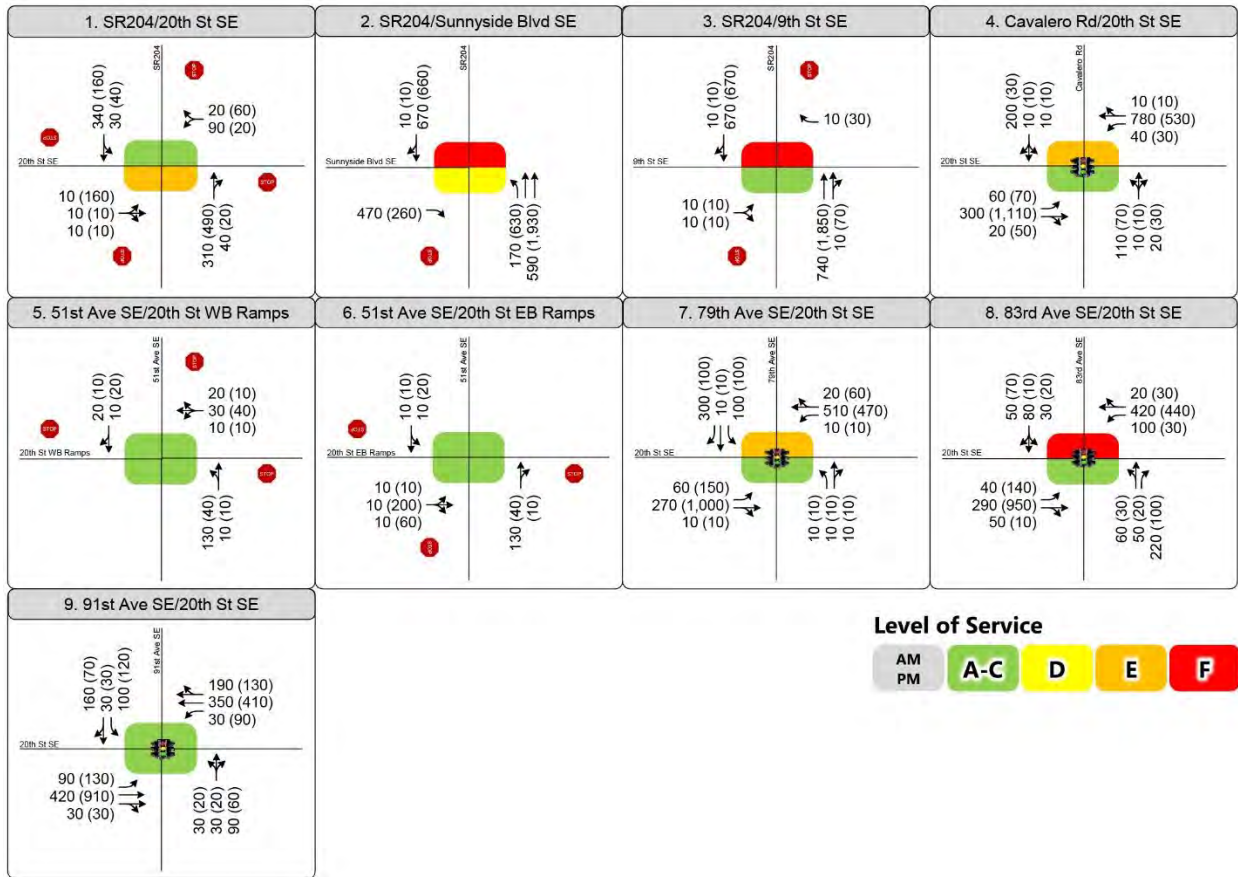


Figure 25 No Build (2025) Intersection Turning Movements

Intersection Queuing

AM Peak Hour

During the AM peak hour, the following intersection movements have extended queues. In some cases, these queues extend beyond the limits of the VISSIM model network:

- SR 204/Sunnyside Blvd SE- eastbound queue on Sunnyside Blvd.
- 20th St SE/Cavalero Road- Westbound extends to 79th Ave SE
- 20th St SE/79th Ave SE- Southbound approach on 79th Ave SE
- 20th St SE/83rd Ave SE- Northbound right turn exceeds pocket length
- Ebey Island /SR 204 WB on-ramp- Northbound traffic extends through the intersection with the EB off-ramp (Note: these are relatively low-volume movements, but the storage distance is short)

Westbound queues are also evident along 20th St SE to the east of 79th Ave SE but generally do not extend through the upstream intersection.

PM Peak Hour

During the PM peak hour, the following intersection movements have extended queues. In some cases, these queues extend beyond the limits of the VISSIM model network:

- SR 204/Sunnyside Blvd SE- Northbound left turn exceeds pocket length
- 20th St SE/79th Ave SE- Southbound left turn exceeds pocket length
- Ebey Island /SR 204 WB on-ramp- Northbound traffic extends through the intersection with the EB off-ramp (Note: these are relatively low-volume movements, but the storage distance is short)

Additional detail regarding intersection analysis is available in the Appendix.

Preliminary Preferred Alternative

A summary of corridor travel times is presented in **Table 17** PPA (2025) Corridor Travel Times. During the AM peak, all WB traffic travel times are improved over no-build estimates by 15–30 percent. EB traffic through the study corridor will experience similar travel times to the no-build alternative. There is no benefit for HOV travelers in the opening year, since there is no reconstruction of the trestle with HOV lanes.

During the PM peak, travel times for WB traffic are expected to be similar to the no-build condition. The traffic simulation model shows EB travel times increasingly up to one minute, although this is likely due to fluctuations within the different model runs rather than actual traffic conditions.

TABLE 17 PPA (2025) CORRIDOR TRAVEL TIMES

Segment	Direction	Travel Time (min)	Speed (mph)
AM Peak 15 Minutes			
From SR 204 at 81st Ave SE to I-5 at Pacific Ave	WB	11:30	22
From 20th St SE at 83rd Ave SE to I-5 at Pacific Ave	WB	9:40	23
From US 2 at Bickford Ave to I-5 at Pacific Ave	WB	8:25	29
From I-5 at Pacific Ave to SR 204 at 81st Ave SE	EB	5:15	48
From I-5 at Pacific Ave to 20th St SE at 83rd Ave SE	EB	5:25	41
From I-5 at Pacific Ave to US 2 at Bickford Ave	EB	5:20	50
PM Peak 15 Minutes			
From SR 204 at 81st Ave SE to I-5 at Pacific Ave	WB	5:35	46
From 20th St SE at 83rd Ave SE to I-5 at Pacific Ave	WB	5:40	40
From US 2 at Bickford Ave to I-5 at Pacific Ave	WB	5:25	45
From I-5 at Pacific Ave to SR 204 at 81st Ave SE	EB	7:40	33
From I-5 at Pacific Ave to 20th St SE at 83rd Ave SE	EB	8:50	25
From I-5 at Pacific Ave to US 2 at Bickford Ave	EB	7:20	37

As shown in **Figure 26** and **Figure 27**, the forecast PPA 2025 speeds show improvements on each of the westbound interchange approach roadways in the AM peak hour. PM speeds were similar to existing conditions.

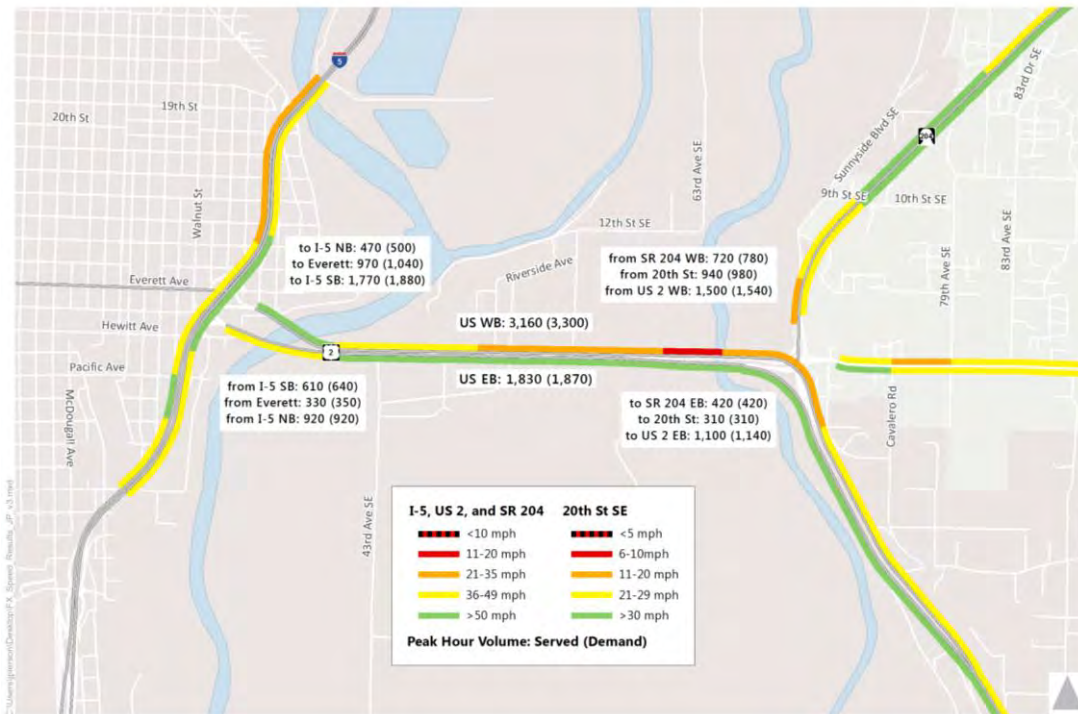


Figure 26 PPA (2025) Speed Diagram - AM

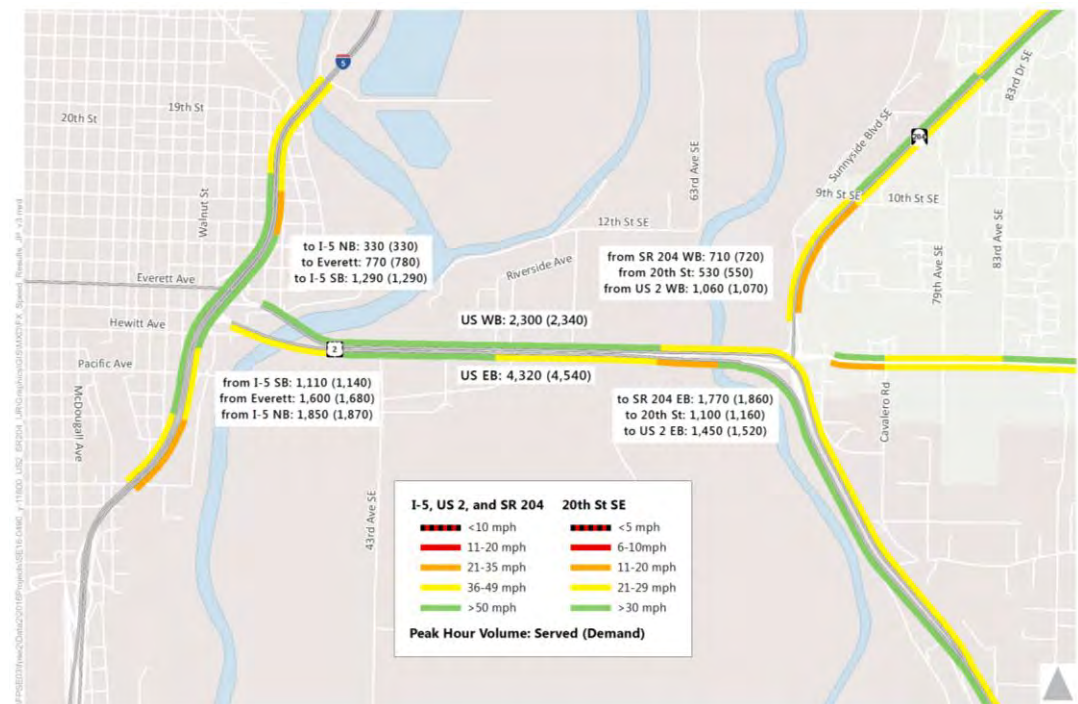


Figure 27 PPA (2025) Speed Diagram - PM

Freeway Operations

As shown in **Table 18**, the improvements to the US 2/SR 204/20th Street SE interchange in the 2025 PPA scenario result in more westbound demand being served during the AM peak hour from SR 204, 20th St SE, and US 2. The additional volume merging onto the US 2 trestle, from 4 lanes to 2 lanes, results in worse forecasted LOS (D to F) from the SR 204 merge to 50th St on-ramp merge compared with the No Build scenario.

During the PM peak hour (**Table 0-1**), NB I-5 worsens to LOS F to the north of US 2 due to the additional traffic traversing the trestle in the WB direction, then exiting to NB I-5. Two eastbound sections of US 2, approaching the SR 204/20th St SE off ramps, show LOS F, although the speeds remain good with minor queuing. This is likely a model anomaly, since the volumes are similar to those in the No Build condition.

TABLE 18 PPA (2025) FREEWAY OPERATIONS –AM PEAK

Facility	Type	LOS (A-F)		Density (VPLPM)		Speed (mph)		Queue (veh)	
		No Build 2025	PPA 2025	No Build 2025	PPA 2025	No Build 2025	PPA 2025	No Build 2025	PPA 2025
US 2 WB: Bickford Ave On-ramp	Merge	F	C	56	23	28	47	10	0
US 2 WB: SR 204 EB Off-ramp	Diverge	F	B	120	20	9	47	20	0
US 2 WB: SR 204 On-ramp	Merge	-	F	-	81	-	21	-	80
US 2 WB: 20 th Street On-ramp	Merge	D	F	33	137	43	10	260	80
US 2 WB: SR 204 WB On-ramp to 50th St On-ramp	Basic	D	F	35	86	46	18	0	50
US 2 WB: 50th St On-ramp	Merge	F	F	50	65	36	26	20	20
US 2 WB: 50th St On-ramp to I-5 NB On-ramp	Basic	E	E	42	43	45	45	0	0
US 2 WB: I-5 NB Off-ramp	Diverge	D	D	34	34	50	51	0	0
US 2 WB: I-5 SB Off-ramp	Diverge	D	D	31	31	51	52	0	0
US 2 EB: Hewitt Ave On-ramp	Merge	D	C	32	26	47	52	40	50
US 2 EB: 50th St Off-ramp	Diverge	C	C	26	25	40	40	0	0
US 2 EB: 50th St Off-ramp to SR 204/20th St Off-ramp	Basic	B	B	17	17	54	55	0	0
US 2 EB: SR 204 EB/20th St Off-ramp	Diverge	C	C	21	20	53	53	0	0
US 2 EB: SR 204 EB/20th St Off-ramp to SR 204 WB On-ramp	Basic	B	B	14	14	55	55	0	0
US 2 EB: SR 204 WB On-ramp	Merge	C	B	21	17	45	46	150	80
US 2 EB: SR 204 WB On-ramp to Bickford Ave Off-ramp	Basic	B	B	14	15	51	50	0	0
US 2 EB: Bickford Ave Off-ramp	Diverge	B	B	12	13	50	49	0	0
I-5 NB: Pacific Ave Off-ramp	Diverge	E	E	40	40	39	43	0	0
I-5 NB: US 2 EB Off-ramp	Diverge	C	C	22	23	50	50	0	0
I-5 NB: US 2 EB Off-ramp to US 2 WB/Everett Ave On-ramp	Basic	E	E	38	40	43	41	0	0
I-5 NB: US 2 WB/Everett Ave On-ramp to Marine View Dr Off-ramp	Weave	D	C	31	27	43	47	20	10
I-5 SB: Marine View Dr On-ramp to US 2 EB/Everett Ave Off-ramp	Weave	F	F	51	51	31	31	460	480
I-5 SB: US 2 EB/Everett Ave Off-ramp to US 2 WB On-ramp	Basic	D	D	32	30	47	48	10	0
I-5 SB: US 2 WB On-ramp	Merge	D	D	31	31	53	53	180	120
I-5 SB: Pacific Ave On-ramp	Merge	E	E	37	39	44	44	0	10

TABLE 0-1 PPA (2025) FREEWAY OPERATIONS –PM PEAK

Facility	Type	LOS (A-F)		Density (VPLPM)		Speed (mph)		Queues (ft)	
		No Build 2025	PPA 2025	No Build 2025	PPA 2025	No Build 2025	PPA 2025	No Build 2025	PPA 2025
US 2 WB: Bickford Ave On-ramp	Merge	B	B	19	16	46	45	0	10
US 2 WB: SR 204 EB Off-ramp	Diverge	D	D	30	29	35	35	0	0
US 2 WB: 20th St On-ramp	Merge	-	C	-	21	-	42	-	10
US 2 WB: SR 204 WB On-ramp	Merge	C	C	28	26	45	44	20	20
US 2 WB: SR 204 WB On-ramp to 50th St On-ramp	Basic	C	C	21	24	57	52	0	0
US 2 WB: 50th St On-ramp	Merge	C	C	27	23	55	52	0	0
US 2 WB: 50th St On-ramp to I-5 NB On-ramp	Basic	C	C	22	24	57	53	0	0
US 2 WB: I-5 NB On-ramp	Diverge	C	D	22	29	57	44	0	0
US 2 WB: I-5 SB On-ramp	Diverge	C	C	25	24	51	51	0	0
US 2 EB: Hewitt Ave On-ramp	Merge	E	E	41	37	36	36	370	140
US 2 EB: 50th St Off-ramp	Diverge	C	D	27	33	54	46	0	10
US 2 EB: 50th St Off-ramp to SR 204/20th St Off-ramp	Basic	D	F	26	49	54	38	0	30
US 2 EB: SR 204 EB/20th St Off-ramp	Diverge	E	F	39	69	41	23	0	50
US 2 EB: SR 204 EB/20th St Off-ramp to SR 204 WB On-ramp	Basic	B	B	14	14	55	53	0	0
US 2 EB: SR 204 WB On-ramp	Merge	B	E	14	36	53	38	0	0
US 2 EB: SR 204 WB On-ramp to Bickford Ave Off-ramp	Basic	B	B	15	15	57	57	0	0
US 2 EB: Bickford Ave Off-ramp	Diverge	B	B	13	13	58	58	0	0
I-5 NB: Pacific Ave Off-ramp	Diverge	F	F	112	76	17	26	1,050	120
I-5 NB: US 2 EB Off-ramp	Diverge	F	F	97	54	19	38	10	10
I-5 NB: US 2 EB Off-ramp to US 2 WB/Everett Ave On-ramp	Basic	C	C	18	22	51	54	0	0
I-5 NB: US 2 WB/Everett Ave On-ramp to Marine View Dr Off-ramp	Weave	D	F	30	47	41	31	100	90
I-5 SB: Marine View Dr On-ramp to US 2 EB/Everett Ave Off-ramp	Weave	D	D	30	32	47	44	30	30
I-5 SB: US 2 EB/Everett Ave Off-ramp to US 2 WB On-ramp	Basic	C	C	22	23	56	53	0	0
I-5 SB: US 2 WB On-ramp	Merge	C	C	24	25	59	53	0	0
I-5 SB: Pacific Ave On-ramp	Merge	E	E	39	37	41	45	20	20

Operations at Crossroad Intersections

Analysis of local network intersections during the opening year shows that operations have improved for the intersections along 20th Street SE which had been failing during the no-build alternative for 2025 (**Table 19**). Sunnyside Ave continues to operate at LOS F. **Figure 28** shows the intersection turning volumes and depicts LOS.

TABLE 19 PPA (2025) INTERSECTION OPERATIONS

Intersection	Control Type	LOS		Delay (s)	
		AM	PM	AM	PM
SR204/20th St	All-way stop	C	E	21	46
SR 204/Sunnyside	Side-street Stop	F	F	303	79
SR 204/9th	Side-street Stop	A	B	7	12
Cavalero/20th St	Signal	C	C	23	28
Ebey Island WB Ramps	All-way Stop	A	A	4	4
Ebey Island EB Ramps	All-way Stop	A	B	9	12
79th Ave SE/20th St SE	Signal	B	B	16	18
83rd Ave SE/20th St SE	Signal	D	B	36	13
91st Ave SE/20th St SE	Signal	B	C	20	27

Intersection Queuing

AM Peak Hour

During the AM peak hour, the following intersection movements have extended queues. In some cases, these queues extend beyond the limits of the VISSIM model network:

- SR 204/Sunnyside Blvd SE- eastbound queue on Sunnyside Blvd.
- 20th St SE/79th Ave SE- Southbound approach on 79th Ave SE
- 20th St SE/83rd Ave SE- Northbound right turn exceeds pocket length
- Ebey Island /SR 204 WB on-ramp- Northbound traffic extends through the intersection with the EB off-ramp (Note: these are relatively low-volume movements, but the storage distance is short)

Overall queue lengths are lower than in the No Build condition with the exception of those noted above, which are similar to No Build.

PM Peak Hour

During the PM peak hour, the following intersection movements have extended queues. In some cases, these queues extend beyond the limits of the VISSIM model network:

- SR 204/Sunnyside Blvd SE- Northbound left turn exceeds pocket length

- 20th St SE/79th Ave SE- Southbound left turn exceeds pocket length
- Ebey Island /SR 204 WB on-ramp- Northbound traffic extends through the intersection with the EB off-ramp (Note: these are relatively low-volume movements, but the storage distance is short)
- Ebey Island /SR 204 EB off-ramp- Southbound traffic extends through the intersection with the WB on-ramp (Note: these are relatively low-volume movements, but the storage distance is short)

Overall queue lengths are lower than in the No Build condition with the exception of those noted above, which are similar to No Build. Additional detail regarding intersection analysis is available in the Appendix.

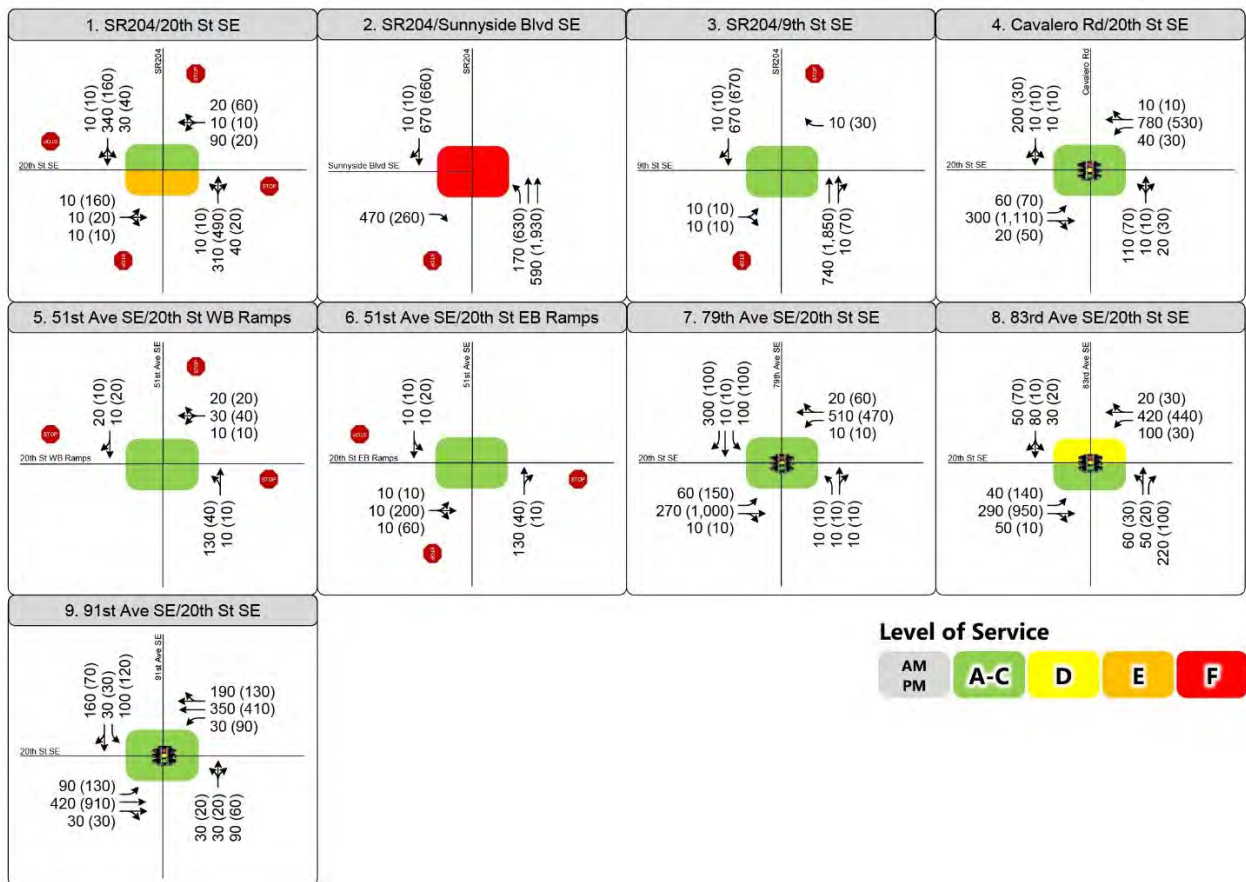


Figure 28 PPA (2025) Intersection Turning Movements

COLLISION ANALYSIS

Observed Crash History

One of the primary goals for the interchange modification was to improve safety for the traveling public. To provide a basis for comparison, existing crash data from January 2011 to December 2015 was collected and analyzed on the state facilities US 2 and SR 204. The analysis highlights locations with safety concerns and identifies the contributing circumstances. Vehicle collision data was obtained from WSDOT, which includes various details about the collisions: type, probable cause, severity, time of day, and weather conditions. Over the five-year study period, there were 467 collisions in the study area.

As shown in **Figure 29**, along US 2 Westbound, the majority of collisions occur in the morning and between the Ebey Island on-ramp and the merge with I-5. Two other locations along this corridor tend to be frequent collision locations: at the SR 204 / 20th St SE on-ramp, and just after milepost 4. The congestion experienced as traffic approaching I-5 leads to frequent lane-changing and rear-end collisions. There also tend to be collisions at the SR 204 / 20th St SE interchange location as oncoming traffic enters the highway from SR 204 and 20th Street SE and attempts to merge with existing lanes. The collisions near milepost 4 occur as vehicles merge and diverge due to the Bickford Avenue on and off ramps.

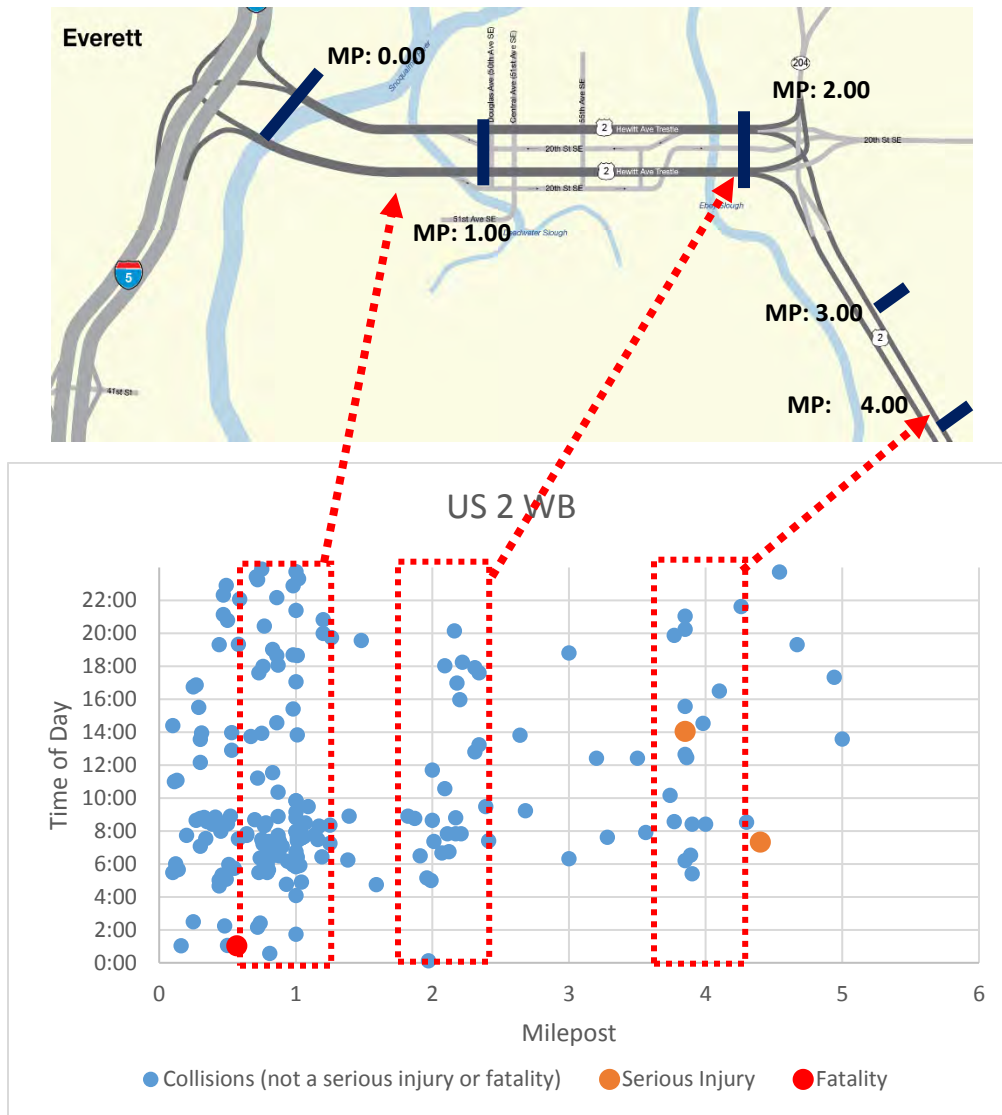


Figure 29 Locations of Collisions along US 2

The on-ramp from SR 204 and 20th St SE also sees a defined pattern of collisions throughout the day at the point where the separate ramps from 20th St SE and SR 204 merge. The difference in speed between those coming from 20th St SE and those coming from SR 204 is such that it is a very uncomfortable merge. **Figure 30** and **Figure 31** illustrate the collision data along the separate legs of the on-ramp.

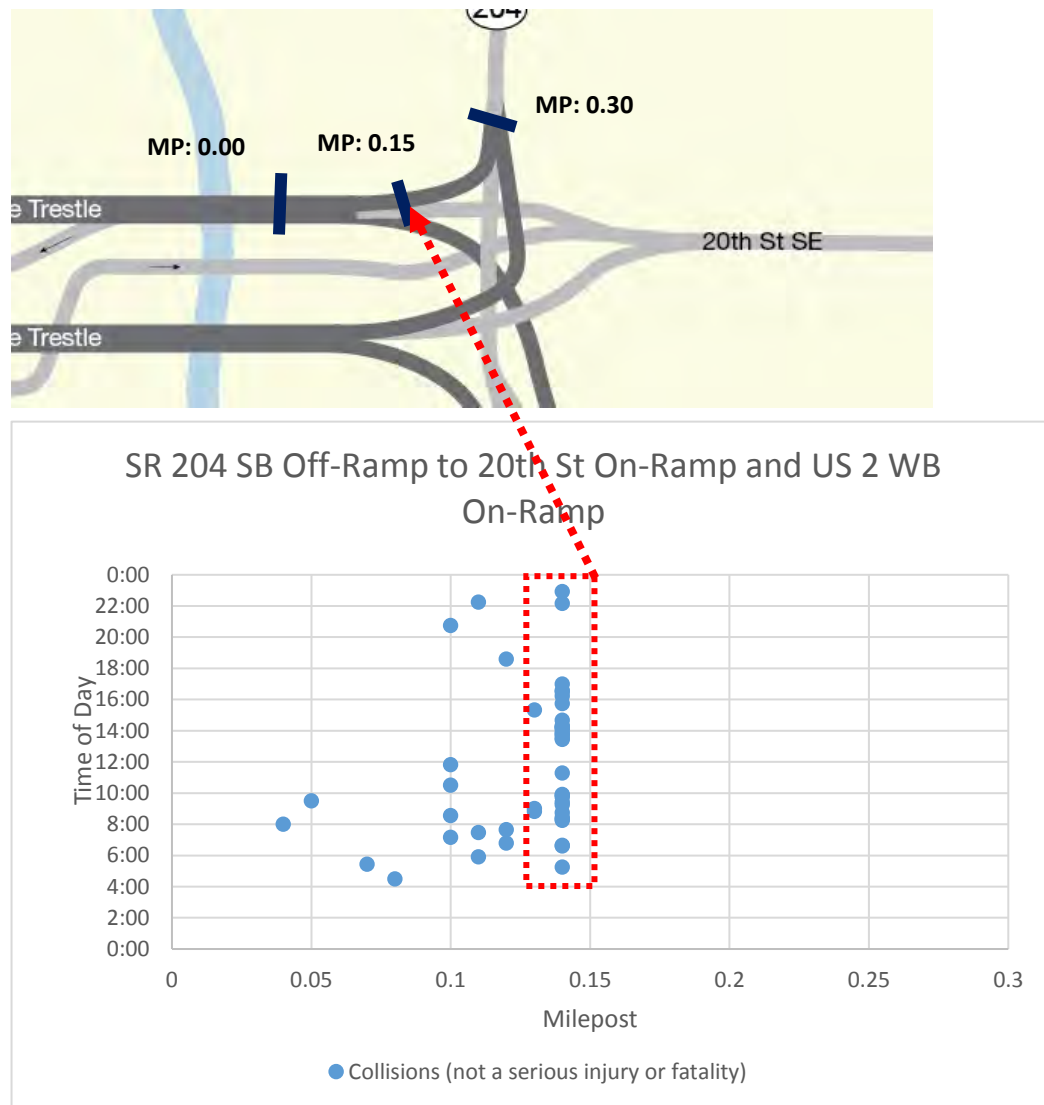


Figure 30. 20th Street SE On-Ramp Collisions

As the IJR study was in progress, the study team was contacted by the Bicycle Center of Snohomish and Silver Lake concerning a bicycling fatality that occurred at the SR 204 / 20th Street SE intersection. This collision is not reflected in the data presented above since it was not reported prior to the data collection, but the incident demonstrates a need for improvement to the existing non-vehicular network in vicinity of the interchange.

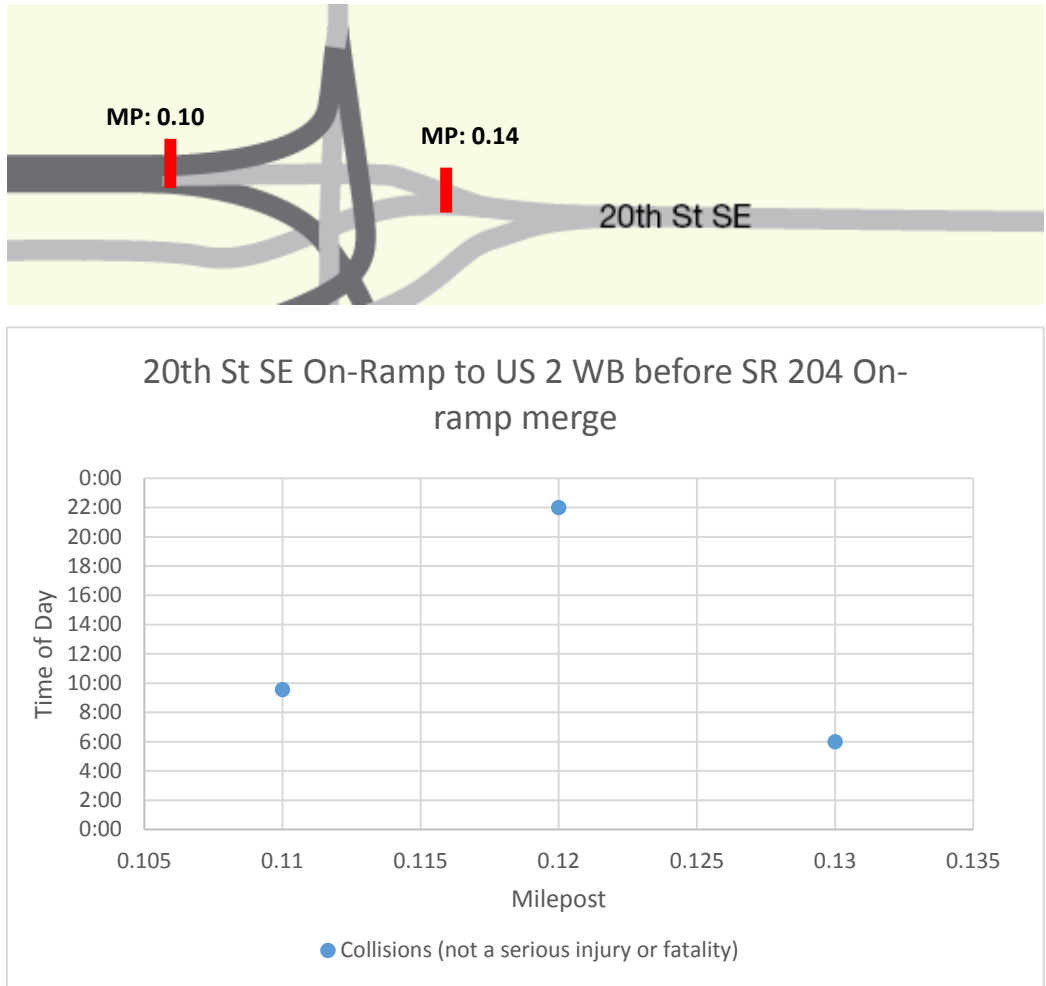


Figure 31. SR 204 On-Ramp Collisions

Collision Rates

The project team calculated collision rates for intersections and roadway segments surrounding the US 2/SR 204/20th Street SE interchange using a methodology developed by the FHWA. The rates were calculated to allow comparison of collision rates between locations in the study area and around the state. The FHWA methodology for calculating collision rates at intersections considers the total number of collisions and average daily traffic (ADT) entering an intersection. This approach allows for an equal comparison between intersections in the study area. The following calculation provides the number of collisions per million entering vehicles (MEV) into the intersection.

$$R = \frac{1,000,000 \times \text{total collisions}}{365 \times \text{number of years of data} \times \text{ADT}}$$

The collision rate calculation for road segments provides the number of collisions per 100 million vehicle miles traveled (MVMT) along a segment, accounting for length of segment and ADT carried.

$$R = \frac{100,000,000 \times \text{total collisions}}{365 \times \text{number of years of data} \times \text{ADT} \times \text{length of roadway}}$$

Similarly, MEV and MVMT rates by collision types and severity were calculated to explore other collision patterns.

Results – FHWA Method

Collision rates per MEVs for intersections and MVMs of travel for road segments surrounding the US 2/SR 204/20th Street SE interchange are summarized below in **Table 20** and **Table 21**.

TABLE 20 ANNUAL AVERAGE INTERSECTION COLLISION RATES 2011-2015

Intersection	Type of Collision			5-Year Total	ADT	Collision Rate (per MEV)
	Fatal	Injury	Property Damage Only			
SR 204 and 20th St SE	0	4	6	10	9,330	0.59
SR 204 and Sunnyside	0	12	16	28	36,300	0.42
SR 204 and 9th St SE/10th St SE	0	4	6	10	27,570	0.20
Cavalero Road and 20th Street SE	0	0	4	4	18,800	0.12
51st Avenue SE and 20th Street SE	0	0	1	1	3,140	0.17

Based on a previous study done by the University of Wisconsin for the Wisconsin Department of Transportation (WisDOT), the average collision rate for intersections that share similar characteristics as those evaluated in the study area is 0.82 MEV (WSDOT does not have statewide intersection collision rate data). These characteristics include intersections with 25,000 or more average daily entering volumes and in incorporated areas. For intersections with fewer than 15,000 daily entering vehicles (e.g. SR 204/20th Street SE and 51st Avenue SE and 20th Street SE), the average collision rate is 1.33. So, none of the studied intersections have rates higher than the average collision rate for these types of intersections.

TABLE 21 ANNUAL AVERAGE ROADWAY SEGMENT COLLISION RATES 2011-2015

Segments	Segment Length (mi)	Type of Collision			5-Year Total	ADT	Collision Rate (per 100 MVMT)
		Fatal	Injury	Property Damage Only			
US 2 EB							
I-5 on-ramps to Ebey Island off-ramp	0.9	0	19	41	60	44,010	83.0
51st St SE to SR 204/20th St SE off-ramp	1.1	0	28	59	87	41,400	104.7
SR 204/20th St SE off-ramp to SR 204 on-ramp	0.3	0	0	0	0	13,380	0
SR 204 on-ramp to Bickford Ave off-ramp	1.1	0	6	13	19	14,760	64.1
Bickford Ave off-ramp to Bickford Ave on-ramp	0.6	0	8	12	20	8,820	207.1
Bickford Ave on-ramp to SR 9	0.6	1	1	9	11	9,390	107.0
US 2 WB							
SR 9 to Bickford Ave on-ramp	1.5	0	6	17	23	9,670	86.9
Bickford Ave on-ramp to SR 204 off-ramp	0.5	0	0	3	3	16,530	19.9
SR 204 off-ramp to SR 204/20th St SE on-ramp	0.5	0	3	6	9	11,520	85.6
20th St SE on-ramp to 20th St SE (Ebey Island) off-ramp	0.2	0	4	2	6	22,610	72.7
20th St SE (Ebey Island) off-ramp to Ebey Island on-ramp	1.0	0	5	15	20	21,310	51.4
Ebey Island on-ramp to I-5/California St/Walnut St off-ramps	0.9	1	35	58	94	22,150	258.4
US 2 EB Ramps							
Ebey Island off-ramp	0.26	0	0	2	2	2,610	161.5
SR 204 NB on-ramp	0.41	0	3	2	5	18,320	36.5
20th St SE off-ramp	0.33	0	2	0	2	9,700	34.2
SR 204 SB on-ramp	0.46	0	0	0	0	1,380	0
Bickford Ave off-ramp	0.33	0	0	3	3	5,940	83.9
Bickford Ave on-ramp	0.30	0	0	0	0	570	0
US 2 WB Ramps							
Bickford Ave on-ramp	0.74	0	2	1	3	6,860	32.4
SR 204 NB off-ramp	0.32	0	1	0	1	5,010	34.2

Segments	Segment Length (mi)	Type of Collision			5-Year Total	ADT	Collision Rate (per 100 MVMT)
		Fatal	Injury	Property Damage Only			
US 2 WB Ramps (continued)							
SR 204 SB on-ramp	0.18	0	23	19	52	6,710	2359.1
20th St SE on-ramp	0.19	0	1	2	3	4,380	197.5
Between 204/20th and US 2 ramp	0.15	0	18	30	48	11,090	1581.1
20th St SE (Ebey Island) off-ramp	0.15	0	0	0	0	440	0
Ebey Island on-ramp	0.22	0	3	0	3	840	889.5
Other Roadway Segments							
SR 204 from 20th St SE to 81st Ave NE	1.43	1	51	84	136	32,560	160.0
Sunnyside Blvd from SR 204 to 4th St SE	0.81	0	7	8	15	8,240	123.1
20th St SE from Ebey Island to 79th Ave SE	1.75	0	31	33	64	16,900	118.6

Snohomish County averages about 236.0 collisions per 100 million vehicle miles traveled according to the 2015 Statewide Annual Collision Summary published by WSDOT. The segments in the study area with collision rates equal to or greater than the county average are the following:

- The US 2 WB segment between the Ebey Island on-ramp and I-5 off-ramps (258.4 MVMT)
- The SR 204 on-ramp to US 2 WB (2359.1 MVMT)
- The segment between the SR 204/20th Street merge and the US 2 WB merge (1581.1 MVMT)
- The Ebey Island on-ramp to US 2 WB (889.5 MVMT)

These locations match those where existing traffic congestion has been observed.

The detailed reports indicate that 467 collisions were reported in the study area, where approximately 33 percent were injury collisions and where approximately 50 percent of all the collisions were rear-end collisions, mostly attributable to merging and diverging. Additional study area collision statistics are summarized in **Table 22**.

TABLE 22 COLLISION SUMMARY STATISTICS

Category	Number	Percent of Total*
Rear-end collisions	235	50%
Single-vehicle collisions	87	19%
Exceeding reasonably safe speed	50	11%

Under influence of alcohol/drugs	22	5%
Bike collisions	0	0%
Ped collisions	3	1%
Injury collisions	153	33%
Fatal collisions	0	0%
Nighttime collisions	110	24%
Wet/ice/snow conditions	172	37%
Total collisions in study area	467	100%
* Column sums to more than 100% because several collision characteristics can occur simultaneously.		

In addition to the FHWA method, the consultant team calculated existing and future 2040 collision rates for 12 freeway segments and ramps along US 2 and SR 204 using the Enhanced Interchange Safety Analysis Tool (ISATe) methodology developed by the FHWA and AASHTO. The rates were calculated to allow comparison of collision rates between locations in the study area and around the state. In addition to the FHWA method, the methods identified in the AASHTO Highway Safety Manual (HSM) were also applied to five arterial street segments and five intersections using the HSM spreadsheet for urban and suburban arterials.

Analysis Tools

Enhanced Interchange Safety Analysis Tool (ISATe)

The ISATe is a tool that utilizes the freeway and interchange methodologies developed for the HSM to understand how geometric design alternatives affects safety. Inputs include detailed freeway geometry, location of ramps, annual average daily traffic (AADT), and current collision data. It calculates predicted crash frequency for fatal and injury collisions (KABC), and total collisions including property damage only (KABCO). The “KABCO” injury scale was developed by the National Safety Council and is used to classify injuries accordingly:

- K – Fatal
- A – Incapacitating injury
- B – Non-incapacitating injury
- C – Possible injury
- O – No injury/property damage only

This tool was used for these study segments:

- US 2 from 51st St to US 2/SR 204/20th Street SE interchange
- US 2 from 51st St to US 2/SR 204/20th Street SE interchange merge/diverge

- US 2 from US 2/SR 204/20th Street SE interchange to Bickford Ave
- US 2 from US 2/SR 204/20th Street SE interchange to Bickford Ave merge/diverge
- US 2 WB from SR 204 N off-ramp to SR 204 S on-ramp
- US 2 WB from 20th St on-ramp to 20th St off-ramp
- US 2 EB SR 204 NB on-ramp
- US 2 EB 20th St off-ramp
- US 2 EB SR 204 SB on-ramp
- US 2 WB SR 204 SB on-ramp
- US 2 WB between SR 204/20th St and US 2
- US 2 WB 20th St on-ramp

Highway Safety Manual (HSM)

The HSM spreadsheet tool for urban and suburban arterials was used to analyze expected and predicted crash frequency for arterial roadways near the US 2/SR 204/20th Street SE interchange. Inputs include roadway geometry and type, intersection control type, AADT, presence of lighting, number of intersecting driveways, and roadside fixed object density. It calculates expected and predicted average crash frequency for fatal and injury collisions (KABC), and total collisions including property damage only (KABCO) as described in the above ISATe tool.

This tool was used for these study segments and intersections:

- 20th Street:
 - SR 204 to Cavalero Rd/75th Ave S
 - Cavalero Rd/75th Ave S to 79th Ave SE/Fairview Dr
 - 79th Ave SE/Fairview Dr to 83rd Ave SE
 - Intersection of 20th St and 75th Ave S
 - Intersection of 20th St and 79th Ave SE
 - Intersection of 20th St and 83rd Ave SE
- SR 204:
 - US 2 to Sunnyside Blvd SE
 - Sunnyside Blvd SE to 9th St SE
 - Intersection of SR 204 and Sunnyside Blvd SE
 - Intersection of SR 204 and 9th St SE

Collision Analysis – No-Build

Roadway information was entered into the ISATe and HSM spreadsheets for comparison with forecasted no-build conditions in 2040. Detailed HSM and ISATe results are provided in the Appendix **Table 23** provides a summary of the predicted average crash frequency calculated for the no-build scenario compared to the existing rate. The segments correspond to those listed previously in section 0.

TABLE 23 SUMMARY OF ANTICIPATED SAFETY PERFORMANCE FOR EXISTING AND 2040 NO-BUILD

Collision Analysis – Predicted Collision Totals		
	Predicted Average Crash Frequency (crash/yr)	
Scenario	Property Damage Only	Fatal & Injury
Existing	59.2	19.8
2040 No-Build	105.4	32.4
Collision totals include intersections, segments, ramps, and merge/diverge points		
US 2/SR 204/20th Street SE Interchange – ISATe		
	Predicted Average Crash Frequency (crash/yr)	
Scenario	Property Damage Only	Fatal & Injury
Existing	39.9	13.3
2040 No-Build	73.2	21.5
20th Street and SR 204 – HSM		
	Predicted Average Crash Frequency (crash/yr)	
Scenario	Property Damage Only	Fatal & Injury
Existing – 20th Street	9.3	3.0
2040 No-Build – 20th Street	19.9	6.6
Existing – SR 204	10.0	3.6
2040 No-Build – SR 204	12.3	4.3

The predicted average crash frequency for all areas increased in the 2040 no-build scenario. This is expected as AADT increases in the future and this is a major input in the ISATe and HSM calculations.

Collision Analysis – PPA

After analyzing the 2040 no-build scenario, roadway information was entered into the ISATe and HSM spreadsheets for comparison with the 2040 PPA. Detailed HSM and ISATe results are provided in Appendix D. **Table 24** provides a summary of the predicted average crash frequency calculated for the PPA compared to the existing and 2040 no-build rates.

TABLE 24 SUMMARY OF ANTICIPATED SAFETY PERFORMANCE

Collision Analysis – Predicted Collision Totals		
	Predicted Average Crash Frequency (crash/yr)	
Scenario	Property Damage Only	Fatal & Injury
Existing	59.2	19.8
2040 No-Build	105.4	32.4
2040 PPA	100.4	32.4
Collision totals include intersections, segments, ramps, and merge/diverge points		
US 2/SR 204/20th Street SE Interchange – ISATe		
	Predicted Average Crash Frequency (crash/yr)	
Scenario	Property Damage Only	Fatal & Injury
Existing	39.9	13.3
2040 No-Build	73.2	21.5
2040 PPA	68.1	21.4
20th Street and SR 204 – HSM		
	Predicted Average Crash Frequency (crash/yr)	
Scenario	Property Damage Only	Fatal & Injury
Existing – 20th Street	9.3	3.0
2040 No-Build – 20th Street	19.9	6.6
2040 PPA – 20th Street	19.7	6.6
Existing – SR 204	10.0	3.6
2040 No-Build – SR 204	12.3	4.3
2040 PPA – SR 204	12.6	4.4

For the PPA, overall predicted average crash frequency increased from existing conditions due to the predicted increase in AADT on the roadway network as shown in the no-build alternative. However, the total predicted number of fatal, injury, and property damage only crashes (KABCO) in the PPA decreased from the 2040 no-build scenario, while predicted fatal and injury crashes were approximately equal. The reduction in crashes compared to no-build is a function of the PPA geometric improvements that include improved site distance on the ramps, wider lanes, and wider shoulders. Additional evaluation could be performed during the design phase to understand how improved illumination might reduce the number of crashes. The total predicted fatal and injury crashes (KABC) on SR 204 did increase very slightly from the no-build scenario, which is due to changes forecasted AADT surrounding the newly constructed interchange. The change in crashes of 0.3 is not considered statistically significant. As noted above, the design team would look for additional improvements on the corridor to mitigate even this small increase.

Disclaimer

Under Section 409 of Title 23 of the United States Code, crash data is prohibited from use in any litigation against state, tribal, or local government that involves the location(s) mentioned in the crash data.

APPENDIX (SEPARATE DOCUMENT)

Freeway and Intersection Detailed Traffic Results

Collision Analysis Results

EXISTING CORRIDOR DATA SUMMARY

April 5, 2017

Date: April 5, 2017
To: Michael Horntvedt (Parsons)
From : Nathan Chan and Will Lisska (Fehr & Peers)
Subject: Existing Corridor Data Summary - US2/SR204/20th Street SE IJR

This memorandum summarizes the existing freeway and arterial corridor data necessary to complete the transportation analysis. The project limits for the traffic analysis and modeling will include the I-5 corridor from Pacific Street interchange to the Marine View Drive Interchange, US 2 from the I-5 Interchange to south of the Bickford Avenue interchange, 20th Street SE from 51st Avenue SE to Cavelero Road, and SR 204 from the US 2 / 20th Street SE interchange to 81st Avenue SE. The study area is further summarized by freeway mainline, freeway on/off ramp, and arterial intersection location in the list below and in **Figure 1**.

- Freeway Mainline
 - US 2 Eastbound
 - I-5 on-ramps to 51st Street SE (Ebey Island) off-ramp
 - 51st Street SE to SR 204/20th Street SE off-ramp
 - SR 204/20th Street SE off-ramp to SR 204 on-ramp
 - SR 204 on-ramp to Bickford Avenue off-ramp
 - Bickford Avenue off-ramp to Bickford Avenue on-ramp
 - Bickford Avenue on-ramp to SR 9
 - US 2 Westbound
 - SR 9 to Bickford Avenue on-ramp
 - Bickford Avenue on-ramp to SR 204 off-ramp
 - SR 204 off-ramp to SR 204/20th Street SE on-ramp
 - 20th Street SE on-ramp to 20th Street SE (Ebey Island) off-ramp
 - 20th Street SE (Ebey Island) off-ramp to 51st Street SE (Ebey Island) on-ramp
 - 51st Street SE (Ebey Island) on-ramp to I-5/California Street/Walnut Street off-ramps
 - I-5 Northbound
 - 41st Street on-ramp to Pacific Avenue off-ramp

- Pacific Avenue off-ramp to US 2 Eastbound off-ramp
- US 2 Eastbound off-ramp to US 2 Westbound/Everett Avenue on-ramp
- US 2 Westbound/Everett Avenue on-ramp to E Marine View Drive off-ramp
- I-5 Southbound
 - E Marine View Drive on-ramp to US 2 Eastbound/Everett Avenue off-ramp
 - US 2 Eastbound/Everett Avenue off-ramp to US 2 Westbound On-ramp
 - US 2 Westbound On-ramp to Pacific Avenue on-ramp
 - Pacific Avenue on-ramp to 41st Street off-ramp
- Freeway Ramps
 - US 2 Eastbound
 - I-5 Northbound on-ramp
 - I-5 Southbound on-ramp
 - Hewitt Avenue on-ramp
 - 51st Street SE (Ebey Island) off-ramp
 - SR 204 Northbound on-ramp
 - 20th Street SE off-ramp
 - SR 204 Southbound on-ramp
 - Bickford Avenue off-ramp
 - Bickford Avenue on-ramp
 - US 2 Westbound
 - Bickford Avenue on-ramp
 - SR 204 Northbound off-ramp
 - SR 204 Southbound on-ramp
 - 20th Street SE on-ramp
 - 20th Street SE (Ebey Island) off-ramp
 - 51st Street SE (Ebey Island) on-ramp
 - I-5 Northbound off-ramp
 - I-5 Southbound off-ramp
 - Walnut Street off-ramp

- California Street off-ramp
- I-5 Northbound
 - Pacific Avenue off-ramp
 - US 2 Eastbound off-ramp
 - US 2 Westbound/Everett Avenue on-ramp
 - Marine View Drive off-ramp
- I-5 Southbound
 - Marine View Drive on-ramp
 - US 2 Eastbound/Everett Avenue off-ramp
 - US 2 Westbound on-ramp
 - Pacific Avenue on-ramp
- Other roadway segments
 - SR 204 north of 9th Street SE
 - Sunnyside Boulevard north of SR 204
 - 20th Street SE east of Cavaleros Road
- Intersections
 - SR 204 / 9th Street SE / 10th Street SE
 - SR 204 / Sunnyside Boulevard SE
 - SR 204 / 20th Street SE
 - 20th Street SE / Cavalero Road
 - 20th Street SE / 51st Avenue SE (Ebey Island)

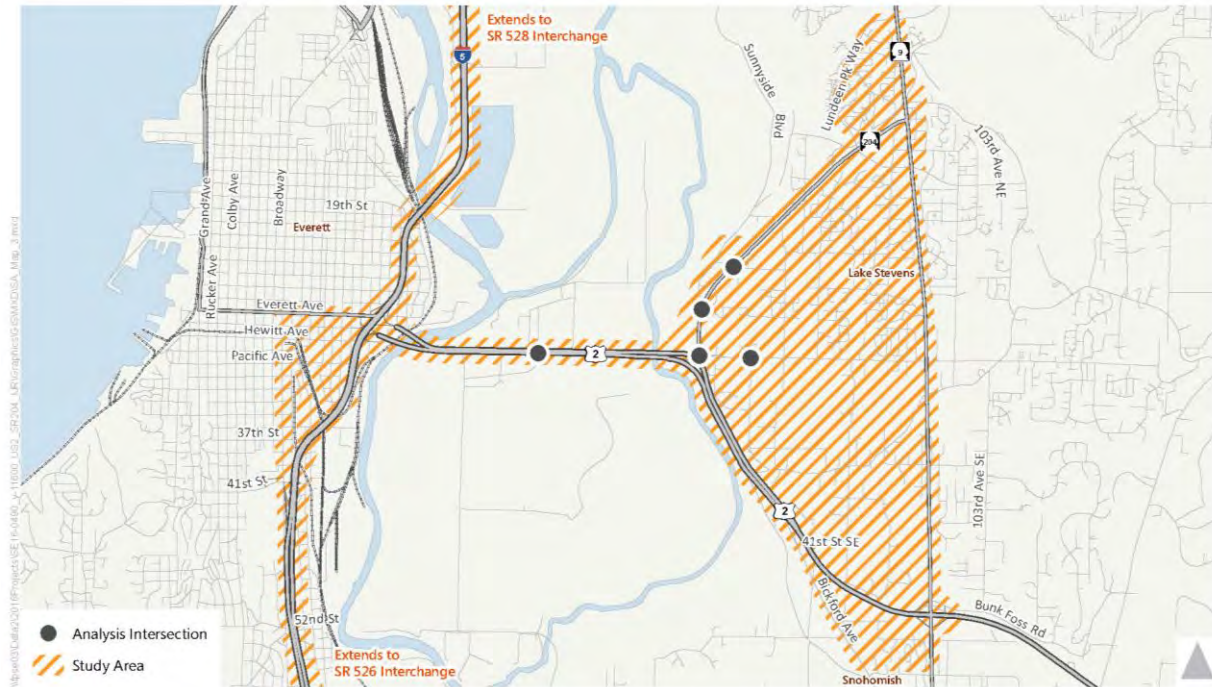


Figure 1: Study Intersections and Data Collection Locations

Figure 1 highlights the study area including the areas in the travel demand forecasting and dynamic traffic assignment analyses.

The data was collected through field observation, aerial imagery, and/or previous reports. For each data category, a link to the location of the data is provided.

Existing Speed Limits

Posted speed limits for I-5, US 2, and SR 204 in the study area are between 55 miles per hour (mph) and 60 mph. Along the US 2 Trestle the speed limit reaches 55 mph and increases to 60 mph east of the US 2 / SR 204 / 20th Street SE interchange. On freeway ramps and on 20th Street SE east of the trestle, the speed limit is posted at 35 mph, while 20th Street SE underneath the trestle is listed at 25 mph. Existing speed limits along relevant study corridors are summarized in the existing speed limits figure.

Sharepoint link: [Existing Speed Limit Map](#)

Existing Land Use

The existing land use and zoning designations within the study area are provided in the Lake Stevens Comprehensive Plan as well as in the City of Everett Land Use Map. The study area includes a mix of residential, commercial, and industrial land uses.

Sharepoint link: [Existing Land Use](#)

Peak Hour Queuing

Queuing was observed on Wednesday November 16 and Thursday November 17, 2016, during the AM (6:45 AM – 8:30 AM) and PM (3:30 PM – 5:30 PM) peak periods for the following interchanges and corridors:

- I-5 / US 2 Interchange
- US 2 / SR 204 Interchange
- 20th St SE
- SR 204

Queuing along US 2 east of the US 2 / SR 204 interchange was observed on Tuesday January 31 and Wednesday February 1, 2017, during the same AM and PM peak periods.

A summary of the maximum observed queues at each intersection movement and operational notes can be found at the link below.

Sharepoint link: [Queuing Observations](#)

Travel Time Runs

Along with the peak hour queuing data, travel time runs were conducted during the AM (6:45 AM – 8:30 AM) and PM (3:30 PM – 5:30 PM) peak periods along the following corridors:

TABLE 1. TRAVEL TIME CORRIDORS

Corridor	Description	Data Collection Dates
SR 204	I-5 from 41st St across US 2 Trestle to 81st Ave NE on SR 204	November 16 and 17, 2016
20th St SE	I-5 from 41st St across US 2 Trestle to 83rd Ave SE on 20th St SE	November 16 and 17, 2016
US 2	I-5 from 41st St across US 2 Trestle to US 2 / SR 9 Interchange	January 31 and February 1, 2017

A summary of the travel time run results can be found at the following link.

Sharepoint link: [Travel Time Runs](#)

Tube Counts/Vehicle Classification Counts

Seven-day tube counts including vehicle classification were collected at the following locations:

TABLE 2. VEHICLE CLASSIFICATION COUNTS

Location	Tube Count Location	Dates of Collection
1	WB US 2 to SB I-5	11/17/16 to 11/23/2016
2	WB US 2 to NB I-5	11/13/16 to 11/20/16
3	WB US 2 to California Street	11/17/16 to 11/23/2016
4	WB US 2 to Walnut Street	11/14/16 to 11/19/2016
5	NB I-5 to EB US 2	11/30/16 to 12/7/16

Existing Corridor Data Summary
 April 5, 2017

6	SB I-5 to EB US 2	11/17/16 to 11/23/16
7	Hewitt Ave to EB US 2	12/1/16 to 12/7/16
8	NB I-5 to Pacific Ave	11/13/16 to 11/20/16
9	Pacific Ave to SB I-5	11/14/16 to 11/19/16
10	Everett Ave to NB I-5	11/14/16 to 11/19/16
11	SB I-5 to Everett Ave	11/17/16 to 11/23/16
12	EB US 2 on trestle	WSDOT PTR (Oct. 2016)
13	WB US 2 on trestle	WSDOT PTR (Oct. 2016)
14	EB US 2 East of Bickford Interchange	11/30/16 to 12/6/16
15	WE US 2 East of Bickford Interchange	11/30/16 to 12/6/16
16	Bickford to WB US 2	11/14/16 to 11/19/16
17	EB US 2 to Bickford	11/17/16 to 11/23/16
18	Bickford to EB US 2	11/14/16 to 11/19/16
19	WB US 2 to SR 204	12/11/16 to 12/17/16
20	SR 204 to EB US 2	12/11/16 to 12/17/16
21	EB US 2 to 20 th St SE (At west end of trestle and at US 2/SR 204 interchange)	12/1/16 to 12/7/16
22	EB US 2 to SR 204	11/27/16 to 12/4/16
23	20 th St SE to WB US 2 (at US 2/SR 204 interchange and on west end of trestle)	11/27/16 to 12/4/16
24	SR 204 to WB US 2	11/27/16 to 12/4/16
25 EB	20th St E of 204	11/30/16 to 12/7/16
25 WB	20st St E of 204	11/30/16 to 12/7/16
26 NB	SR 204 north of 9 th St SE	12/8/16 to 12/14/16
26 SB	SR 204 north of 9 th St SE	11/28/16 to 12/4/16
27 SB	Sunnyside Blvd SE S of 9 th St SE	11/27/16 to 12/4/16
27 NB	Sunnyside Blvd SE S of 9 th St SE	11/27/16 to 12/4/16
28 EB	20 th St SE E of Cavalero Rd	11/27/16 to 12/4/16
28 WB	20 st St SE E of Cavalero Rd	11/27/16 to 12/4/16

All tube counts can be found at the following Sharepoint link: [Tube Counts/Vehicle Classification Counts](#)

Freight Routes

Freight and Goods Transportation System (FGTS) designations are provided by WSDOT. Designations are defined by annual tonnage carried and are established for the following segments within the study area:

- T1 (over 10,000 annual tons)
 - I-5
- T2 (4,000 to 10,000 annual tons)
 - US 2 Trestle
 - SR 9
- T3 (300 to 4,000 annual tons)
 - US 2 east of US 2 / SR 204 Interchange
 - 20th St SE
 - SR 204
 - Sunnyside Blvd SE
 - Bickford Ave
- T4 (100 to 300 annual tons)
 - Cavalero Rd

Sharepoint link: [FGTS Truck Routes](#)

Signal Timing Cards

Signal timing cards were obtained for all signalized intersections in the study area along 20th St SE as listed below

- Cavalero Rd
- 79th Ave SE
- 83rd Ave SE
- 91st Ave SE

Sharepoint Link: [Signal Timing Cards](#)

Transit Data

Two transit routes serve the study area – Community Transit routes 280 and 425. Daily boardings and alightings by stop were provided by Community Transit and can be found in Table 3. Community Transit routes 270/271 and 277 also travel through the study area along US 2 between Everett and Snohomish with no stops in the study area. Additional projects and long-range plans can be found in Community Transit’s 2016 – 2021 Transit Development Plan (TDP).

TABLE 3. TRANSIT DATA

Data	Sharepoint Link
Routes and Stops Map	Map
Ridership Data	Ridership
Community Transit 2016 – 2021 Transit Development Plan	Document

Lane Channelization

The lane channelization of the study area freeway alignment was initially gathered through review of aerial imagery and was confirmed during the November 2016 field visit. A summary of the lane channelizations on I-5 and US 2 is shown in the Channelization Diagrams.

Sharepoint link: [Freeway Lane Channelization Diagrams](#)

Historical Safety Data

Collision data for intersections and roadway segments along I-5, US 2, SR 204, and 20th Street SE was provided by WSDOT from the previous five consecutive years (January 2011 through December 2015). The data provided contains collision type, severity, frequency, cause, time of day, and contributing circumstances.

Sharepoint link: [Historical Collision Data](#)

Turning Movement Counts

Turning movement counts have been collected for all study intersections. Turning movement counts were collected according to the schedule found in Table 4.

TABLE 4. TURNING MOVEMENT COUNTS

Int. #	Intersection Location	Count Date	
		AM	PM
1	SR 204 / 20th St SE	11/29/16	12/6/16
2	SR 204 / Sunnyside Blvd SE	12/7/16	12/1/16
3	SR 204 / 9th St SE	11/17/16	12/1/16
4	20th St SE / Cavalero Rd	12/13/16	12/7/16
5	51st Ave SE / 20th St WB ramps	11/30/16	12/1/16
6	51st Ave SE / 20th St EB ramps	12/1/16	
7	20th ST SE / 79th Ave SE	11/17/16	12/7/16
8	83rd Ave SE / 20th St SE	2/2/17	2/2/17
9	91st Ave SE / 20th St SE	2/9/17	2/1/17
10	S Lake Stevens Rd / 87th Ave SE	2/9/17	2/1/17
11	S Lake Stevens Rd / SR 9	2/1/17	1/31/17
12	Sinclair Ave / Bickford Ave	2/9/17	2/1/17
13	SR 9 / 4th St SE	2/1/17	1/31/17
14	SR 9 / 20th St SE	2/1/17	1/31/17

All turning movement counts can be found at the following Sharepoint link: [Turning Movement Counts](#)

Supporting Documentation

Previous reports were reviewed and will be referenced for future deliverables.

TABLE 5. SUPPORTING REPORTS

Report	Sharepoint Link
US 2 – Everett Port/Naval Station to SR 9 Corridor Planning Study – August 2016	Report
US 2 – Everett Port/Naval Station to SR 9 Corridor Planning Study – Traffic Analysis Technical Report – November 2011	Report

HOV BYPASS TECHNICAL MEMORANDUM

February 16, 2018

Date: July 27, 2017
To: Michael Horntvedt (Parsons)
From : Will Lisska and Don Samdahl (Fehr & Peers)
Subject: HOV Bypass Technical Memorandum

INTRODUCTION

The City of Lake Stevens and Snohomish County requested that the US 2 / SR 204 / 20th Street SE IJR project team conduct an early evaluation of a westbound high-occupancy vehicle (HOV) bypass route serving the US 2 trestle and 20th Street SE. Analysis and recommendations derived from this work will be used to inform the the IJR analysis. The following sections describe the HOV bypass concepts included in the analysis, data sources, assessment of benefits to traffic operations, design feasibility, and the stakeholder process.

HOV BYPASS CONCEPTS

The HOV bypass analysis included two concepts – (1) a westbound HOV and transit bypass for the US 2 trestle, repurposing the existing portions of the 20th Street SE lower roadway and (2) a westbound HOV and transit bypass lane within the existing width of roadway of 20th Street SE between 83rd Avenue SE and the US 2 westbound on-ramp . The concepts are described in additional detail in the following sections.

CONCEPT 1- LOWER ROADWAY HOV BYPASS – 20TH STREET SE THROUGH EBEEY ISLAND

The Lower Roadway HOV Bypass includes the addition of a westbound HOV and transit bypass for US 2, routing traffic through the intersection of 20th Street SE / SR 204 / US 2 ramps and merging with US 2 westbound from the left-hand Ebey Slough/ Homeacres road on-ramp. Currently, the portion of this route between Cherry Avenue (on Ebey Island) and the 20th Street SE / SR 204 / US 2 ramps intersection accomodates one-way eastbound traffic only. Implementation of the bypass would require a two-way traffic configuration. A conceptual schematic of the bypass route is shown in **Figure 1**.

The City of Lake Stevens and Snohomish County have suggested that the Lower Roadway Bypass concept could improve travel time for HOV and transit riders crossing the US 2 trestle westbound during the AM peak. The Operations Analysis section provides travel time and person throughput results from a

simulation model for several operating scenarios for the Lower Roadway HOV Bypass, including HOV 2+ and transit, HOV 3+ and transit, and vanpool only.



Figure 1: Lower Roadway HOV Bypass Concept

CONCEPT 2-20TH STREET SE HOV LANE – FROM 83RD AVENUE SE TO US 2 WESTBOUND ON-RAMP

The City of Lake Stevens has been considering options for a westbound HOV lane on 20th Street SE upstream of the US 2 westbound on-ramp, providing carpools, transit buses, and vanpools the opportunity to bypass queues during the AM peak period. Because money is not currently available for full pavement work, the City is considering the use of existing shoulder space for the HOV lane. Within the existing width of roadway, an HOV lane could potentially be striped between the US 2 westbound on-ramp to approximately 200 feet west of the 83rd Avenue SE intersection. This concept is illustrated in **Figure 2**. Other notable assumptions for this concept include:

- HOV lane restricted to carpools, transit, vanpool, and right-turning vehicles only
- Removal of eastbound and westbound left-turn pockets at Cavalero Road. Left-turn movement becomes permissive and shared with through-lanes during AM peak period.
- Eastbound left turn access into gas station and shopping center is prohibited east of 79th Avenue SE intersection. Eastbound traffic would instead turn left at the 20th Street SE / 79th Avenue SE signal.

- Signal priority for transit buses would be integrated into signal controllers at Cavalero Road and 79th Avenue SE.

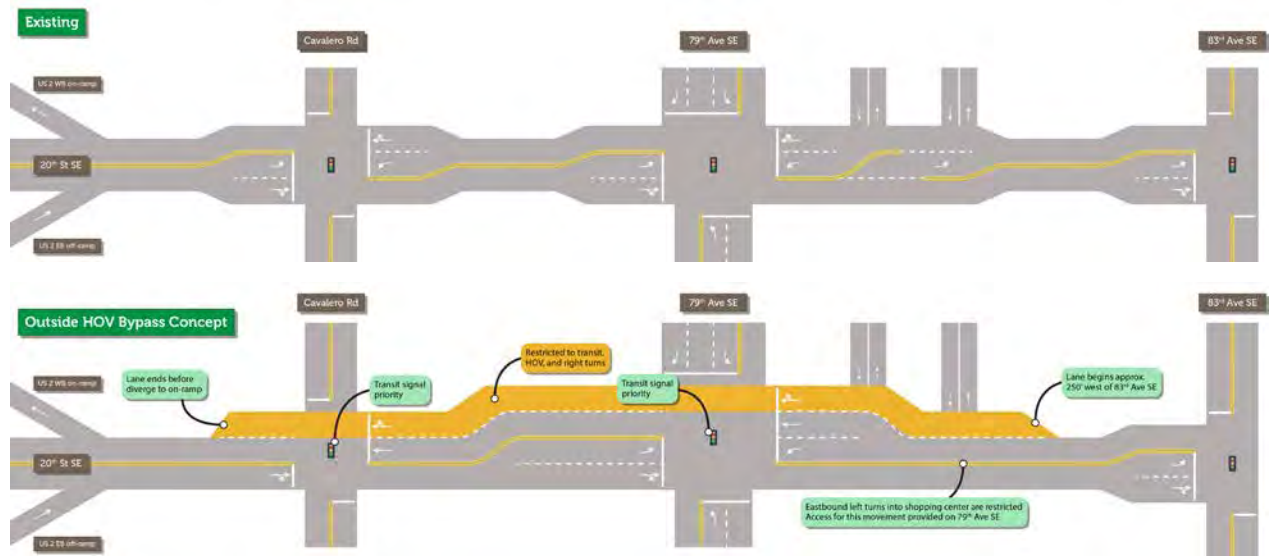


Figure 2: 20th Street SE HOV Lane Concept

DATA SOURCES

The HOV bypass analysis used existing traffic counts and floating car travel time surveys as a starting point for analyzing the two concepts. These data items were collected for the US 2 / SR 204 / 20th Street SE IJR existing conditions analysis and are summarized in the *Existing Corridor Data Summary* memorandum. This decision was made to analyze HOV bypass operations under existing conditions, because the HOV bypass concept is considered an early action effort to improve mobility and/or safety within the US 2 / SR 204 / 20th Street SE interchange area. If the Project Team decides to include the HOV bypass (or components of the bypass) as part of a longer term solution, then it will be included in the future analysis.

Existing travel times for westbound travel across the US 2 trestle to I-5 southbound are summarized in **Figure 3**, including the congested AM peak hour travel time and the estimated free flow (no traffic) travel time.

In addition to traffic counts and travel time data, vehicle occupancy observations were conducted to understand the current split of traffic (SOV, HOV 2, HOV 3+, vanpools, transit buses, etc.) and the number of vehicles that would likely use the HOV bypass. Occupancy data is summarized in **Table 1** for the three primary westbound approaches to the US 2 / SR 204 / 20th Street SE interchange area.



Figure 2: Westbound US 2 Trestle Travel Time during AM Peak Hour

TABLE 1. VEHICLE OCCUPANY OBSERVATIONS – AM PEAK HOUR

US 2 Westbound on-ramp from SR 204					
Measure	SOV	HOV 2	HOV 3+	Vanpool	Bus
Total	812	67	6	1	8
Percent	90.8%	7.5%	0.7%	0.1%	0.9%
US 2 Westbound on-ramp from 20th Street SE					
Measure	SOV	HOV 2	HOV 3+	Vanpool	Bus
Total	770	63	3	2	4
Percent	91.4%	7.5%	0.4%	0.2%	0.5%
US 2 Westbound, east of SR 204/20th Street SE on-ramps					
Measure	SOV	HOV 2	HOV 3+	Vanpool	Bus
Total	1496	65	2	2	5
Percent	95.3%	4.1%	0.1%	0.1%	0.4%
Data collected in January 2017					
SOV = single occupany vehicle, HOV 2 = high occupancy vehicle with 2 total people; HOV 3+ = high occupancy vehicle with 3 or more total people; Vanpool = community transit vanpool program vehicles; Bus = fixed-route transit buses and school buses					

OPERATIONS ANALYSIS

The Lower Roadway HOV bypass and 20th Street SE HOV lane concepts were analyzed with the VISSIM simulation model, which was previously validated and calibrated to AM peak hour traffic conditions. VISSIM calculated changes in travel time and person delay compared to the existing conditions model. Methods, specific analysis assumptions, and results are described in the following sections.

LOWER ROADWAY HOV BYPASS

Methodology and Assumptions

The following assumptions were used to modify the model and extract results for a “with Lower Roadway HOV bypass” condition:

- All HOV2+, vanpools, transit buses, and school buses that currently access the US 2 westbound trestle from the SR 204 on-ramp and 20th Street SE on-ramp (near Cavalero Rd) would shift to the Lower Roadway HOV Bypass route. Occupancy data shown in **Table 1** were used to estimate the total number of each vehicle type that would reroute from SR 204 and 20th Street SE.
- Traffic counts from 2016 show 0% heavy vehicles on the eastbound leg of the 20th Street SE/SR 204 intersection, so transit and school buses that shift to the bypass would account for all heavy vehicles usage of the Ebey Slough Bridge.
- Transit bus usage of the bypass would include 5 trips during the AM peak hour and 23 total daily trips (all shifted from the 20th Street SE on-ramp).
- School bus usage of the bypass would include 4 trips during the AM peak hour and 8 total daily trips (shifted from both the 20th Street SE and SR 204 on-ramps).
- A 2017-2019 Regional Mobility Grant application filed by the City of Lake Stevens estimates that 93 person trips would shift from SOV to HOV and transit mode due to the bypass during the 2-hour AM peak period. This equates to 47 shifted person trips during the AM peak hour. We assumed this same shift for the analysis.
- The HOV2 volumes on 20th Street SE and SR 204 were assumed to increase by 20% over existing levels, or approximately 27 additional HOV vehicle trips during the AM peak hour and 180 additional daily HOV vehicle trips. These HOV2 trips would be shifted from SOV trips that currently use the corridor (i.e. total person trips for the corridor would not change).
- AM peak hour bus person trips were estimated to increase by 20 total riders, assumed to shift from SOV and distribute evenly across the five AM peak hour buses that could use the HOV bypass.
- Though HOV, transit buses, and school buses would shift access onto US 2 to the US2 left-hand on-ramp from Ebey Island, traffic volumes on the westbound US 2 trestle east of this on-ramp would be approximately the same during the AM peak hour both with and without the HOV

Bypass. This assumes that latent demand (SOV traffic) from the SR 204 and 20th Street SE corridors would fill any AM peak hour capacity on the trestle resulting from the shifted HOV bypass traffic. Additional operating conditions were tested, including a scenario with Lower Roadway HOV Bypass occupancy requirements raised to HOV3+ and a scenario where only vanpools were able to use the bypass.

As noted in the assumptions above, we assumed that buses would be able to utilize the bypass route. However, subsequent WSDOT design feasibility analysis (discussed in a following section) indicates that transit buses and heavy vehicles with similar turn radii would not be able to navigate the Lower Roadway HOV Bypass due to the tight radius of the proposed reverse curve underneath the trestle. The traffic operations analysis assumed approximately three buses per hour would use the Lower Roadway Bypass before receiving the WSDOT design determination. However, because the inclusion or exclusion of the three buses would not significantly change overall model travel time results, the technical analysis was not revised.

Results Summary

Several metrics were calculated using the outputs from the the Lower Roadway HOV Bypass VISSIM model, including corridor freeway density, level of service (LOS), travel times, vehicle hours of travel, and person hours of travel. Freeway LOS/Density results are summarized in **Table 2**, and travel time results are shown in **Table 3**. Results indicate the following:

- Travel time for HOVs using the Bypass is slightly faster for traffic traveling from SR 204 to I-5.
- There is no distinguishable savings for traffic traveling from the SR 204/20th Street intersection to I-5 for people originating on 20th Street SE.
- Under the HOV2+ operating condition, travel times on the westbound US 2 trestle corridor would increase by over 1 minute due to increased congestion at the merge from the 20th Street SE lower roadway to westbound US 2.
- Overall person delay on the corridor would increase by over 90 person hours because the vast majority of people would still be traveling on the US 2 westbound corridor, where travel times would degrade.

TABLE 2. AM PEAK HOUR FREEWAY OPERATIONS – LOWER ROADWAY BYPASS

Location	Facility Type	Existing		With Bypass– HOV2+		With Bypass– HOV3+		With Bypass– Vanpool Only+	
		Density	LOS	Density	LOS	Density	LOS	Density	LOS
SR 204/20th St SE on-ramp merge (to US 2 westbound)	Mege	69	F	71	F	70	F	69	F
US 2 westbound weave from 20th St SE / SR 204 on to Ebey Island left-hand off-ramp	Weave	32	D	38	E	32	D	32	D
US 2 westbound merge from under Trestle (left merge)	Merge	37	E	78	F	47	F	37	E
US2 westbound mainline, east of I-5	Basic	40	E	59	F	49	F	40	E
I5 southbound on-ramp from US 2 WB	Merge	32	D	32	D	32	D	32	D

Notes:
 Density and level of service (LOS) and measurement based on Highway Capacity Manual methods, calculated as an average for the AM peak hour of travel
Bolded LOS and density values do not meet LOS D standard for Highways of Statewide Significance in Snohomish County.

TABLE 3. AM PEAK HOUR FREEWAY OPERATIONS – LOWER ROADWAY BYPASS

Route	Existing					With Bypass HOV 2+ and Transit					With Bypass HOV 3+ and Transit				
	Veh	Per	Veh TT	VHT	PHT	Veh	Per	Veh TT	VHT	PHT	Veh	Per	Veh TT	VHT	PHT
SR 204 to I-5 (on US 2)	789	882	11.1	145.7	162.9	789	789	12.2	160.4	160.4	789	850	11.2	146.6	158.0
SR 204 to I-5 (on lower roadway) (HOV)	-	-	-			82	188	10.4	14.3	32.7	15	61	10.4	2.6	10.6
20th Street SE to I-5 (on US 2)	861	1043	8.7	124.6	150.9	861	861	10.1	145.2	145.2	861	926	9.1	130.6	140.4
20th Street SE to I-5 (on lower roadway) (HOV)	-	-	-			90	276	8.6	12.9	39.6	14	128	8.6	2.0	18.3
US 2 to I-5	1513	1670	7.1	179.5	198.1	1513	1670	8.2	205.9	227.3	1513	1670	7.3	182.8	201.8
Total	3163	3595		449.8	512.0	3335	3784		538.7	605.2	3192	3635		464.6	529.0
Increase with HOV Bypass									88.9	93.2				14.8	17.1

Notes:
 Veh = vehicle volume; Per = person volume; Veh TT = average vehicle travel time; VHT = vehicle hours of travel; PHT = person hours of travel

20TH STREET SE HOV LANE

Methodology and Assumptions

Similar to the Lower Roadway HOV Bypass, the 20th Street SE HOV Lane was analyzed by modifying the VISSIM model. The following assumptions were used to modify the model and extract results for a “with HOV lane” condition:

- Layout assumptions, including intersection turning movement configurations and turn pockets, are shown in **Figure 2**.
- All HOV2+, vanpools, transit buses, and school buses traveling westbound on 20th Street SE would be able to use the HOV lane during the AM peak hour. Additionally, the lane would accommodate any vehicle turning right at an immediate downstream intersection. Occupancy data shown in **Table 1** was used to estimate the lane usage.

Results Summary

Several metrics were calculated, including intersection level of service (LOS), corridor travel times, vehicle hours of travel, and person hours of travel. Intersection LOS/delay results are summarized in **Table 4**, and travel time results are shown in **Table 5**. Results indicate the following:

- Because the 20th Street SE HOV lane would add a westbound travel lane, it would improve overall corridor traffic operations for both SOV and HOV traffic.
- For HOV2+ vehicles traveling westbound between 83rd Avenue SE and the US 2 on-ramp, average travel time would improve by approximately 2 minutes under congested AM conditions. Average SOV travel time would improve by 0.7 minutes over the same stretch.
- Total person hours of travel during the AM peak hour would be reduced by 10 hours.

TABLE 4. AM PEAK HOUR INTERSECTION OPERATIONS – 20TH STREET SE HOV LANE

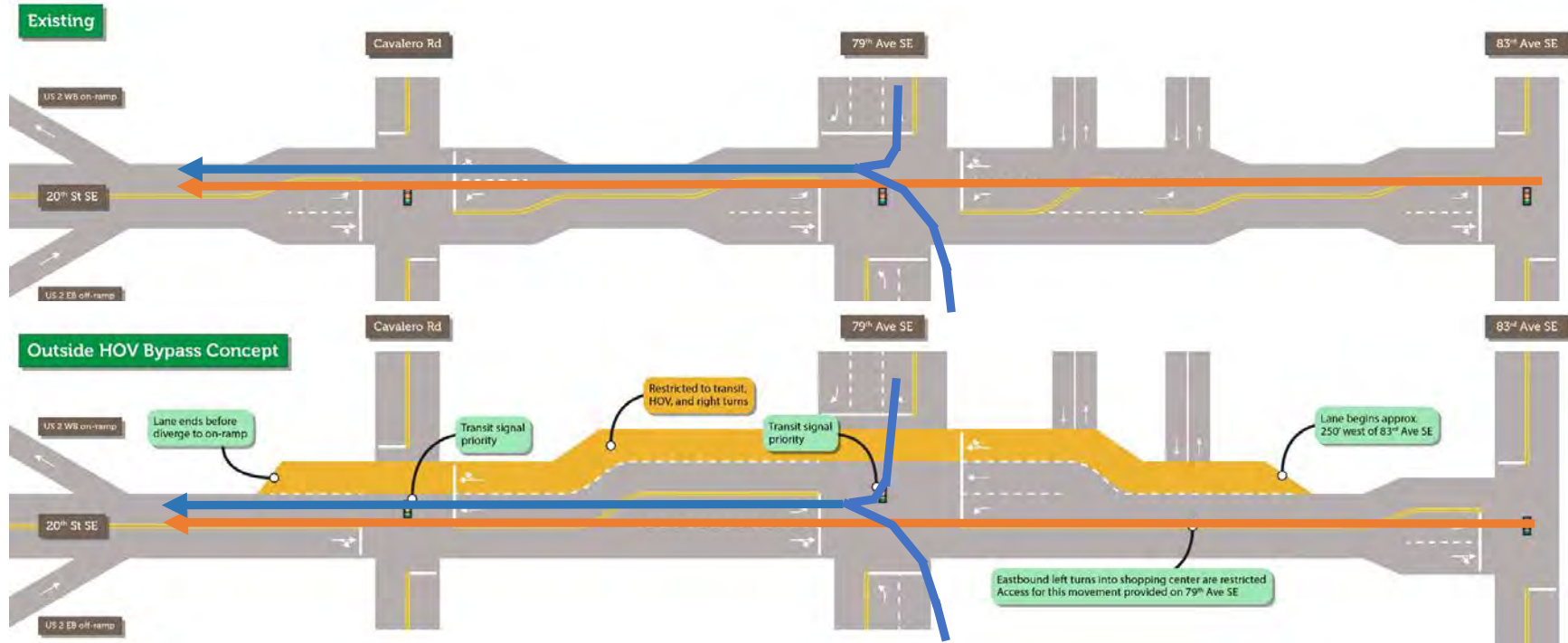
Intersection	Facility Type	Existing		With 20th Street SE HOV Lane	
		Delay	LOS	Delay	LOS
SR 204 / 20th Street SE	All-Way Stop	10	A	10	A
Cavalero Road / 20th Street SE	Signal	51	D	39	D
79th Avenue SE / 20th Street SE	Signal	41	D	30	C
83rd Avenue SE / 20th Street SE	Signal	52	D	45	D
91st Avenue SE / 20th Street SE	Signal	10	A	10	A
Notes: Delay and level of service (LOS) and measurement based on Highway Capacity Manual methods. Bolded LOS and density values do not meet LOS D standard for intersections in the City of Lake Stevens.					

TABLE 5. AM PEAK HOUR FREEWAY OPERATIONS – LOWER ROADWAY BYPASS

Route	Mode	Existing					With 20th Street SE HOV Lane					Difference	
		Veh	Per	Veh TT	VHT	PHT	Veh	Per	Veh TT	VHT	PHT	VHT	PHT
20th Street SE Westbound - from east of 83rd Ave SE to US2 on-ramp diverge	SOV	371	371	4.3	26.5	26.5	371	371	3.6	22.2	22.2	-4.3	-4.3
	HOV/Vanpool	34	77	4.3	2.4	5.5	34	77	2.4	1.3	3.0	-1.1	-2.5
	Transit	3	54	4.6	0.2	4.1	3	54	2.6	0.1	2.4	-0.1	-1.8
20th Street SE Westbound - from 79th Ave SE side street to US2 on-ramp diverge	SOV	232	232	2.7	10.4	10.4	232	232	2.5	9.7	9.7	-0.7	-0.7
	HOV/Vanpool	21	46	2.7	1.0	2.1	21	46	1.5	0.5	1.2	-0.4	-0.9
	Transit	0	0	3.0	0.0	0.0	0	0	1.6	0.0	0.0	0.0	0.0
Total		661	780	-	40.5	48.6	661	780	-	33.8	38.3	-6.7	-10.2

Notes:

Veh = vehicle volume; Per = person volume; Veh TT = average vehicle travel time; VHT = vehicle hours of travel; PHT = person hours of travel
 Eastbound travel times do not change significantly.



COMBINED CORRIDOR RESULTS

The combined operational results for both the Lower Roadway HOV Bypass and 20th Street SE HOV Lane concepts are displayed in the following figures. Travel time changes were measured along the following routes:

- SR 204 westbound at 81st Avenue NE to I-5 Southbound
- 20th Street SE westbound at 83rd Avenue SE to I-5 Southbound
- US 2 westbound at Bickford Avenue on-ramp to I-5 Southbound

Figure 3 shows results with a Lower Roadway HOV Bypass that would allow HOV2+, vanpools, and transit. **Figure 4** shows results with a HOV3+ Lower Roadway HOV Bypass. **Figure 5** shows results with a Lower Roadway HOV Bypass that serves only Vanpools.

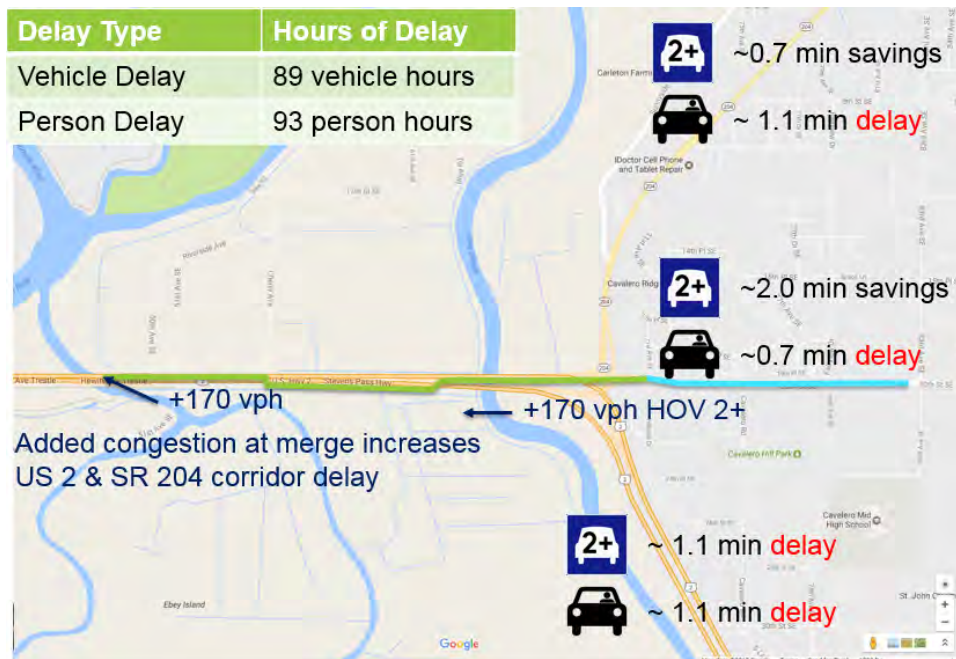


Figure 3: Combined Corridor Results with HOV2+ Lower Roadway Bypass

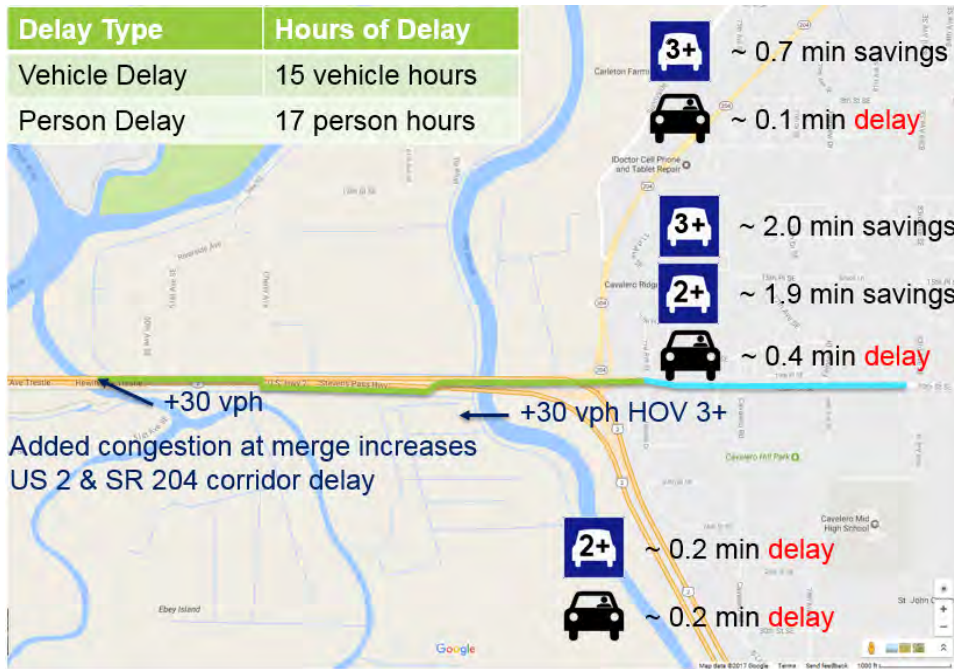


Figure 4: Combined Corridor Results with HOV3+ Lower Roadway Bypass

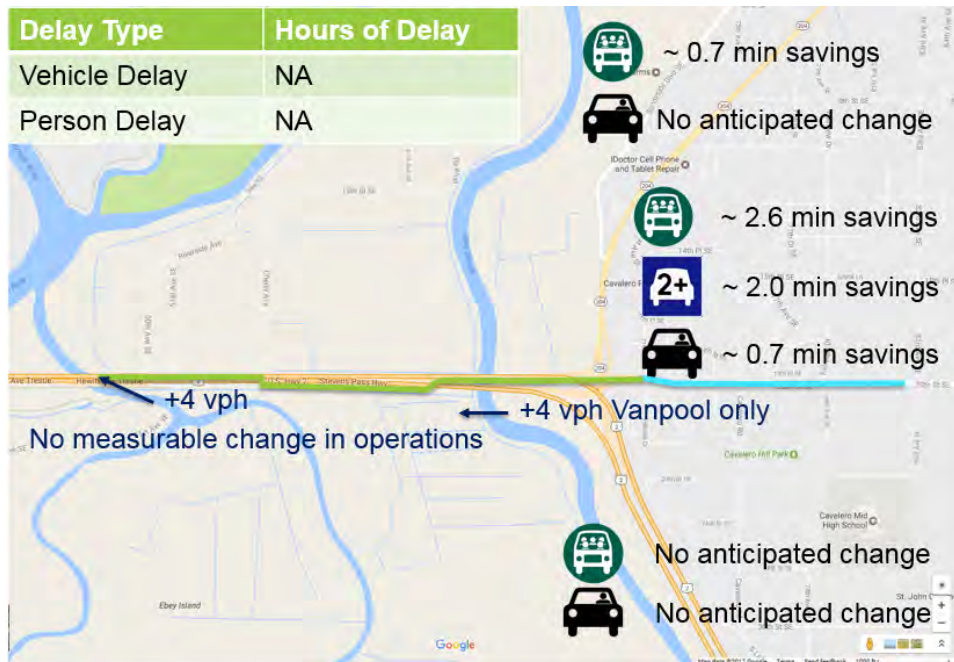


Figure 5: Combined Corridor Results with Vanpool Only Lower Roadway Bypass

DESIGN FEASIBILITY (WSDOT)

A design feasibility analysis was conducted by WSDOT for the Lower Roadway HOV Bypass concept, which would utilize WSDOT right-of-way if constructed. Preliminary design and feasibility work for the 20th Street SE HOV Lane would be led by Lake Stevens, if necessary.

The following sections summarize roadways sections, pavement structure, and environmental issues related to implementation of the Lower Roadway Bypass concept, as documented by WSDOT.

ROADWAY SECTIONS AND CHANNELIZATION

To access the 20th SE street from east side, the eastern portion of the current eastbound direction only road has to be converted to a two way roadway to accommodate westbound traffic. There are three typical sections within this portion of the roadway:

- **East and West of Ebey Slough Bridge:** The total width of this section of the roadway varies between 22 and 25 feet. Currently it is striped as 12 foot lane and 10 foot shoulder. The Shoulder is designated as a bike lane for both east and westbound directions. Assuming a 10 foot lane in each direction, the roadway can accommodate a westbound direction traffic. However, with this configuration the roadway will not have a shoulder in case of a vehicle breakdown. In addition, the bikes have to share the roadway with vehicles in both directions.
- **Ebey Slough Bridge:** Ebey Slough Bridge has a total width of 25 feet. Currently, it is striped as a 12 foot lane and 10 foot shoulder with a 1.5 feet shy distance in both sides from the bridge barrier. Like the roadway, the shoulder is designated as a bike lane for both east and westbound directions. Assuming a 10 foot lane in each direction, the bridge can accommodate a westbound direction traffic. However, with this configuration there will not be shoulder on the bridge in case of a vehicle breakdown. In addition the bikes have to share the bridge with vehicles in both directions.
- **Reverse Curve (tight back-to-back curves) Under US 2 Eastbound Trestle:** The total width of this section of the roadway is about 20 feet. This section has a tight back-to-back radius of 55 feet. Due to the tightness of these curves, currently there is a speed reduction advisory sign posted out there. It advises to reduce speed to 10 mph. Without widening this section, buses and other vehicles with wide turn radii requirements cannot be accommodated in westbound direction. Standard Passenger vehicles and vanpools can be accommodated by reducing the speed to 10 mph. However, like the above scenarios, there will not be shoulder for breakdown vehicles and also bikes have to share the roadway with vehicles.

Appendix A contains typical cross sections and design element findings of the existing eastbound direction roadway between SR 204 and Cherry Avenue.

PAVEMENT STRUCTURE

Both the westbound and eastbound running roadways on Ebey Island are built in a flood plain area. Based on the information from NWR maintenance office, the roadway flood a few times a year. Some portion of the westbound direction roadway can become submerged throughout the wet season. Over the course of a couple of site visits, the westbound running roadway road was observed to be partially submerged. There had not been significant rainfall for several days before these observations.

In addition, due to the ongoing settlement issues, the current roadway condition has an uneven pavement surface. To utilize this road as an HOV bypass, the NW Region materials office recommends to rebuild the pavement structure by removing the existing structure to the subgrade.

ENVIRONMENT

As stated in the previous section, the westbound and eastbound running roadways are built in a flood plain area. The area directly adjacent to the roadway is wetland, so widening of the roadways would result in impacting high class wetlands.

COST OPINION

WSDOT estimates that signing and striping the existing roadway to serve westbound traffic (without any additional physical improvements) would cost approximately \$285,000. Signing, striping, and widening of the reverse curve section to accommodate buses would cost approximately \$380,000 total. A full roadway replacement including subgrade and pavement would cost upwards of \$7.5 million.

FINDINGS

Analysis of the 20th Street SE HOV lane would provide average travel time savings of about 2 minutes for HOVs between 83rd Avenue and the US 2 interchange. Analysis indicated that providing access for traffic on the Lower Roadway HOV Bypass would result in the following:

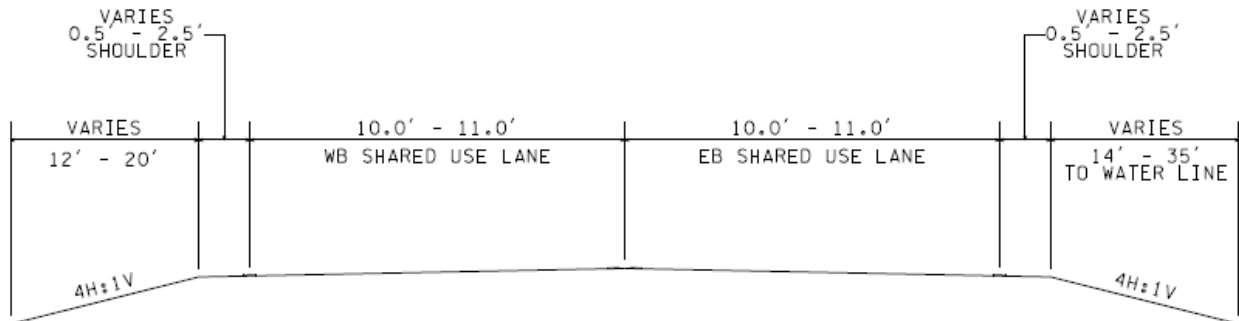
- Access for 2+ HOV including vanpools and buses would result in higher levels congestion on US 2 at the Ebey Island left-hand on-ramp merge and cause added person delay on the corridor. Access for 3+ HOV including vanpools and buses would also result in higher levels of congestion and at this merge point and cause added person delay.
- Access for vanpools only would create almost no measurable affect on US 2 corridor traffic. There are currently 4 vanpools per hour that access the US 2 trestle from SR 204 and 20th Street SE during the AM peak period.
- Average travel time savings for vehicles using the Lower Roadway HOV Bypass would be between 30 seconds and 1 minute.
- If the Lower Roadway HOV Bypass were open to HOV2+ or 3+ traffic, the roadway would need to be reconstructed to accommodate additional traffic demand. The cost range would be

between \$7.5 and \$10.5 million. Opening this bypass to vanpool only would require improvements costing about \$400,000.

Overall, the conversion of the existing lower roadway to an HOV bypass configuration would provide limited person mobility benefits and likely worsen total person hours of delay during the AM peak period. Further consideration of HOV improvements on the lower roadway will not be carried forward in the IJR analysis. The City of Lake Stevens is anticipated to move forward with the 20th Street HOV bypass project that will provide benefits for travelers between 83rd Avenue NE and the US 2 interchange.

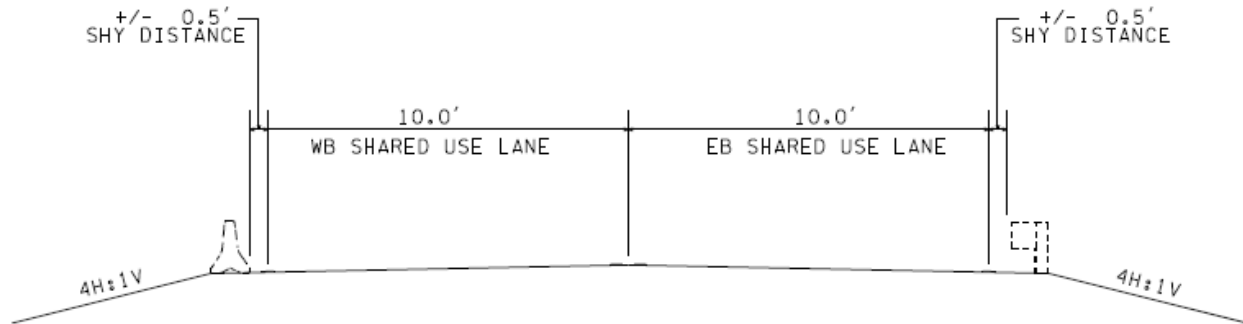
APPENDIX A – LOWER ROADWAY HOV BYPASS DESIGN

20th Street SE/US-2 HOV Bypass Design Summary – Pavement Marking Only



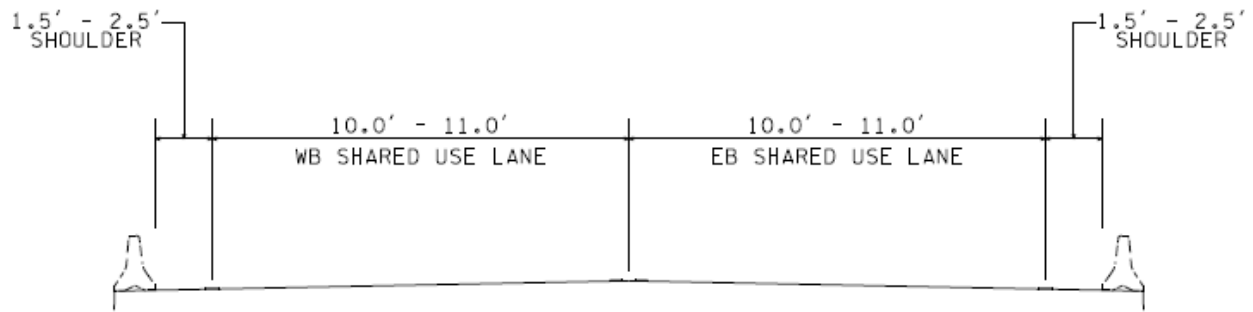
TYPICAL CROSS SECTION WEST OF EBEBY SLOUGH

Design Criteria	Reference	Min. Requirement	Remark
Minimum Shoulder required for structural support of pavement	DM Exhibit 1230-7	2 ft.	Does not meet minimum requirement with 11' lanes. Meets minimum requirement with 10' lanes.
Clear zone	DM Exhibit 1600-2	10 ft.	Both the north and south side of the road have adequate clear zone and recovery area for a 30 MPH design speed. Roughly, 550 ft. of the south side may require coordination with Everett Water.



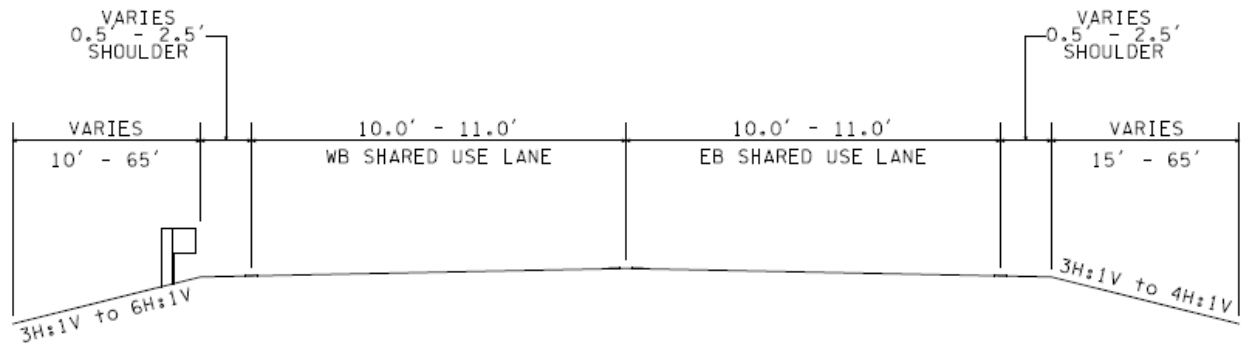
TYPICAL CROSS SECTION UNDER EB TRESTLE (REVERSE CURVE)

Design Criteria	Reference	Min. Requirement	Remark
Minimum lateral clearance (shy distance)	DM Exhibit 1230-7	2 ft.	Does not meet minimum requirement with 10' lanes.
Turning roadway width (track width)	AASHTO Figure 3-17 (SU design vehicle)	12 ft. (24 ft. for two-way roadway)	Does not meet minimum requirement. Based on the available width (10'), AutoTurn shows that an SU vehicle can complete the maneuver. Clearance is narrow, however, and a slight driver error or mechanical failure could potentially result in a collision with an oncoming vehicle or barrier.
Minimum radii	AASHTO Table 3-3b	333 ft. at 30 MPH 50 ft. at 15 MPH	Does not meet minimum requirement. Minimum requirement can be met with a reduced design speed of 15 MPH.



TYPICAL CROSS SECTION ON EB EY SLOUGH BRIDGE

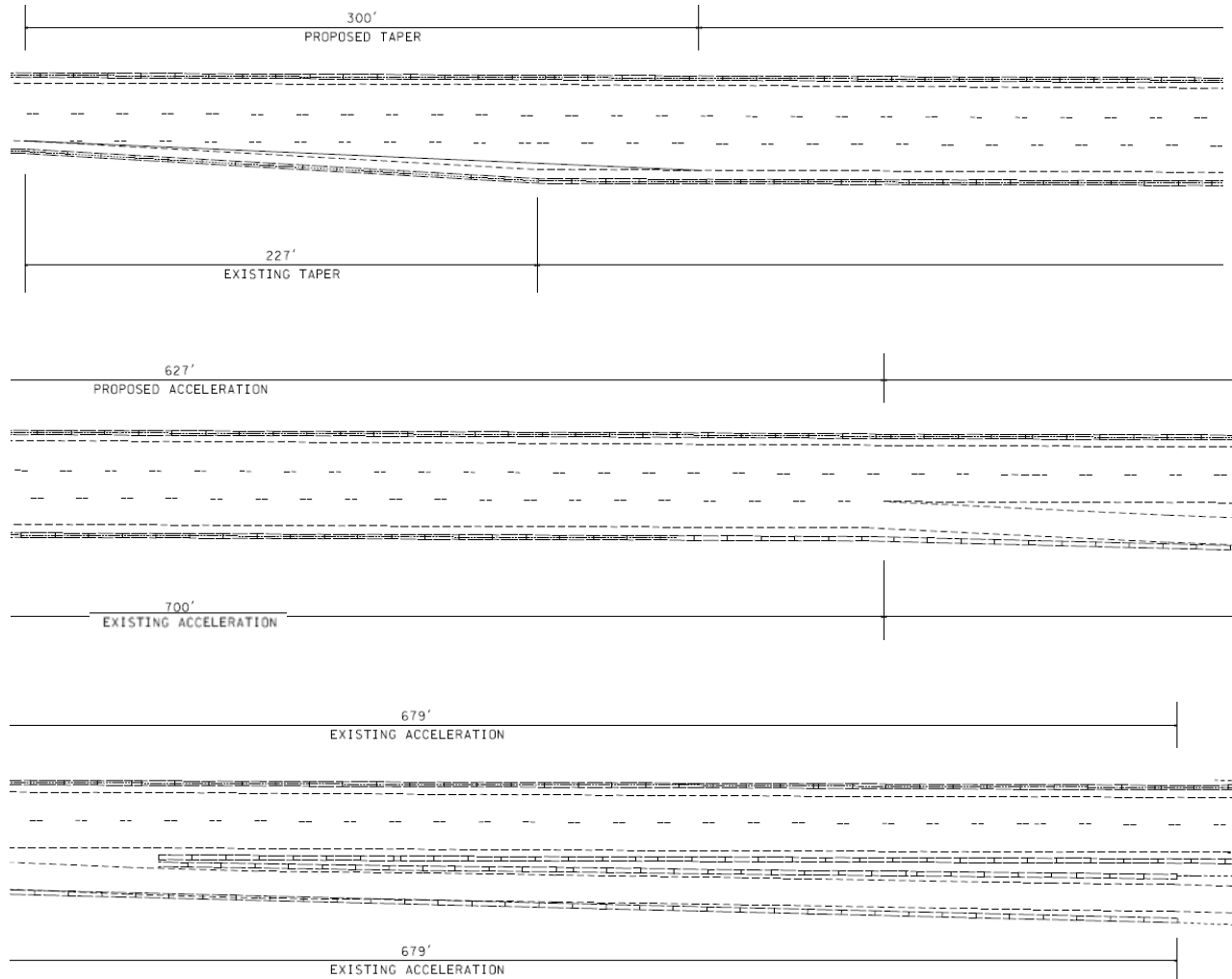
Design Criteria	Reference	Min. Requirement	Remark
Minimum lateral clearance (shy distance)	DM Exhibit 1230-7	2 ft.	Does not meet minimum requirement with 11' lanes. Meets minimum requirement with 10' lanes.



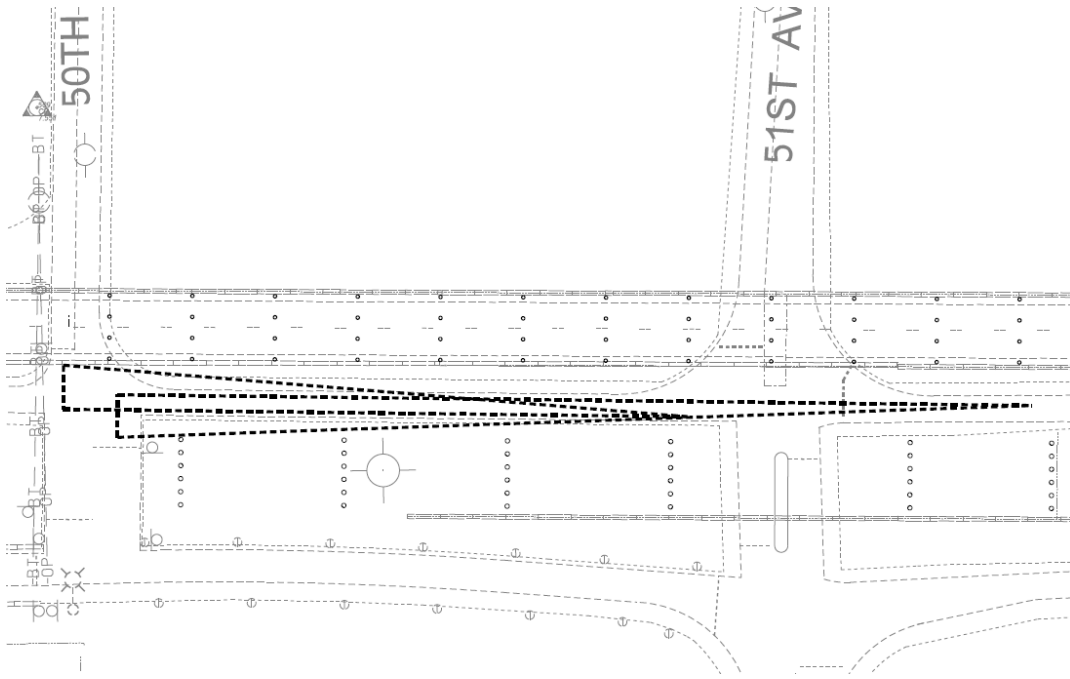
TYPICAL CROSS SECTION EAST OF EBEBY SLOUGH

Design Criteria	Reference	Min. Requirement	Remark
Minimum shoulder required for structural support of pavement	DM Exhibit 1230-7	2 ft.	Does not meet minimum requirement with 11' lanes. Minimum requirement is met along most of the section with 10' lanes.
Clear zone	DM Exhibit 1600-2	10 ft.	South side of the road is unlikely to require any traffic barrier with the exception of the pier for the WB US2 bridge. Even though these bridge piers are outside the clear zone, they are within the recovery area. The north side of the road should have guardrail installed for roughly 500 ft. prior to the bridge

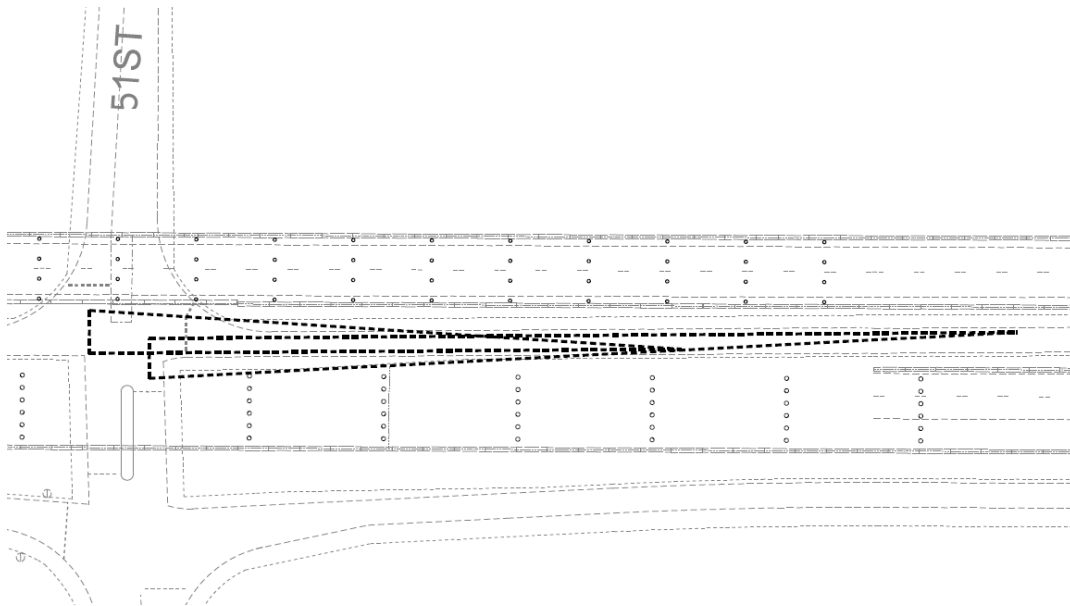
US-2 WB ON-RAMP FROM 20TH STREET SE



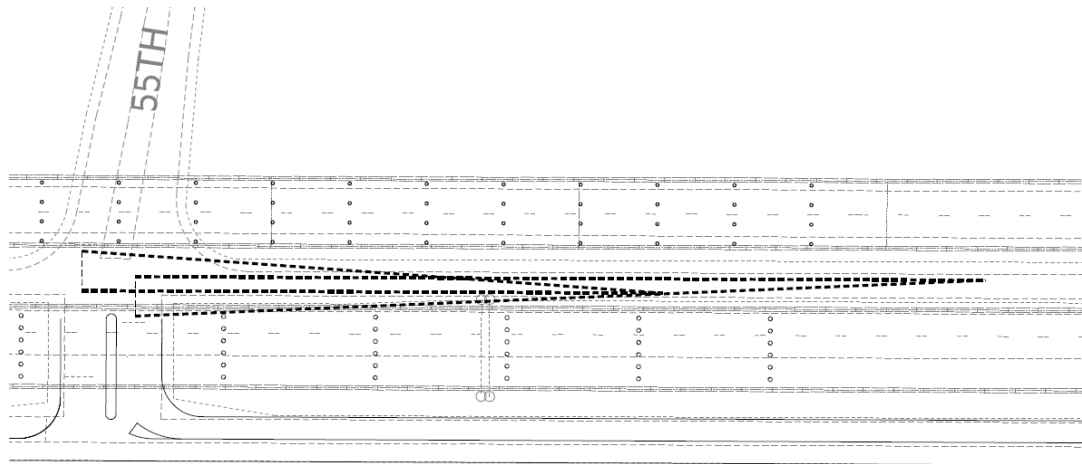
Design Criteria	Reference	Min. Requirement	Existing	Remark
Sight distance	DM Exhibit 1260-1, 1260-6	200 ft. at 30 MPH	311 ft.	Meets requirement
Curve length	DM Exhibit 1260-1	90 ft. for 30 MPH	300 ft.	Meets requirement
Acceleration lane length	DM Exhibit 1360-9	1224 ft. for 30 MPH	1379 ft.	Meets requirement
On-connection: Single Lane, Parallel	DM Exhibit 1360-13b	300 ft. min. taper length	227 ft.	Does not meet requirement but can be met by restriping the edge line with a 300 ft. taper



50th Avenue SE & 20th Street SE Intersection Sight Distance



51st Avenue SE & 20th Street Intersection Sight Distance



Cherry Avenue (55th) & 20th Street SE Intersection Sight Distance

Location	Reference	Min. Required	Existing	Remark
50 th Avenue SE	DM Exhibit 1310-19a	420 ft. at 30 MPH with 10 ft. setback	> 500 feet	Meets requirement
51 st Avenue SE	DM Exhibit 1310-19a	420 ft. at 30 MPH with 10 ft. setback	> 500 feet	Meets requirement
Cherry Avenue	DM Exhibit 1310-19a	420 ft. at 30 MPH with 10 ft. setback	> 500 feet	Meets requirement
20 th Street SE Turnaround	DM Exhibit 1310-19a	630 ft. at 45 MPH with 10 ft. setback	≈ 266 ft.	Does not meet requirement. WB traffic should use Cherry Avenue intersection to access existing WB lane of 20 th Street SE

IJR SUPPORT TEAM MEETING MINUTES

US 2/SR 204/20th Street SE Interchange Justification Report

Draft IJR Support Team Meeting 1 Summary

Meeting summary and purpose

This meeting was the first in a series of seven meetings with the US 2/SR 204/20th Street SE Interchange Justification Report (IJR) Support Team. The purpose of the meeting was to provide an overview of the study, define roles and responsibilities for team members and to review a memorandum describing the proposed methods and assumptions for the analytical components of the IJR. Michael Horntvedt, Don Samdahl and Amanda Reykdal facilitated the meeting and presented on the following items: study overview, roles and responsibilities, project schedule, public outreach, and methods and assumptions.

Meeting date and location

Dec. 14, 2016, 10 a.m. – 12 p.m.

City of Everett Public Services Center, 3200 Cedar Street, Everett, WA

IJR Support Team meeting attendees

Members

- John Spencer, Mayor of City of Lake Stevens
- Mick Monken, City of Lake Stevens
- Steven Dickson, Snohomish County
- Carol Thompson, Community Transit
- Jim Bloodgood, Snohomish County
- Gene Brazel, City of Monroe
- Tim Miller, City of Everett
- Corey Hert, City of Everett
- Ryan Sass, City of Everett
- Jeff Laycock, City of Marysville
- Adam Emerson, City of Lake Stevens
- Brad Feilberg, City of Monroe

WSDOT staff

- Barbara Briggs, WSDOT
- Barbara De Ste. Croix, WSDOT
- Greg Lippincott, WSDOT
- Doug McClanahan, WSDOT
- Jeff Horton, FHWA

Project team

- Cathy George, WSDOT
- Jim Brown, WSDOT
- Tes Abraha, WSDOT
- Michael Horntvedt, Parsons
- Don Samdahl, Fehr and Peers
- Amanda Reykdal, PRR

Meeting agenda

Time		Presenter/Facilitator
10 a.m.	Welcome <ul style="list-style-type: none"> ○ Safety orientation ○ Meeting purpose ○ Introductions 	Michael Horntvedt/ All
10:20 a.m.	Study overview <ul style="list-style-type: none"> ○ Overview ○ History 	Michael Horntvedt/ Don Samdahl
10:30 a.m.	Roles and responsibilities <ul style="list-style-type: none"> ○ WSDOT project team ○ IJR Support Team 	Michael Horntvedt/ All
10:45 a.m.	Schedule <ul style="list-style-type: none"> ○ Key milestones ○ IJR Support Team meetings 	Michael Horntvedt
11 a.m.	Public outreach <ul style="list-style-type: none"> ○ Online open house and other outreach ○ Key messages 	Amanda Reykdal
11:15 a.m.	Methods and assumptions <ul style="list-style-type: none"> ○ Stakeholder key comments working session 	Michael Horntvedt/ Don Samdahl/ All
11:50 a.m.	Next steps <ul style="list-style-type: none"> ○ Action items ○ Upcoming events and activities 	Michael Horntvedt
12 p.m.	Adjourn	

Meeting notes

Study overview and history

Michael Horntvedt kicked off the meeting with an overview of the project purpose and a brief history of work completed in the project area. The purpose of the project is to outline performance gaps in the interchange area and identify short term and long term solutions that can be prioritized for further funding. He noted that the US 2: Everett Port/Naval Station to SR 9 Corridor Planning Study showed SR 204 had the highest collision rate among the corridor evaluated. He further described that this safety condition could be attributed to the interchange geometrics and congestion on US 2. Michael described the existing year 2016 congestion issues at SR 204 and 20th Street SE that have been observed by the design team during the data gathering stage. He clearly described congestion that extends east on 20th Street SE to beyond 78th Street SE. Several members of the IJR Support Team agreed with his description and added that congestion on westbound US 2 extends east of the US 2/SR 204 interchange during the morning commute period.

Greg Lippincott asked if the team had information related to a recent Value Engineering Study in the area that considered a roundabout at the interchange. None of the WSDOT attendees were aware of the study Greg was referencing. Greg will look into it and see if he can find anything. Michael will touch base with Greg to close the loop on the relevant information.

Mayor John Spencer described current and forecast growth in the City of Lake Stevens as it relates to congestion at the interchange. He gave the group an overview of the amount of growth he has witnessed in his city, noting that they have recognized a steady 2 percent

increase in population every year. In 2016 they issued 800 building permits that could increase population by about 2,000 people. It's predicted their current population is 31,000, and another 200 building lots are on the way and should be permitted in late-2017/2018. He doesn't see a substantial slowing in growth in the area. The mayor wants to ensure that we're accounting for growth as we conduct the study. Michael reassured the mayor that the analysis team is using the most recently updated land use forecasts for the traffic estimating process. Michael also noted that the team is working closely with the SR 9/SR 204 Intersection Improvements project to ensure both teams are using the most current land use information and traffic forecasts.

To finish the study overview and history portion of the meeting, Michael spoke about project funding. He made a point to say that this project was funded separately, not through Connecting Washington (unlike the nearby SR 9/SR 204 project). Michael set expectations by stating the team's focus is to determine both short and long term issues and solutions that can improve mobility and safety at the US 2/SR 204 interchange. Michael also noted that the project was only funded for the Interchange Justification Report and did not include full environmental, design, or construction funding. Michael also described that the funding was intended to study the US 2/SR 204 interchange, but that the team would consider how the interchange improvements could be constructed to not preclude potential future widening of the US 2 trestle.

Roles and responsibilities

Michael then reviewed the roles and responsibilities for the IJR Support Team and the project team. Michael started by saying that the IJR Support Team will help us finalize the study, but the Washington State Department of Transportation is the final decision maker. Michael asked the group for their agreement and there was no opposition to the decision.

After reviewing the roles and responsibilities for the support team, a few members expressed concern with the amount of time they had to review documents prior to the first meeting. They requested a review period of 15 days, noting the sooner they get the materials, the better. The project team agreed to get materials out to the support team sooner.

A conversation about roles and responsibilities for IJR Support Team members ensued. The following topics were discussed:

- **Local project connections:** Jim Bloodgood specifically noted the connection between the US 2/SR 204 project and SR 9/SR 204 project. Steven Dickson added that the project area and the data collection area may be different between the two projects.
- **Funding:** Mayor John Spencer noted that he does not consider that the US 2 trestle widening will be part of the Connecting Washington program, and he would like to know if federal funding is available for this study or future work. He's in agreement with the roles and responsibilities, but wants to ensure the project team considers the potential for future federal funding and that they are in alignment with FHWA requirements. Michael said we are following the proper IJR documentation procedure required by WSDOT and the FHWA, but we are not completing final environmental documentation. Although there is no environmental process for this study, as we look at potential solutions we are keeping in mind that in the future this project will need to meet NEPA and SEPA requirements.
- **Trestle timeline:** Steven would like to know the timeline for the trestle. He suggested that the team develop a work backward schedule starting from the year 2045 to the point when funding is needed to begin the planning and design process.
- **Additional funding:** Carol Thompson asked WSDOT if there are programs that allow for early operational improvements in the area, or any other additional resources. Barbara



Briggs mentioned that the local traffic operations group has funding for traffic operations improvements, but the budget is limited to \$60,000 per project and would not likely be effective at the interchange. Carol would like to see more information on that. At this time there is no federal or state funding beyond the IJR process. Federal funding could be pursued, but it's a question of how. No commitments to explore additional funding were made at this time.

- Rapid transit expansion and safety concerns: Mayor John Spencer noted that you can't get to the Everett Transit Station at this point, which will be a problem when rapid transit is brought to Everett. He is also worried about road rage on 20th Street SE, where he's heard of people getting out of their cars. He said that we need to look hard at the system approach and how we can get to a solution sooner to get people over the river.

Michael refocused the conversation and covered the project team's roles and responsibilities. Michael referenced the roles and responsibilities section of the WSDOT Design Manual 550.02. He indicated that the project team will be responsible for collecting data, analyzing the concepts, documenting results, and collecting public input. They will also be responsible for sharing information with the IJR Support Team in a timely manner that supports effective meeting time.

Study schedule

After reviewing the study and its history, Michael walked the group through the study schedule. He said that he wants to have some solid project concepts ready by the next legislative session, which is a short session, so that we can get this in front of elected officials. He noted that early pre-briefings with elected officials will be important in moving this process forward to get funding.

The support team had the following suggestions and questions about the schedule:

- Carol asked to see an additional meeting between the third and fourth meeting. She also requested to see a working draft of the IJR that can be revised as we go along. Don Samdahl said that we will come up with a draft.
- Steven wanted to know if the IJR will focus on an early solution or if it will include a more comprehensive plan. Michael said that the team will be looking at long-range, full-build solutions along with early action options that can be built in phases. Ryan Sass noted that he supports working toward a long-term solution.
 - In response to Steven's comments, Mayor John Spencer asked if the road below the trestle can support HOV 3+ and vanpool traffic. Additionally, he wants to know if we are going to look at an option that extends HOV lanes on 20th Street SE below the trestle and coordinate those efforts with the IJR. Michael confirmed that the team is going to evaluate the lower HOV lane as a phasing option. Carol expressed concern that the lane might not be open to transit. Michael confirmed that the evaluation will consider all modes so that a clear understanding about cost differences for improvements can be weighed against the option benefits. The IJR Support Team supported the multimodal approach to the evaluation.

Public outreach and key messages

Amanda Reykdal walked the group through the robust communications and outreach plan for the study. Activities will include an online open house, project webpage, stakeholder interviews, community meetings, media support, ongoing community support and the IJR Support Team meetings. All of this outreach will support the study.

Next, Amanda walked through the key messages to communicate to the public. The group had specific edits they would like to see. The first edit they suggested is removing any reference to

the year 2045. Secondly, they would like to highlight in the key points that while the trestle maintains structural integrity, it is functionally obsolete. It is important to recognize that people living along the corridor have difficulty accessing the trestle because of severe congestion.

In discussing the outreach tactics, the team had thoughts about the online open house approach. Carol likes the idea of the online open house. Mayor John Spencer concurred. Mick Monken expressed concerns that the online open house would not provide for direct staff feedback to questions from open house attendees. Amanda informed Mick that opportunity for comment will be available through the online open house portal. The IJR Team agreed to consider a future in-person open house after the online open house is completed. The community briefings options will be used to address public concerns.

A side conversation on high capacity transit (HCT) took place after the outreach section and before the team discussed the methods and assumptions memo. Carol stated that we should consider infrastructure needs to accommodate HCT, noting this is a fluid area. Michael asked if Community Transit had current plans for HCT on the corridor and Carol responded that Community Transit doesn't assume a major infrastructure improvement when they make their long range plan, but if there was a big change in infrastructure they would adjust their long range plan. Michael indicated that the team would consider how to address the HCT request while evaluating the travel demand modeling results. The IJR Support Team agreed with the continued assessment.

Methods and assumptions

Following the review of the project scope and team roles and responsibilities, a working session was conducted to discuss the methods and assumptions document that was sent to the team members on Friday, Dec. 9, 2016. Some members of the group did not have enough time to review the document. Michael requested that the IJR Support Team submit their comments by Wednesday Dec. 21, 2016 and to submit those to him and Amanda. Michael will work with the team to finalize responses and return to the IJR Support Team within a week of receiving comments. Michael also requested that if an agency has comments from several staff members that they consolidate comments into a single submittal. The following edits were identified in-person at the meeting:

- Fix page numbers
- Include title page, then signature page to follow
- Barbara De Ste. Croix would like to have the map improved so that it is visible when you print out the document
- On page A1-2, include City of Monroe in list
- On page A1-5, Jim Bloodgood would like to expand the project study area shown on the Methods and Assumptions map further to the east
 - Michael noted that the study limits shown were constraints for the operational model and that the team will use a travel demand model that encompasses the entire county. Jim requested that the extents of the operational model (VISSIM) be extended on 20th Street SE east to SR 9. Jim said that the portion of 20th Street SE we're showing is not the extent of the queuing we're seeing. Queuing can be back to the high school. Jim also requested to see the Bickford interchange included in the modeling. He noted that congestion on US 2 extends beyond the Bickford interchange on US 2.
 - Don noted that we will use the VISSIM model developed for the SR 9/SR 204 intersection improvement project to capture traffic operations impacts between



the two projects. The model from SR 9/SR 204 will coordinate traffic volumes in and out of the US 2/SR 204 VISSIM model to provide a close coordination. He said that if we improve SR 9/SR 204, that any traffic improvements or impacts will be recognized at the US 2/SR 204 interchange. Don said that we will work to outline a method that best captures traffic diversions.

- Steven also asked to see the study area extended east and south so that SR 204, 20th Street SE, and US 2 all terminate at SR 9
- Michael agreed to discuss model process modifications that address concerns expressed by Steve and Jim
- Gene Brazel noted a safety concern on US 2 at the Bickford Avenue interchange that is caused by people trying to avoid the westbound congestion that originates at the US 2/SR 204 interchange. He has witnessed accidents due to cars headed toward Everett taking U-turns to avoid the congestion at the interchange.
- All members of the IJR Support Team agreed that existing travel time information should be collected for US 2.

Next steps

The meeting concluded with action items for the project team and a summary of next steps within the group.

- ✓ IJR Support Team to submit comments on the Methods and Assumptions Technical Memorandum by Dec. 21, 2016
- ✓ Project team to edit the methods and assumptions document based on comments received and conversation at the kick off meeting. The revised version will be sent to the team.
- ✓ The project team will discuss adding in-person open house(s) and an additional IJR Support Team meeting
- ✓ Project team to discuss modeling methodology modification to address concerns expressed about queueing limits and alternate route choices
- ✓ Project team to discuss gathering additional travel time data
- ✓ Project team to send materials two weeks in advance
- ✓ Project team to update public messages.
- ✓ Project team to update project schedule to include additional meeting and extended review times

Upcoming events and activities

- ✓ Project website
- ✓ Second IJR Support Team meeting
- ✓ Online open house

The meeting adjourned at 11:59 a.m.

US 2/SR 204/20th Street SE Interchange Justification Report

IJR Support Team Meeting 2 Summary

Meeting summary and purpose

This meeting was the second in a series of seven meetings with the US 2/SR 204/20th Street SE Interchange Justification Report (IJR) Support Team. The purpose of the meeting was to provide an update to the Support Team on the action items identified during the first Support Team kick-off meeting, to share and discuss the updated Methods and Assumptions Memo, to discuss the IJR Policy Points 5, 6, and 7, and to provide an update on the study's public outreach.

Meeting logistics

Feb. 15, 2017, 10 a.m. – 12 p.m.

City of Everett Public Services Center, 3200 Cedar Street, Everett, WA

IJR Support Team meeting attendees

Members

- Mick Monken, City of Lake Stevens
- Adam Emerson, City of Lake Stevens
- Carol Thompson, Community Transit
- Steven Dickson, Snohomish County
- Jim Bloodgood, Snohomish County
- Brad Feilberg, City of Monroe
- Tim Miller, City of Everett
- Corey Hert, City of Everett
- Ryan Sass, City of Everett
- Jeff Laycock, City of Marysville

WSDOT staff

- Greg Lippincott, WSDOT
- Miguel Gavino, WSDOT
- John Klockenteger, WSDOT

Study team

- Cathy George, WSDOT
- Jim Brown, WSDOT
- Tes Abraha, WSDOT
- Lindsay Yamane, Parsons
- Michael Horntvedt, Parsons
- Maria Hayashi, Parsons
- Don Samdahl, Fehr and Peers
- Amanda Reykdal, PRR
- Kate Elliott, PRR

Meeting agenda

Time	Topic	Presenter/Facilitator
10 a.m.	Welcome <ul style="list-style-type: none"> ○ Safety orientation ○ Meeting purpose ○ Introductions ○ Schedule update 	Michael Horntvedt
10:15 a.m.	Action items <ul style="list-style-type: none"> ○ Approval of IJR Support Team Meeting 1 Summary ○ Review action items from IJR Support Team kickoff 	Michael Horntvedt
10:30 a.m.	Methods and Assumptions Memo <ul style="list-style-type: none"> ○ Edits overview ○ Approval 	Michael Horntvedt/ Don Samdahl
10:50 a.m.	IJR Policy Points working session <ul style="list-style-type: none"> ○ Policy Point 5: Land Use and Transportation Plans ○ Policy Point 6: Future Interchanges ○ Policy Point 7: Coordination 	Michael Horntvedt
11:35 a.m.	Outreach <ul style="list-style-type: none"> ○ Stakeholder interviews ○ Outreach update <ul style="list-style-type: none"> ● Study webpage, online open house and public survey 	Amanda Reykdal
11:50 a.m.	Next steps <ul style="list-style-type: none"> ○ Action items ○ Upcoming activities 	Michael Horntvedt
12 p.m.	Adjourn	

Meeting notes

Welcome

Michael Horntvedt kicked off the meeting and asked Ryan to provide a safety briefing. After the briefing, Michael provided an overview of the meeting purpose:

- Provide an update on the study status and action items
- Finalize the updated Methods and Assumptions Memo to be signed at the next IJR Support Team Meeting
- Discuss and receive comments on IJR Policy Points 5, 6 and 7

Michael provided an overview of the study schedule and noted that traffic modeling is underway and the alternatives development is beginning this month. Currently, the project team is reviewing the existing and no-build conditions.

Review of action items

Michael reviewed the status of action items that came out of the Dec. 14 Support Team meeting. Completed action items:



- Methods and Assumptions document updated per comments received from WSDOT and the IJR support team.
- Schedule was updated to include additional IJR Support Team meeting (#4) in August 2017. During this meeting the study team will provide an update to the Support Team on the draft alternatives analysis. Baseline milestones remain unchanged.
- A meeting was held January 4 to discuss traffic demand modeling and forecasting; agreement was reached regarding study area and trip distribution parameters.
- Traffic counts and travel time data collection were completed and are being input to the travel demand model; the model is currently under calibration.
- Traffic occupancy data was received and is being reviewed.
- IJR Policy Points 5, 6, and 7 have been drafted and were provided for review.

Questions / comments upon review of the Draft IJR Support Team Meeting 1 Summary:

- Greg Lippincott asked how the IJR fits into the Practical Design Process and if there will be a Basis of Design worksheet completed. *Michael indicated that the IJR Study would not include a BOD because there is no funding for design, environmental, or construction. A BOD will be part of future work if further design budget is secured.*
- Miguel Gavino asked how the HOV bypass project fits into the larger study schedule. *Michael clarified that Lake Stevens developed plans to build a westbound HOV lane on 20th Street SE that runs beneath the trestle and connects to the existing ramp before the Snohomish River. This lane would serve as an HOV and transit bypass for the trestle congestion. The study team has been asked to evaluate the feasibility and functionality of the design. The study team will include the preferred design with the rest of the interchange design alternatives and will begin reviewing and evaluating concepts this month. Michael confirmed that the HOV bypass may be part of one of the final interchange alternatives, or may just be a preliminary concept if it doesn't prove to be functional and feasible for the long range preferred alternative. The team will have more information on the HOV bypass design to discuss at the IJR meeting in May.*
- Ryan Sass requested a correction to the Dec. 14 IJR Support Team Meeting summary on page three at the end of paragraph two - that simply not precluding work on the trestle isn't enough, outcomes of the study need to facilitate and enhance the trestle.: *Michael clarified that this smaller, phase-one project doesn't include work on the trestle, but also doesn't preclude it. Steve Dickson suggested that replacing the word 'preclude' with 'anticipate'. The support team agreed with this text edit.*

Methods and Assumptions Memo

To kick off the Methods and Assumptions Memo, Michael updated the Support Team that a meeting was held on Jan. 4, 2017 with a few Support Team members to confirm the study area and identified intersections. The study team recommended the use of an additional traffic management system called dynamic traffic assignment (DTA) that is used in the Dynameq modeling platform.

Don Samdahl explained that the study already uses EMME traffic demand modeling which provides data at the county level for overall existing and future travel demand. However, EMME is not intended to give details on how traffic is performing at a localized level, for example at a specific intersection, which is key data for the traffic modeling. The traffic study team is now using Dynameq to enhance forecasting to account for traffic diversions due to system

congestion. The January 4 meeting participants agreed to use Dynameq modeling to account for localized diversion in the project area.

The primary change to the Methods and Assumptions document include the Dynameq modeling methodology. Additional updates include the collection of new travel time data on US 2 between I-5 and east of the Bickford interchange.

Michael opened the floor up for comments on the Methods and Assumptions Memo:

- Miguel Gavino asked what the no-build condition assumption is for the US 2 trestle, and what the requirements are for prospective projects to be included in the baseline model.
 - Michael confirmed that the US 2 trestle widening, while on the PSRC project list, may not be in the Snohomish County model. It is up to the IJR Team to determine which projects they think should be included in the baseline model for evaluation of alternatives.
 - Michael clarified that the no-build scenario typically includes all planned and programmed projects and that the study would assume a 2040 horizon year. Once a year a 2040 preferred alternative is selected, the study team in coordination with the Support Team will figure out what early action improvements could be built to alleviate congestion and/or improve safety. Michael recommended that including the trestle expansion in the 2040 model so that the team would work with a higher traffic demand and they would be able to assess interchange configuration needs.
 - Michael clarified that to get a clear comparison for the study, the No Build and all concepts would assume the westbound trestle widening to three lanes. The support team concurred.
- Ryan Sass mentioned that the previous corridor plan reviewed whether the third lane would operate as an HOV or general purpose lane. The corridor plan was inconclusive regarding whether the HOV lane would be beneficial. Ryan recommended that the team assume the third lane designation is general purpose at this time.
 - Michael clarified Ryan's statement that the corridor plan was focused on the trestle, which is outside of this study's scope.
 - Michael asked and confirmed that the team will move forward under the assumption based on the description provided in the PSRC 2040 model that the trestle has three lanes with the third lane designated for HOV. The support team concurred.
- Carol Thompson stated that there are a lot of expectations on what transit will do in this corridor and she would like to run the Methods and Assumptions Memo past the Community Transit planning team. Carol also asked that Community Transit be added to the Memo approval signature document.
 - Cathy George reminded the team that of Legislature's deadline and requested all additional review and discussion of the Methods and Assumptions Memo to occur no later than two weeks after the team receives the updated document from Michael.
- Cathy George requested to change "WSDOT HD Access" on the signature page to "WSDOT NW Region".

- Michael restated that:
 - Study limits would remain as previously discussed; the traffic models would include the trestle widening and Table 6 of the Methods and Assumptions document would be updated to match.
 - Requested signature page changes would also be made.
 - The updated document will be emailed to all reviewers for final comment and must be returned within two weeks of being received.
 - The document will still be signed at the May 3 IJR Support Team Meeting.
 - Fehr and Peers will continue to proceed with their analysis using the document and all comments received to date.

IJR Policy Points working session

Policy Point 5: Land Use and Transportation

Michael kicked off the IJR Policy Points working session with Policy Point 5 by reading the question that must be addressed in the chapter and providing a summary review of the team's findings. The study team found that the proposed interchange improvements are compatible with all municipalities' land use and transportation plans while progressing the goals set forth in regional and statewide policy.

Michael opened the floor for comments:

- Steve stated that the interchange is critical to freight movement, especially the building materials that originate from the Granite Falls area, which also makes it a critical interchange for economic vitality because it is a major east to west freight route.
 - Michael agreed to include the importance to freight and economic vitality to the policy language.
- Steve requested a few other edits including:
 - Section 5.2.3.1 in the last paragraph to read “drawing large numbers of commuters from Lake Stevens, Monroe and Snohomish.”
 - Section 5.2.3.5 in the third paragraph to change the statement “City of Marysville is not directly served”, which Steve says is not correct and that many people use the interchange to access Sunnyside Boulevard toward Marysville.
 - Section 5.4.2, Steve asked the study team to confirm what is included in “the Regional TIP” and to clarify how that compares to section 6.2.2.
 - Section 5.4.5 regarding Sound Transit states that the US 2/SR 204 interchange will not have any impact on Sound Transit service. Steve clarified that this study is key to supporting the growing transit ridership, especially at Everett Station. Steve asked the study team to broaden the statement to acknowledge how the interchange will support transit and ridership.
 - Carol concurred with this statement adding that transit ridership demand to Lynnwood will grow exponentially by 2023 with the expansion of light rail.
- Michael confirmed that the chapter would be revised per comments received; any additional comments can be submitted to him via email.

Policy Point 6: Future Interchanges

Michael introduced Policy Point 6 regarding future interchanges, and shared the question that is addressed for the policy point. Michael cited three future interchanges, the US 2/SR 9

interchange, the SR 9/SR 204 intersection, and the City of Lake Steven's 20th Street SE widening project. The study team found that the revision is compatible with all local transportation network plans. Michael confirmed that the team should include the SR 9/SR 204 intersection improvements to the project list.

Michael opened the floor for comments:

- Carol clarified that the adjacent interchanges to US 2/SR 204/20th Street SE are significant for transportation mobility throughout the region, but they operate independent of one another such that they will not be impacted by any proposed US 2/SR 204/20th Street SE interchange revision.
- Steve asked that the study team make a few edits, including:
 - Add economic vitality and freight to this section, similar to Policy Point 5.
 - In sections 6.2.2., 6.2.3, 6.3.1, the policy point discusses the "US 2 approach" should not interfere because they are far enough apart, but Steven noted that in 2040 the traffic counts will be much higher so impacts would be more likely.
 - The team agreed to use the term "operate independently", in lieu of the description about intersections not interfering.

Policy Point 7: Coordination

Michael introduced Policy Point 7 regarding coordination, which addresses the question: Are all coordination projects and actions programmed and funded? Michael provided an example to the team about why policy point 7 is important. He further confirmed that no supplementary projects are necessary for completion of the proposed interchange improvements. Additionally, the interchange does not rely on any other developments or improvements to achieve modeling, analysis or predicting safety. Therefore, although the proposed improvements are not reliant on any other infrastructure alteration, there are several project candidates within the impact area that, if funded are pursued, would be complimentary to and integrated with the US 2/SR 204 improvement proposed in this report.

Michael opened the floor for comments:

- Steve asked the project team to clarify the statement 'several project candidates' in section 7.1. This section refers to section 5.4.2 which lists 'Ebey Slough Trestle, from SR 204 to Bickford Ave and from Bickford Ave to Monroe', which is not a project. This issue is included in table 6 and perhaps other places throughout.
 - Michael clarified that this project came from PSRC 2040, and that he will confirm whether he should remove all mention of this project in all the policy points.

Michael closed out the policy points discussion stating that comments will be incorporated into the chapters and that the policy points will not be finalized until the study team has the draft Interchange Justification Report. He requested that the Support Team send any further comments along via email.

Outreach

Amanda Reykdal provided an update to the Support Team regarding the study's public outreach efforts. In early February, Amanda interviewed ten stakeholders to gather information about perceived interchange issues, interchange improvement priorities, potential benefit to surrounding communities, and the best community outreach methods. Common themes we heard from the stakeholder interviews include:



- General agreement that the interchange operates poorly, especially for morning commuters, and the SR 204 and 20th Street SE merge poses safety concerns.
- General agreement on priorities including addressing the SR 204 and 20th Street SE merge and improving overall trip reliability, ensuring that any improvement won't just move the problem elsewhere, that any improvement will consider long-term regional planning, and the improvement will support HOV and transit mobility.
- The stakeholders suggested several outreach tactics including a mix of online tactics with in-person meetings, use of social media, newspapers, listservs, direct mail and Snohomish County Economic Alliance.

Amanda asked the Support Team if anything missing from the key takeaways and Carol Thompson stated that she appreciated that her transit-related concerns were adequately addressed.

Amanda provided an overview of upcoming outreach activities including a summary of the stakeholder interviews that will be used to inform online public survey questions. Survey questions will be a key feature of the online open house, scheduled to be active April 2017. The online open house will be hosted on the new study webpage. Both the stakeholder interview summary findings and the online open house findings will be shared with the Support Team during the May 3 meeting. Michael clarified that the open house survey results will be considered as the team develop interchange concepts.

Next steps

The meeting concluded with action items for the study team and a summary of next steps with the group.

- The study team will finalize the following
 - Run and summarize operational model for existing and future no-build conditions
 - Begin working on development and evaluation of HOV bypass
 - Update schedule to add HOV bypass as a separate item
 - Initiate concept development process following need identification
 - Ensure Greg Lippincott is on the distribution list
- The study team will update the following materials and recirculate to the Support Team for review:
 - Methods and Assumptions Technical Memorandum
 - Update table 6 per agreement about the trestle and findings about US 2
 - Pg. 7-12, TT study, limits
- The study team will incorporate comments for Policy Points 5, 6, 7. Review of the updated policy points will occur when the draft IJR is submitted.
- IJR Support Team to review and submit any final comments on the following documents
 - Methods and Assumptions Technical Memorandum within two weeks of receiving the revised document.

Meeting adjourned at 11:32 a.m.

US 2/SR 204/20th Street SE Interchange Justification Report

IJR Support Team Meeting 3 Summary

Meeting summary and purpose

This meeting was the third in a series of seven meetings with the US 2/SR 204/20th Street SE Interchange Justification Report (IJR) Support Team. The purpose of the meeting was to provide the Support Team an update on the study status and start alternatives development.

Meeting logistics

May 3, 2017, 10 a.m. – 12 p.m.

City of Everett Public Services Center, 3200 Cedar Street, Everett, WA

IJR Support Team meeting attendees

Members

- *Mayor John Spencer, City of Lake Stevens*
- *Eric Durpos, City of Lake Stevens*
- *Carol Thompson, Community Transit*
- *Scott Ritterbush, Community Transit*
- *Steve Dickson, Snohomish County*
- *Jim Bloodgood, Snohomish County*
- *Mohammad Uddin, Snohomish County*
- *Brad Feilberg, City of Monroe*
- *Tim Miller, City of Everett*
- *Ryan Sass, City of Everett*

WSDOT staff

- *Miguel Gavino, WSDOT*
- *John Klockenteger, WSDOT*

Study team

- *Cathy George, WSDOT*
- *Jim Brown, WSDOT*
- *Tes Abraha, WSDOT*
- *Lindsay Yamane, Parsons*
- *Michael Horntvedt, Parsons*
- *Don Samdahl, Fehr and Peers*
- *Amanda Reykdal, PRR*
- *Brett Houghton, PRR*

Meeting agenda

Time		Presenter/Facilitator
10 a.m.	Welcome <ul style="list-style-type: none"> ○ Safety orientation ○ Meeting purpose ○ Introductions 	Michael Horntvedt/ All
10:10 a.m.	Study update	Michael Horntvedt

	<ul style="list-style-type: none"> ○ Schedule update ○ Review past action items ○ Sign Methods and Assumptions Technical Memorandum 	
10:20 a.m.	Outreach <ul style="list-style-type: none"> ○ Survey results and key findings 	Amanda Reykdal
10:30 a.m.	Existing conditions <ul style="list-style-type: none"> ○ Safety summary ○ Traffic operations ○ Transit and HOV use 	Don Samdahl
10:45 a.m.	Future traffic	Don Samdahl
10:55 a.m.	Issues <ul style="list-style-type: none"> ○ Whiteboard activity 	Michael Horntvedt
11:15 a.m.	Potential options <ul style="list-style-type: none"> ○ Preliminary concepts ○ Brainstorm 	Michael Horntvedt/ Don Samdahl
11:55 a.m.	Next steps <ul style="list-style-type: none"> ○ Screening process ○ Purpose and need ○ Selection of concepts 	Michael Horntvedt
12 p.m.	Adjourn	

Meeting notes

Welcome

Michael Horntvedt kicked off the meeting and asked Ryan Sass to provide a safety briefing. After the briefing, Michael provided an overview of the meeting purpose:

- Provide an update on the study status and action items
- Review the alternatives development schedule

Study update

Michael reviewed completed action items from the February 15, IJR Support Team meeting:

- Updated Methods and Assumptions Memo
 - Updated table 6 per agreement about the trestle and findings about US 2
 - Pages 7-12, travel time study, and limits
- Redistributed edited Methods and Assumptions Memo
- Updated policy points 5, 6, and 7
 - Review of the updated policy points will occur when the draft IJR is submitted

Michael distributed the Methods and Assumptions Memo for signature. All required parties signed the Methods and Assumptions memorandum.

Outreach

Amanda Reykdal presented the online survey results and key findings. The survey was shared through the WSDOT project webpage, city and county websites, city councils, business organizations, relevant listservs, social service providers, Everett Herald newspaper, and freight and bicycle organizations. It was live for two weeks. The majority of the responses were submitted in the first three days. Of those 2,750

people, the vast majority (78 percent) reported that their travel time through the interchange has changed in the last five years, with essentially all indicating that the time has increased.

Respondents identified five primary diversion routes. While respondents identified several other diversions, they are all used much less. The majority of people appear to avoid the interchange and the US 2 trestle by traveling south on SR 9, but we also see drivers using Bickford, River Road, Sunnyside, and Bunk Foss Road—all to avoid using 204 or 20th Street SE to get to the westbound trestle. It appears that even though people are using alternate routes, they are still using the trestle to cross the valley.

The survey asked what would be required for people to change modes to transit, vanpool, or carpool. More people responded to the transit mode indicating a potential higher likelihood that people are open to transit use. Improved travel time was the ninth most common condition of the over 15 conditions mentioned. Things that would motivate people to use transit (or use more frequently) when traveling through the interchange are:

- More direct service that doesn't require transfers (33%)
- More parking at park and ride lots and transit centers (27%)
- Transit provided service to more locations (22%)

The top things that would motivate people to vanpool (or use more frequently) when traveling through the interchange are:

- Free ride home in case of emergencies (32%)
- Free parking for vanpoolers (30%)
- Help establishing a vanpool (26%)

The top things that would motivate people to carpool (or use more frequently) when traveling through the interchange are:

- Reserved parking for carpoolers close to place of work (33%)
- Help establishing a carpool (30%)
- Free ride home in case of emergencies (28%)

Some of the things respondents indicated they need to change modes already exist, including help establishing a vanpool, free ride home for emergencies, help establishing a carpool. A more robust education program for the existing programs might support some people to shift modes.

About 1700 people answered this question about what roadway improvements they would like to see, and the majority (53 percent) of responses included some sort of lane improvement at the interchange and on the trestle. The next most popular recommendation was to improve the merge condition. Without specifics, we assume this is the SR 204 merge with 20th Street SE. The remainder of comments are higher level requests or out of the interchange. There were some comments for improved bike access in the "other" category.

Existing conditions

Traffic operations, including transit and HOV use

Don Samdahl presented on existing conditions, including traffic operations and a summary of collisions in the project area. Members of the study team drove the corridor on typical days to measure congested travel times. The team took test drives during morning and afternoon peak periods.

As expected, the typical morning conditions are more congested going westbound. While US 2 is moderately to heavily congested on the trestle, the most severe congestion is on SR 204, 20th St SE, and some on US 2 as it nears the interchange. The congestion is highly variable, with some travel times during morning peak being equal to free flowing and the same route being up to twice as long just 15 minutes later. The trestle itself flows well until you get close to I-5. The congestion on I-5 causes some backups on US 2.

Twenty total vanpools use this corridor, six during the peak hour. Of the approximately 3,000 cars coming together into the two lanes to cross the trestle, between 5 and 10 percent are HOV. This is lower than other similar urban areas. Bus ridership in this area is also fairly low.

The afternoon peak hour traffic is not as congested as the morning peak. I-5 congestion provides some metering onto the US 2 trestle. That combined with an extra general purpose lane (i.e., with the use of the hard shoulder on eastbound US 2 trestle), results in less congestion.

Where the SR 204/20th Street lanes diverge from US 2, there is some backup. Where northbound SR 204 meets the left turn to Sunnyside, there is a weaving movement and traffic backs up.

- The hard shoulder going eastbound on US 2 makes a big difference.
- The backup is greater in the left lane than the right lane going eastbound in the afternoons. Vehicles staying on US 2 move faster. One contributing factor is from drivers staying in the middle lane and cutting in to the left at the last minute.

Given the greater congestion in the morning, the project team will focus primarily on westbound interchange solutions, but will consider the afternoon eastbound issues as well.

Collision summary

The project team used collision data from WSDOT. Don pointed out the cluster of collisions at mile .25 going westbound on US 2 from SR 204. There are collisions throughout the day at this location, though there are more in the AM commute.

There are collisions throughout the day at mile marker 1, on US 2 westbound. Congestion starts building in this location. The on-ramp from Home Acres Road also enters traffic here. Overall, there isn't a significant number of serious or fatal accidents occurring in this area.

There are two places on eastbound US 2, on the trestle, where there are clustered collisions in the afternoon peak time.

The clusters of collisions on SR 204 happen at intersections. There are more serious injury collisions at Sunnyside and at milepost .7. The project team has not assessed these individually, but suspects they are left hand turn collisions. The collision rate here is pretty typical for an urban arterial.

Future traffic

Don continued presenting about expected travel growth through 2040. He clarified that these numbers are not about traffic congestion or behavior, rather it indicates how many people will be trying to get from one place to another based on projected growth in jobs and housing.

- I-5 congestion is going to increase northbound in the mornings which affects future conditions considerably.

- The Mayor of Lake Stevens shared that the largest employer in Lake Stevens is the school district and suggested this might impact area traffic.

Issues

Michael reviewed the issues the alternatives needs to address and led the group through a brainstorm of ideas to resolve each of the defined issues.

1. SR 204/20th Street SE merge
 - a. Add a lane
 - i. One option is to add a lane for traffic from 20th Street SE instead of SR 204. This is an opportunity because we have three buses coming down the hill and it has higher demand than the other two legs.
 - b. Create a westbound 20th Street SE queue jump that goes down on the surface
 - i. This allows westbound 20th Street SE users to use the lower roadway, merging onto the trestle at Home Acres Road, this could be an HOV lane or a general purpose lane
 - ii. If all the traffic goes down, we close the interchange. If it is HOV, this interchange stays open
 - c. Lengthen the merge
 - d. Relocate the 20th Street SE on-ramp
 - i. Bring it outside to SR 204
 - ii. Take it south then back up to US 2
 - e. Meter or signalize the traffic to regulate the flow at the westbound lane that receives SR 204 and 20th Street SE traffic.
 - i. If you meter them upstream, you may be able to make the merge smoother. This addresses merge condition and safety.
 - f. Reroute SR 204 to lower roadway
 - g. Create a couplet so US 2 westbound is a standalone road that goes across the valley further south and only SR 204 and 20th Street SE go across here.
 - i. Repurpose existing lane to be a single direction
 - ii. Or east bound trestle could be used for westbound traffic or reversible lanes
 - iii. This would be a SR 526 extension. It creates a diversion similar to River Road
2. US 2 merge with SR 204/20th Street SE and westbound off-ramp
 - a. Relocate 20th Street SE access to Ebey
 - b. Close access
 - c. Lane management
3. Sunnyside intersection (Michael moved it south of the intersection)
 - a. Does solving issue #1 solve #4?
 - i. Build a roundabout.
 - d. Relocate access to 71st Street?
 - e. Add a lane to the ramp from US 2 onto SR 204.
 - f. This would also address issue #6
 - g. SR 204 comes in as two lanes, meter 20th Street SE, let SR 204 operate as a state highway
 - h. Relocate 20th Street SE
4. Combined solution to issues #5 and #6:
 - a. Eastbound diverge to US 2 and 20th Street SE/SR 204
 - b. Eastbound volume on SR 204

1. Relocate the 20th Street off-ramp to parallel options and return at 79th Street
 - a. This could be a flyover.
 - b. Does the proposed extra lane on the ramp mentioned in issue #4 take care of this too?

The Mayor suggested exploring the option of a new crossing of the valley. Perhaps there are short to mid-term fixes that involve this interchange, and long-term solutions that include additional crossings.

Michael brought up the idea of four lanes on the trestle: one HOV, two general purpose, and a hard shoulder as the fourth lane. During regular periods you have three lanes, including one HOV. Then in peak times you use the shoulder to add a third general purpose lane. Other proposed solutions and thoughts included:

- What about an entirely new city of Everett trestle, so you are separating I-5 and Everett traffic?
- Some of the solutions at this interchange would make room for another trestle later.
- Relocating the 20th Street off-ramp is a benefit

As the group considers whether one westbound trestle lane is HOV, they need to consider transit. It is Community Transit's experience that once a lane is designated general purpose, it will not be converted to HOV only. To make transit more reliable, responding to the survey results that people want more reliable and direct service, we need some kind of HOV accommodation. If we want people to use more HOV/transit, we need to encourage that by making HOV more reliable.

Next steps

Michael concluded the meeting by reviewing next steps. The team will combine the white board exercise with their own concepts. The team will then develop a qualitative screening method which they will use to identify three concepts that provide the benefits we are looking for. The team will provide single line images at about 1 percent high-level design. We will work with group members to get agreement that we have the right concepts identified to explore. We want to be agile about whether we have an additional meeting. If we can resolve these issues by email, we will get moving on this before the August meeting.

The project team will also use the information from today's meeting to draft the purpose and need statement that will go out with concepts. The initial steps will be by email and we will finalize the purpose and need statement at our next meeting in August.

Meeting adjourned at 12:07 p.m.

US 2/SR 204/20th Street SE Interchange Justification Report

IJR Support Team Meeting 4 Summary

Meeting summary and purpose

This meeting was the fourth in a series of seven meetings with the US 2/SR 204/20th Street SE Interchange Justification Report (IJR) Support Team. The purpose of the meeting was to provide the Support Team an update on the study status and select alternatives for analysis.

Meeting logistics

August 16, 2017, 10 a.m. – 12 p.m.

City of Everett Public Services Center, 3200 Cedar Street, Everett, WA

IJR Support Team meeting attendees

Members

- Rep. Mark Harmsworth, 44th Legislative District
- Mayor John Spencer, City of Lake Stevens
- Eric Durpos, City of Lake Stevens
- Carol Thompson, Community Transit
- Scott Ritterbush, Community Transit
- Steve Thomsen, Snohomish County
- Steve Dickson, Snohomish County
- Jim Bloodgood, Snohomish County
- Mohammad Uddin, Snohomish County
- Jeff Laycock, City of Marysville
- Brad Feilberg, City of Monroe
- Tim Miller, City of Everett
- Ryan Sass, City of Everett
- Corey Hert, City of Everett

WSDOT staff

- Barbara Briggs, WSDOT
- John Klockenteger, WSDOT (phone)

Study team

- Cathy George, WSDOT
- Tes Abraha, WSDOT
- Michael Horntvedt, Parsons
- Maria Hayashi, Parsons
- Don Samdahl, Fehr and Peers
- Will Lisska, Fehr and Peers
- Amanda Reykdal, PRR

Meeting agenda

Time		Presenter/Facilitator
10 a.m.	Welcome <ul style="list-style-type: none"> ○ Safety orientation ○ Meeting purpose ○ Introductions 	Michael Horntvedt/ All
10:05 a.m.	Study update <ul style="list-style-type: none"> ○ Schedule update ○ Review past action items ○ Outreach update ○ HOV bypass option 	Michael Horntvedt/ Amanda Reykdal
10:25 a.m.	Year 2040 traffic <ul style="list-style-type: none"> ○ Forecast ○ Operations 	Don Samdahl
11:00 a.m.	Need statement <ul style="list-style-type: none"> ○ Review current and forecast needs 	Michael Horntvedt
11:10 a.m.	Select interchange concepts <ul style="list-style-type: none"> ○ Discuss methodology ○ Discuss comments/questions ○ Recommendation concurrence 	Michael Horntvedt/ Don Samdahl
11:55 a.m.	Next steps <ul style="list-style-type: none"> ○ Concept analysis and design ○ Update IJR policy points 	Michael Horntvedt
12 p.m.	Adjourn	

Meeting notes

Welcome

The project team kicked off the meeting and asked Ryan Sass to provide a safety briefing. After the briefing, the team provided an overview of the meeting purpose:

- Provide an update on the study status and action items
- Analysis update
- Select alternatives for analysis

Study update

The project team reviewed the study schedule and completed action items from the May 3 IJR Support Team meeting:

- Further develop whiteboard concepts and provide qualitative first level screening
- Provide recommendations for concepts to move forward for analysis
- Draft summary need statement for discussion

Outreach activity has been slow since the online open house closed. She mentioned the website is still the best resource for public information.

The project team then described the HOV Bypass option that was considered as an early project for the interchange area. The team coordinated directly with the City of Lake Stevens to evaluate any benefits associated with providing an HOV lane connection to the lower roadway (20th Street SE). The team determined that the merging activity at the west end of the trestle would result in a higher level of

congestion for more people than would benefit from the new connection. It was determined to not be a reasonable early phase for the project.

Year 2040 traffic

Next the team reviewed the year 2040 network modifications, including:

- US 2 trestle: replace westbound trestle with three lanes (one is HOV 2+)
- US 2 to I-5 southbound ramp: add an HOV bypass lane
- US 2- Bickford Road to Monroe: widen to four lanes (Bickford ramp merges onto westbound US 2)
- 20th Street SE: widen to five lanes between SR 9 and Cavalero Road
- SR 9/SR 204 Intersection Improvements project
- I-5- hard shoulder running north to Marysville
- I-5/SR 529 interchange: complete full interchange
- Light rail to Everett

Travel demand growth between 2015 and 2040 was described with a description about the substantial growth in Everett.

The project team then shared simulation video with 90 percent growth during the AM peak hour of 7-8 a.m., for 2040 no build. The 90 percent growth expectation is based off Puget Sound Regional Council (PSRC) projections. Members of the team agreed the PSRC numbers are aspirational, and we should adjust the simulation to 80 percent to get a better idea of 2040 conditions.

It is clear from the video that the problem merge at SR 204 and 20th Street SE continues into the year 2040 as it does today. There is also a visible bottleneck near Bickford, which will be worse in 2040. The condition at Bickford is more congested as it has to merge in and doesn't have its own lane. In the simulation, the trestle conditions look pretty good since cars are unable to get on the structure. There is a visible backup north of downtown Everett, where cars are blocking I-5 as they exit into downtown Everett, and as a result I-5 south of downtown is clear.

Members asked if light rail and the widening of US 2 at Snohomish were incorporated in the model, and the team confirmed that the future projects were included in the travel demand model. There was also a request for the team to determine how many vehicles using the trestle are destined for the light rail.

Lastly, the members reviewed travel times, where there will be increases for travelers. Mayor John Spencer recommends we talk about the peak of the peak, not the average, so citizens understand that we realize how long their commutes are. Carol Thompson added that people have no confidence in reliability and we need to be forthright with the travel time variability—and the incidents of the unreliability.

Need statement

The project team share the draft need statement aloud and asked for comments. Comments could also be emailed to the project team. Proposed changes include:

- Update the traffic demand number from 25 percent to 35 percent in the last section of the need statement
- Update of the last paragraph verbiage was recommended to make assumptions clear to the reader. It was suggested that the study team look at whether this is a constrained or

unconstrained project. If it is listed as constrained under PSRC, then it is assumed that it will be tolling to fund the project.

- Need to be clear that there is a new HOV lane, not an additional general purpose lane as part of the three lane trestle
- It was suggested that analysis of Sound Transit data be provided to determine where ST commuters originate. The outcome might suggest there is a need for HOV.
- Freight movement needs to be added
- Add conversation about diversion of traffic from the 20th Street SE

Select interchange options

The project team reminded the group of the six issues discussed at the last IJR meeting—what are the problems we’re trying to solve here? It was suggested that the team remove the westbound off-ramp as an issue. The team suggested maintaining the weave between SR 204/20th Street SE on-ramp and the left side off-ramp as a weave condition. Even though the volumes are low, the weave condition creates an operational issue. It was suggested that updates to the concepts might address concerns.

It was suggested that the team consider a four lane trestle in order to accommodate 20th Street SE, SR 204 and US 2 all merging together. The recommendation was made to alleviate congestion east of the interchange and allow traffic to access the trestle. There was further concern that the state would spend money to replace the interchange and westbound trestle only for people to still experience delay. The study team said once improvements are made on the east end of the trestle, more traffic will be able to cross the trestle and they will be congested at the I-5 interchange area.

Concern was shared that the IJR is not assessing geometric conditions beyond the interchange. It was suggested that WSDOT consider a trestle replacement study as soon as possible. It was explained to the group that the amount of funding available from the legislature was just enough to cover the east interchange study and that the stakeholders understood that there would be stepwise process to finally get a trestle replacement project funded. One member suggested that the only consideration should be a four lane trestle (3 gp and 1 hov). Another member suggested that the team consider using the HOV lane as a HOT lane.

The IJR Team members suggested that person throughput be considered as a measure to compare concepts. It was also requested that the team consider travel time reduction and traffic volume changes as a measure.

The project team walked through the screening results for each of the design options, and explained the grading process.

There was a group discussion about possible changes, including moving forward four design concepts instead of the three the team scoped for. It was asked if we want to consider a four lane trestle. The group decided to still assess one option with a three-lane trestle to show the differences a new trestle would introduce to the interchange effectiveness. By the end of the discussion, the group agreed on the following design option to move forward:

- Concept 1 as is with three lanes on trestle
- Concept 4 with four lanes on trestle



- Need to figure out where the two lanes will come from and how to get the HOV lane from 20th Street SE onto the trestle—it will likely be an HOV bypass and metering for the general purpose lane
- Concept 5 with four lanes on trestle

Next steps

- The study team will edit the need statement
- The study team will analyze the three design concepts moving forward

Meeting adjourned at 12:07 p.m.

US 2/SR 204/20th Street SE Interchange Justification Report

IJR Support Team Meeting 5 Summary

Meeting summary and purpose

This meeting was the fifth in a series of seven meetings with the US 2/SR 204/20th Street SE Interchange Justification Report (IJR) Support Team. The purpose of the meeting was to review performance of build concepts and develop the final concept for evaluation.

Meeting logistics

December 14, 2017, 9 a.m. – 12 p.m.

City of Everett Public Services Center, 3200 Cedar Street, Everett, WA

IJR Support Team meeting attendees

Members

- Eric Durpos, City of Lake Stevens
- Scott Ritterbush, Community Transit
- Steve Thomsen, Snohomish County
- Steve Dickson, Snohomish County
- Jim Bloodgood, Snohomish County
- Mohammed Uddin, Snohomish County
- Jeff Laycock, City of Marysville
- Tim Miller, City of Everett
- Ryan Sass, City of Everett
- Corey Hert, City of Everett

WSDOT staff

- Barbara Briggs, WSDOT
- Miguel Gavino, WSDOT
- Dean Moon, WSDOT

Study team

- Cathy George, WSDOT
- Tes Abraha, WSDOT
- Michael Horntvedt, Parametrix
- Rick Chapman, Parsons
- Maria Hayashi, Parsons
- Don Samdahl, Fehr and Peers
- Amanda Reykdal, PRR

Meeting agenda

Time		Presenter/Facilitator
9 a.m.	Welcome <ul style="list-style-type: none"> ○ Safety orientation ○ Meeting purpose ○ Introductions 	Michael Horntvedt/ All
9:10 a.m.	Study update <ul style="list-style-type: none"> ○ Schedule update ○ Review past action items ○ Outreach update 	Michael
9:20 a.m.	Review build concepts <ul style="list-style-type: none"> ○ Discuss questions and comments received on memo ○ No 20th Street SE HOV lane in 2040 ○ No HOV bypass lanes ○ Revised concept 4 alignment 	Michael
9:40 a.m.	Updated no-build simulation results <ul style="list-style-type: none"> ○ Describe issues identified in no-build 	Michael/ Don Samdahl
10 a.m.	Present concept operations <ul style="list-style-type: none"> ○ Concept 1, 4 (modified), and 5 	Michael/Don
10:45 a.m.	Concept comparison	Michael
11 a.m.	Preliminary toll findings	Michael
11:20 a.m.	Final concept for evaluation	All
11:50 a.m.	Next steps	Michael
12 p.m.	Adjourn	

Meeting notes

Welcome

The study team kicked off the meeting with an overview of the meeting purpose:

- Review performance of build concepts
- Select preliminary preferred alternative

Study update

There was discussion about the study schedule and completed action items from the Aug. 16 IJR Support Team meeting. Due to the shift in IJR meeting 5, the next meeting will need to be shifted to allow time for completion of the preferred alternative analysis and draft of the remaining chapters of the IJR. The next meeting will be scheduled during the third or fourth week of February depending on IJR support team availability.

Communications

There was a brief update on communications, noting that activity has increased since the last meeting. A bicyclist fatality at the interchange was discussed, and how the team will address non-motorized improvements in the IJR. A sketch of the proposed bike network improvements was presented, with integration and design to be investigated during the design phase. There was a question about whether non-motorized will be included in the study and he was informed that it would be in the IJR and that a concept layout would be shared later in the presentation.

Sidebar conversation

A request was made to analyze the potential benefit of early construction works or phasing options. The project team described that the feasibility of phasing would be investigated, but an engineer's cost estimate will not be provided for separate construction phases.

Issues, no-build network assumptions, and no-build land use assumptions

The team provided a quick reminder about the existing and future issues that were being addressed with each of the concepts.

Conversation ensued about the possibility for an HOV lane on 20th Street SE to be carried forward by the local agency. The project team agreed to reflect the potential for an HOV lane on 20th Street SE that would feed onto the trestle, and that the interchange design should not preclude the future connectivity.

Build concepts selected for analysis

The project team described the no-build concept, then reviewed the three build concepts:

- Concept 1 has an outside HOV lane, started several hundred feet after the merge of the SR 204 on-ramp. This HOV lane could be moved to the inside if determined through a future trestle replacement project that it would provide improved mobility and connectivity within the system. The off-ramp to Ebey Island would be closed. The intersection at SR 204 and 20th Street SE includes access from all directions to Ebey Island.
- Concept 4 assumes a four-lane trestle with one HOV lane and three general purpose lanes. The off-ramp to Ebey Island is maintained, but the access is for US 2 mainline traffic. Concerns were voiced about the method of restricting weaving in this location, as existing traffic begins to weave immediately upon entering the highway in anticipation of the downstream off-ramps to Interstate 5.
 - The team updated the design to allow 20th Street SE to join the trestle as an add lane rather than merging with SR 204 as originally presented. The IJR Support team agreed that the change was reasonable.
 - SR 204 merges into itself and joins the US 2 trestle as an outside add lane
- Concept 5 assumes a four-lane trestle with one HOV lane and three general purpose lanes
 - The 20th Street SE on-ramp will depart from 20th Street SE near the top of the hill, continuing over the SR 204 off-ramp from eastbound US 2 and the on-ramp to westbound SR 204, joining mainline US 2 as an add lane outside of the SR 204 on-ramp.
 - The off-ramp to Ebey Island would be closed

Eastbound improvements

- The demand for eastbound trips is constrained at I-5; perhaps eastbound improvements do not need to be included, on the condition that the proposed improvements don't preclude future improvements to the eastbound network.

- A comment was made that WSDOT owns part of Cavalero Hill, and if the base assumption includes two lanes eastbound on 20th Street SE, WSDOT will have to widen their portion of that road. No design change commitments were made at the meeting.

Non-motorized network improvements

- Connect existing system to Sunnyside Boulevard
- May need signalization (no data on hand to support this analysis)
- May use grade separated crossing to cross under SR 204 at the on-ramp
- May use on-ramp and shoulder on eastbound US 2 to Bickford Road
- May cut a path from westbound US 2 to 20th Street SE
- Potential for 12-14 ft. shared lane on trestle

A request was made to consider other public transit around the interchange. A comment was made to reflect the inclusion of transit network considerations in the report. The project team agreed to discuss transit connectivity in the IJR.

Access to I-5

Two options were presented for connecting the west end of US 2 to I-5, depending on the concept and trestle width. In either case, the HOV lane designation would end near the river. There is potential for an added HOV bypass ramp to southbound I-5 that was assumed in the operations modeling. The design of the west end of the US 2 trestle is outside the scope of this analysis, but basic lane configuration had to be considered for analysis of the highway operations.

Updated no-build simulation

A speed graphic was presented, depicting demand and throughput in the forecast year 2040. The analysis shows no congestion on the trestle due to constraints on the westbound demand prior to the US 2/SR 204/20th Street SE interchange.

Concept 1 operations

There are improvements in congestion on SR 204 and 20th Street SE, but US 2 is as congested or worse than the no-build because there is not enough capacity on the trestle at the merge point with US 2, SR 204, and 20th Street SE to manage the increased demand that could get through the interchange and access US 2. There is some additional demand on 20th Street SE due to the backup on westbound US 2, but the shift in traffic was minimal. The concept analysis includes planned Community Transit service and assumes buses travel near-full.

Concept 4 operations

Concept 4 shows speed improvement on all routes; congestion moves onto the trestle due to the lack of receiving capacity into the city of Everett and onto southbound I-5. The project team optimized the model signal to a level that would require modifications to the City of Everett signal system.

Concept 5 operations

Concept 5 was modeled in the same way as Concept 4, and it experiences very similar operational benefits to Concept 4. It results in some additional travel time savings for the HOV traffic in Concept 5 compared to Concept 4 because the 20th Street SE connects with the US 2 trestle in alignment with the trestle HOV lane. This would make the 20th Street SE bus connection to the US 2 HOV lane easier and more efficient.

No metering was included in the operations analysis, but the design was completed to ensure ramp meters would not be precluded.

Travel time comparison

Travel time through the corridor is expected to double from the year 2017 to the year 2040 in the no-build configuration (three-lane trestle and no interchange improvements). All concepts provide considerable travel time benefit. Concepts 4 and 5 provide similar benefit with inclusion of an HOV lane, while Concept 1 makes congestion worse along US 2. There is negligible change to the no-build travel time for eastbound traffic, due to the constraints at I-5 and the City of Everett on-ramps.

Preliminary traffic findings from funding and finance study

The IJR study team ran their demand model with a tolling configuration to provide traffic volumes for the funding and finance study team. The demand model results showed that US 2 traffic would decrease by about 30 percent if tolling was introduced. This includes changes in travel time, mode choice, destination, and route choice. This number may vary depending on decisions made in tolling implementation. The ongoing funding and finance study will be noted in the IJR.

There was a request to describe the change as a maximum percentage of reduction when talking about tolling. The project team described that they could not call the toll a maximum reduction because the diversion is dependent on the final toll rates and the changes in traffic volume would need to be proven through implementation. Further discussion included the potential for off-corridor improvements that might be needed to support increased traffic resulting from the tolls. The project team indicated that any additional design due to tolling would be discussed as part of a trestle replacement project and/or tolling effort. The IJR Support Team agreed that no additional discussion about tolling mitigation would be needed in the IJR.

Key findings

Demand is compared at the mid-span portion of the trestle.

- Existing: Demand = Throughput
- No-build: Demand < Capacity Throughput < Capacity
 - Constraints on entering traffic at US 2/SR 204/20th Street SE interchange
 - No benefit is achieved by widening the trestle without additional interchange improvements
- Concept 1: Demand < Capacity Throughput < Capacity
 - Constraints on entering traffic from single lane on US 2
 - Constraints at the merge point on the east end of the trestle
- Concept 4 & 5: Demand < Capacity Throughput < Capacity
 - Constraints on exiting traffic due to lack of capacity at the west receiving end of the corridor into Everett or onto southbound I-5
 - Six percent demand increase due to increased capacity of four-lane versus three-lane trestle

Final concepts for evaluation

The team deconstructed Concepts 4 and 5, as they have very similar operational and travel time benefits, and assessed each design element to reconstruct their preferred alternative. Discussion points included:

- The operational benefits of a four-lane trestle may be achieved with a three-lane trestle with

hard shoulder running (HSR) during peak hours. However, some members suggested that if the four-lane alternative is preferred, the full four-lane trestle should be built to maintain shoulder access for breakdowns, emergency access, maintenance, etc. No conclusions were made about the final trestle cross section.

- Three general purpose lanes across the trestle should be maintained in the final configuration
 - Phasing options could include two general purpose and one HOV as an initial configuration, with three general purpose and one HOV using the HSR in the final configuration
- Two lanes should be maintained along mainline westbound US 2 through the interchange
- An additional lane from Sunnyside Boulevard along SR 204 will not be included, as this would provide local benefit only

After considering each of the design element preferences, it was noted that Concept 5 fulfills all requirements of the IJR Support Team. The decision was unanimous to proceed with Concept 5 as the preliminary preferred alternative. It was also noted that the use of ITS elements should be discussed in the report in order to facilitate closing the Ebey Island off-ramp.

Next steps

- IJR study team
 - Conduct operational analysis of the preferred alternative in the opening year 2020
 - Draft IJR chapters 1-4 for review and comment
 - Schedule IJR meeting 6
- IJR Support Team
 - Review IJR chapters upon receipt and prior to IJR meeting 6

Meeting adjourned at 12:00 p.m.

CONCEPT SCREENING TECHNICAL MEMORANDUM

February 21, 2018

Date: February 21, 2018
To: Michael Horntvedt (Parsons)
From : Don Samdahl and Jeff Pierson (Fehr & Peers)
Subject: Concept Screening Technical Memorandum

1.0 INTRODUCTION

This memorandum describes the results of the concept screening process for the US2/ SR 204/20th St SE Interchange Justification Report. Section 2 describes the methodology used for the screening, and Section 3 describes the screening results and top scoring concepts.

2.0 METHODOLOGY

This section summarizes the methodology used to develop and screen the concepts. The screening process included the following steps:

1. Develop the Concepts
2. Prepare screening criteria
3. Conduct concept screening

Each of these steps is described in the following subsections.

2.1 DEVELOP THE CONCEPTS

The concepts were developed by the Project Team and the IJR Support Team during the April 26, 2017 IJR Support Team meeting to address specific operational and safety issues at the US2/ SR 204/20th St SE interchange. The team discussed the primary existing issues that warrant additional attention as the interchange configuration is considered for a future tie in to the US 2 trestle. **Figure 1** shows locations of the six primary issues that were the focus of conversation during the concept development process. These issues are also described in **Table 1**.



Figure 1- Location of Operational and Safety Issues

TABLE 1- DESCRIPTION OF OPERATIONAL AND SAFETY ISSUES

Issue	Description of Issue
1. SR204/20 th Street SE Merge (westbound)	AM peak period volumes exceed the available capacity at a restricted merge location create substantial queues on both merging roadways. Potential high collision frequency location due to limited sight distance.
2. US 2 Drop Lane Merge (westbound)	Two lanes on US 2 merge into one lane upstream of interchange, resulting in queues developing on US 2 during the AM peak period.
3. US 2 Merge with SR 204/20 th Street SE Downstream off-ramp (westbound)	US 2 merges with SR 204/20 th Street E followed by a left-hand exit to lower 20 th Street. Merge and weaving conflicts contribute to queues and safety concerns, primarily during AM peak period.
4. Sunnyside Intersection (both directions)	Sunnyside intersection with SR 204 is closely spaced with the interchange. During the AM peak period, heavy southbound volumes on Sunnyside create queues waiting for traffic gaps on SR 204. During the PM peak period, the reverse movement occurs, with heavy northbound volumes on SR 204 wanting to turn left onto Sunnyside causing queues on SR 204 and safety concerns for left turning vehicles.
5. US 2 Diverge to US 2 and SR 204/20 th Street (eastbound)	During the PM peak period, the eastbound left-hand diverge from US 2 to 20 th Street/SR 204 causes some moderate delays and queuing. The SR 204/20 th Street volumes must then quickly split onto separate off-ramps, creating multiple decision points for drivers.
6. SR 204 off-ramp Volume (eastbound)	During the PM peak period, the SR 204 off ramp carries very high traffic volumes, which must merge with traffic entering SR 204 from the US 2 westbound off-ramp and 20th Street SE in close proximity to the Sunnyside intersection (see Issue 4).

Concept Development

The project team considered the existing issues to identify a wide range of possible concepts to address these issues. Several of the concepts were variations on a common theme and were subsequently consolidated into a single concept for further consideration. The IJR Support Team reviewed the draft concepts, suggested modifications, and identified other possible concepts to consider.

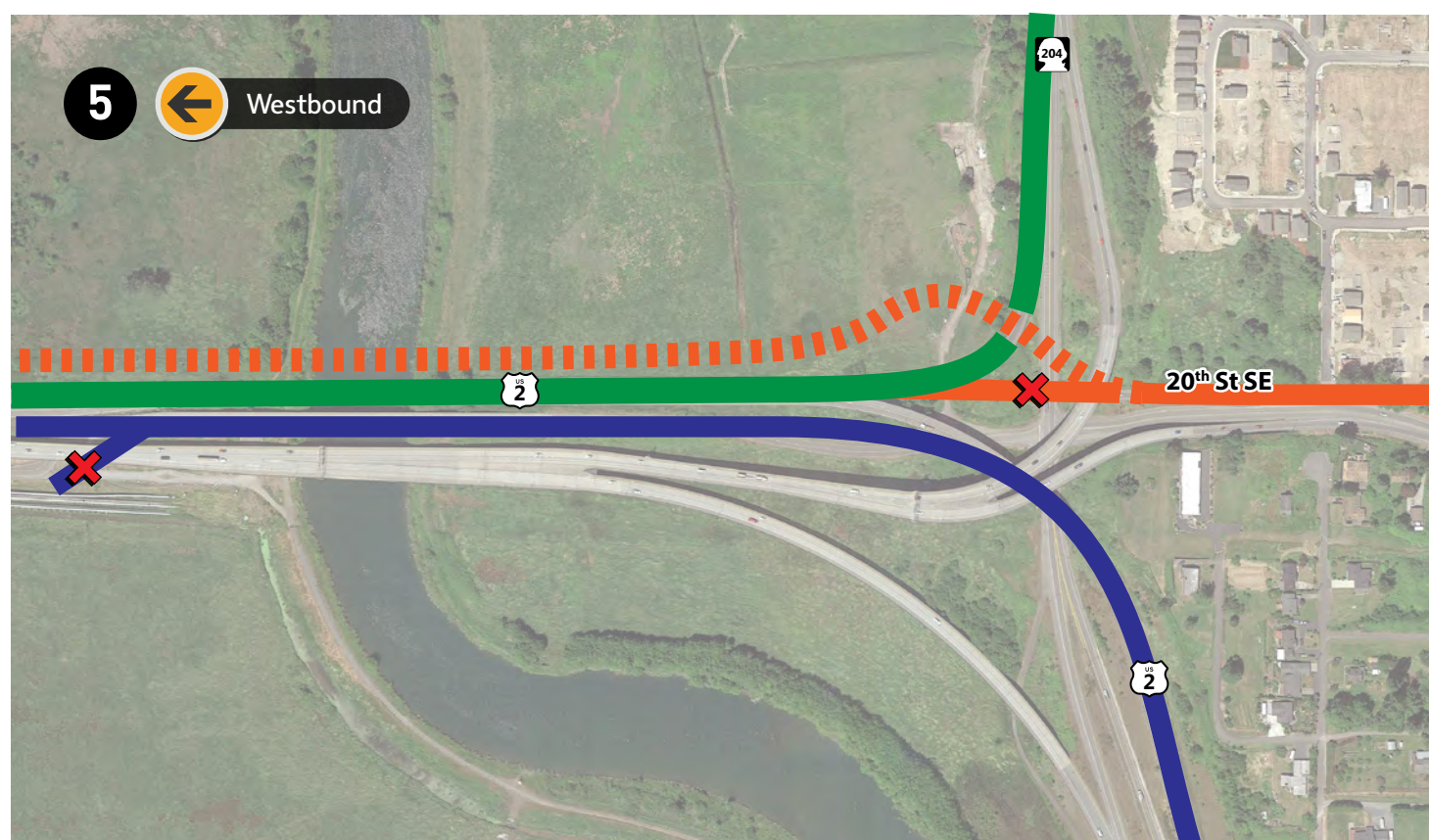
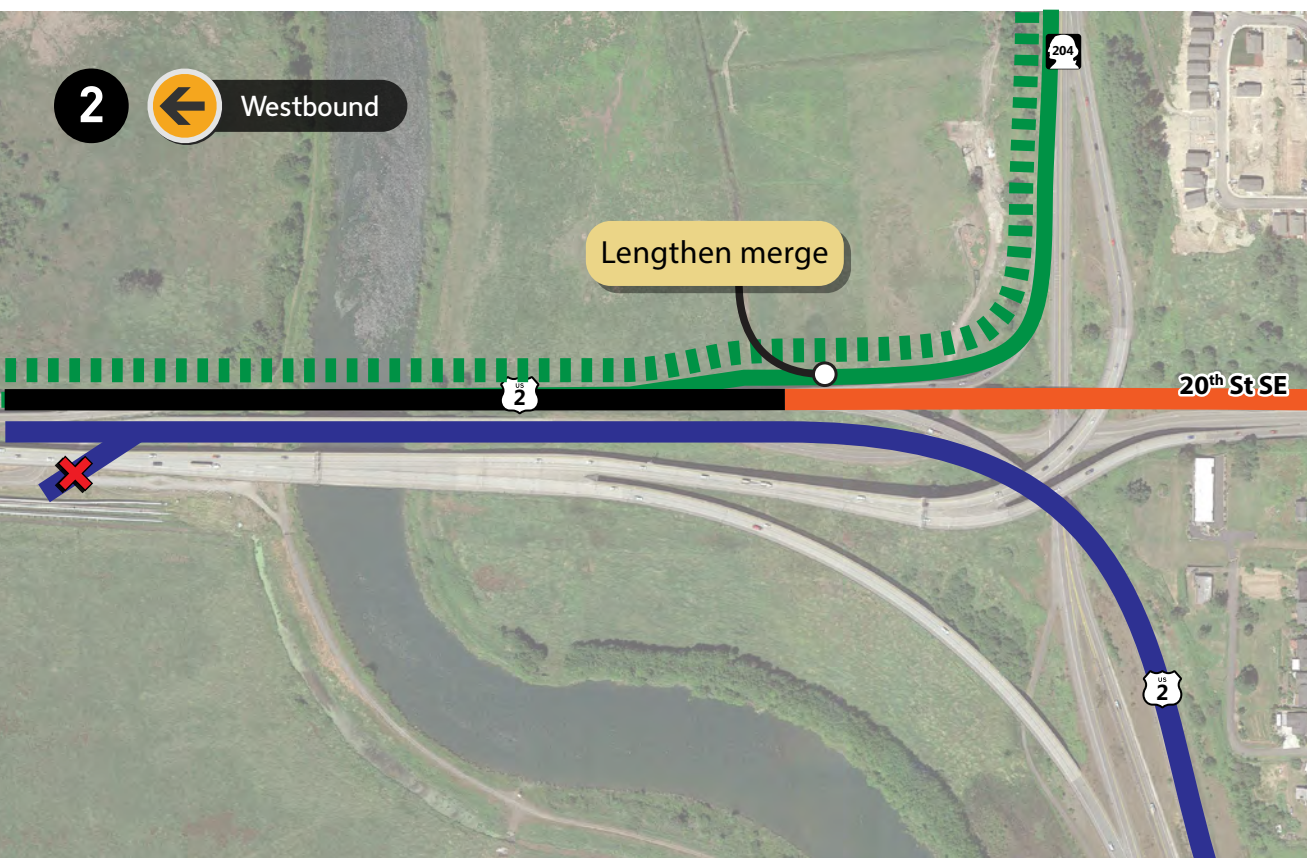
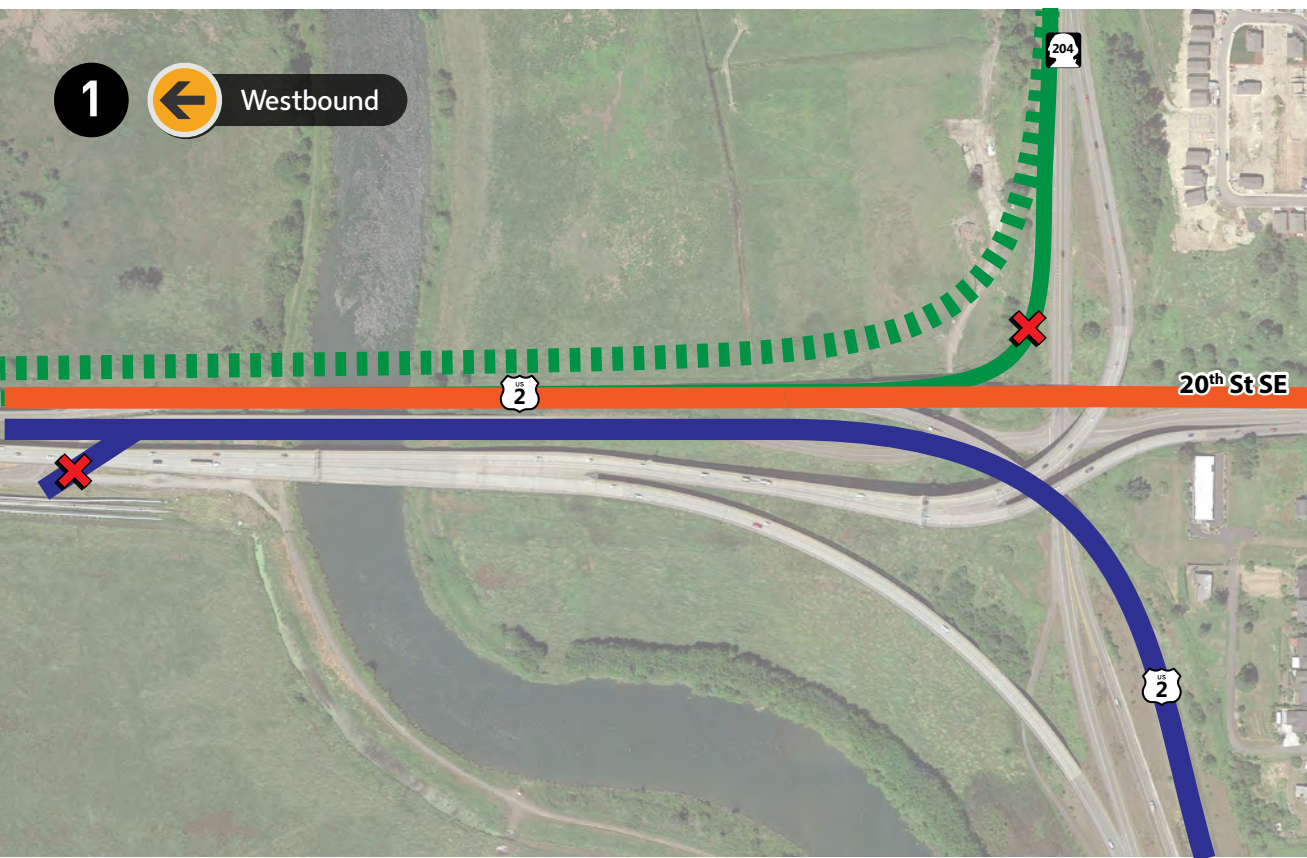
The resulting set of concepts were summarized and sketched so that they could be evaluated for a first level screening. **Figure 2** (diagrams on following pages) shows the concepts that were considered during the screening process. As listed in **Table 2**, these include eight concepts focused on solving the westbound issues, and three concepts specifically developed to address the eastbound issues. Two other concepts identified by the IJR Support Team were not considered to be within the geographic and operational scope of the IJR project and were subsequently not carried through the screening process.

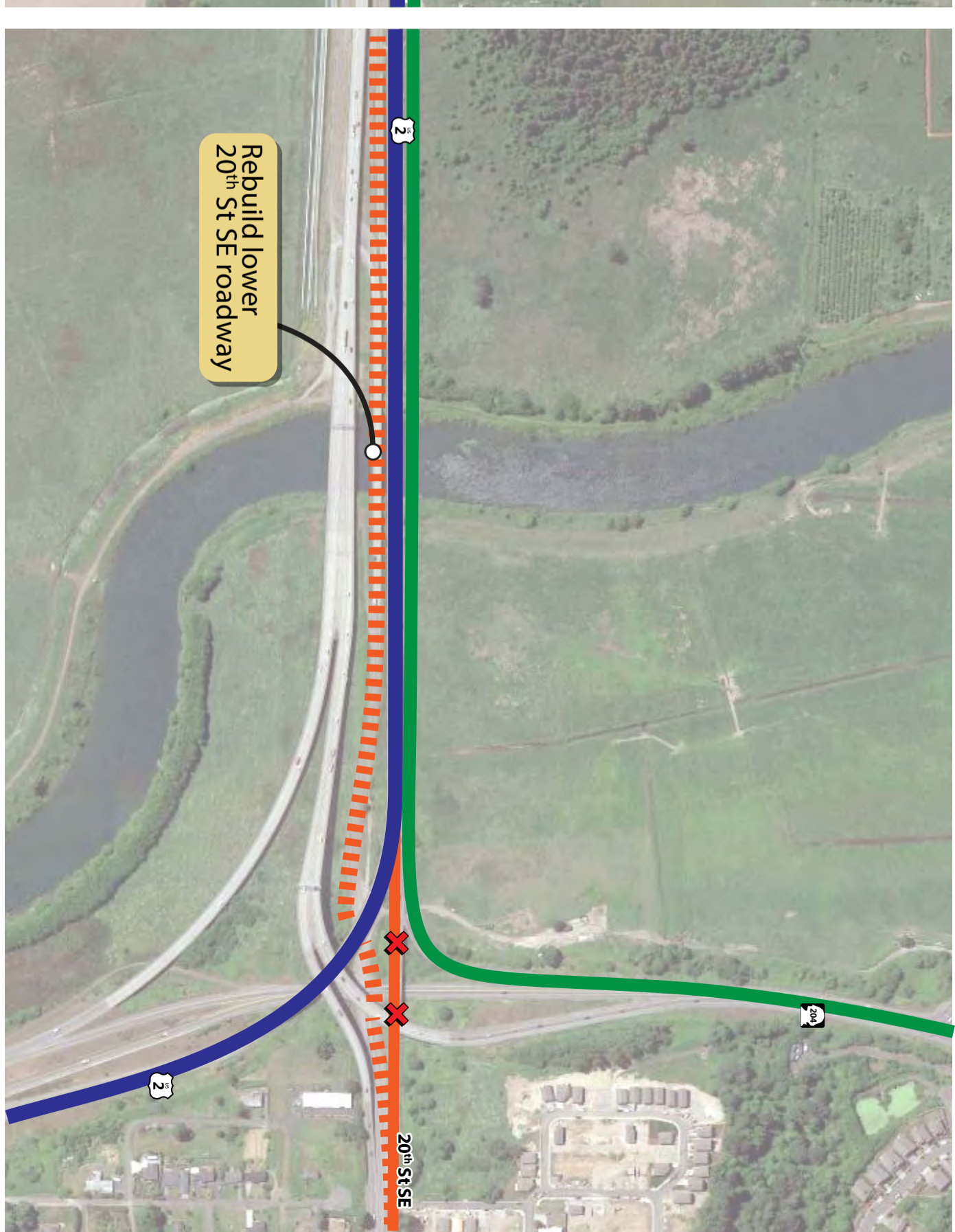
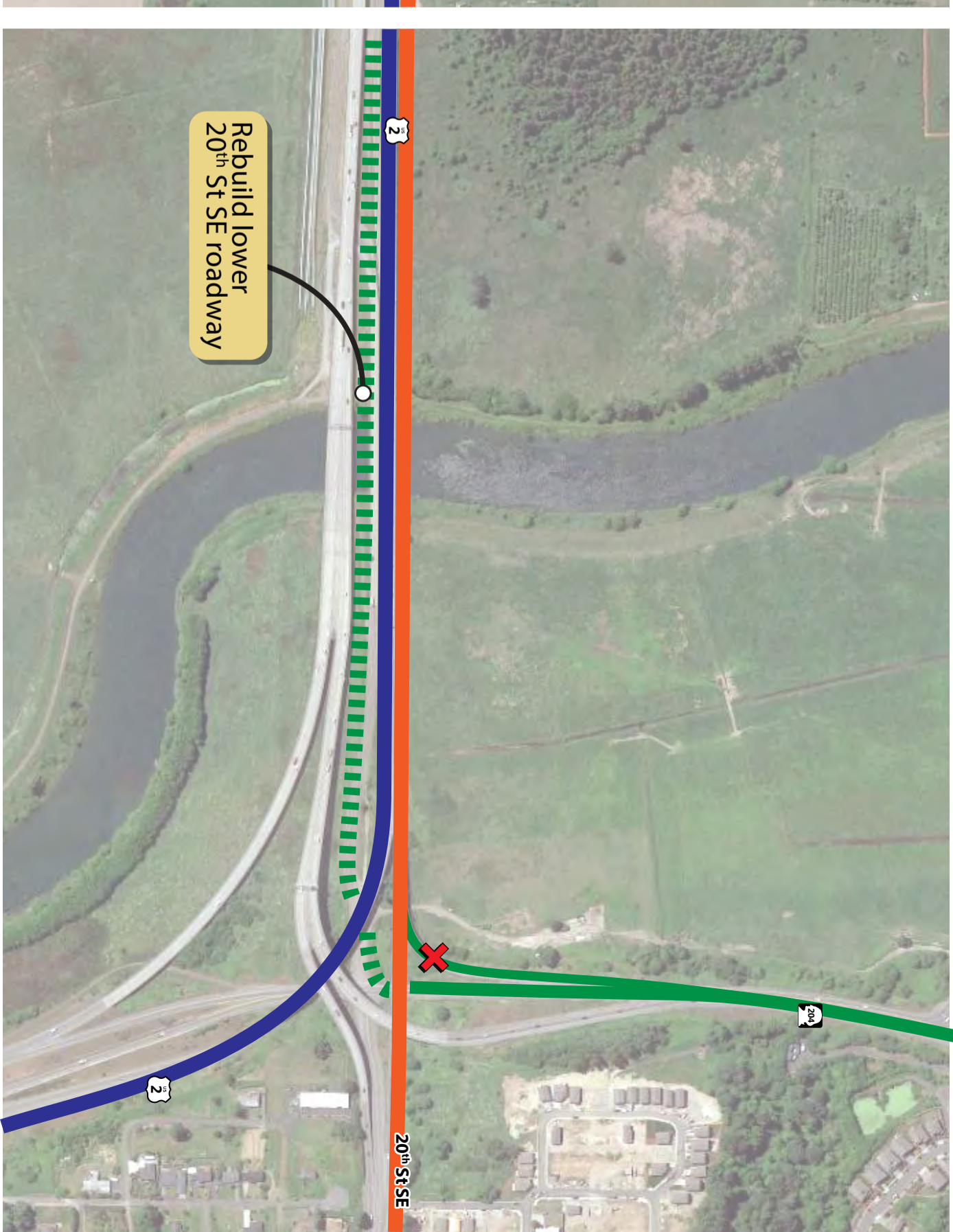
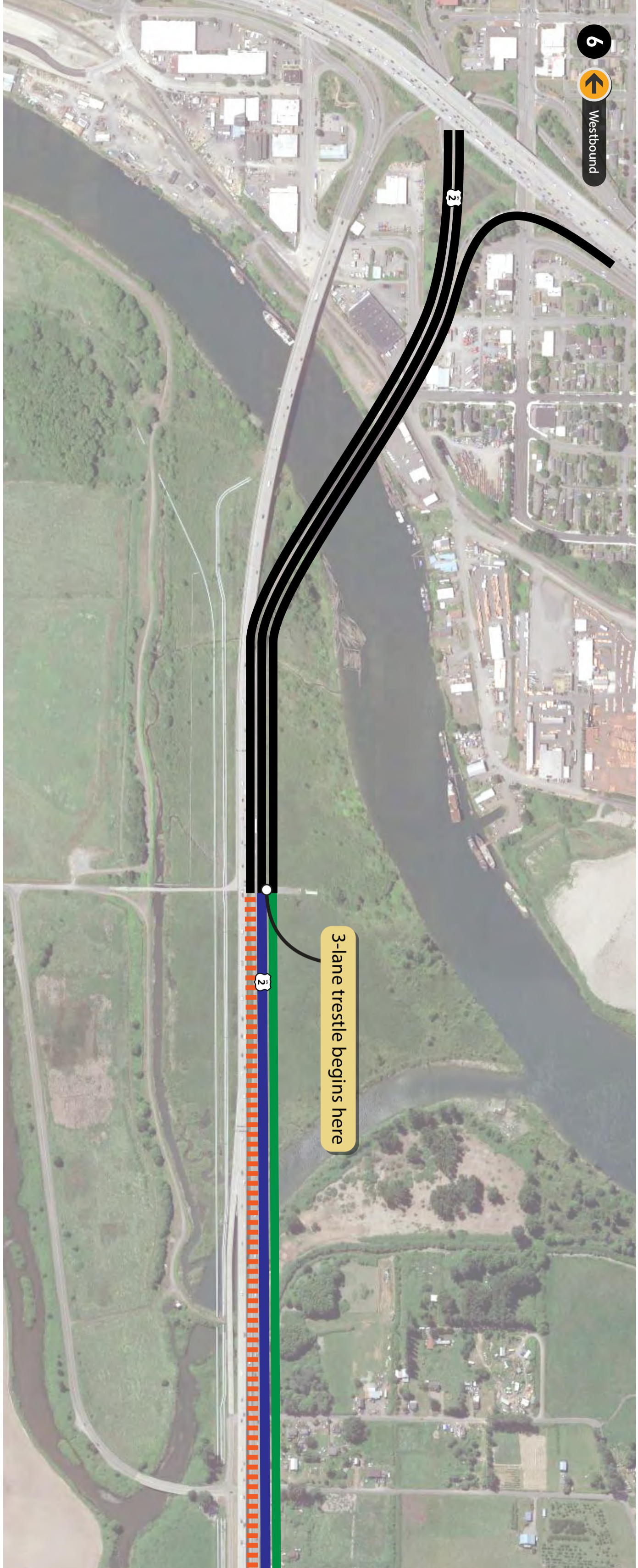
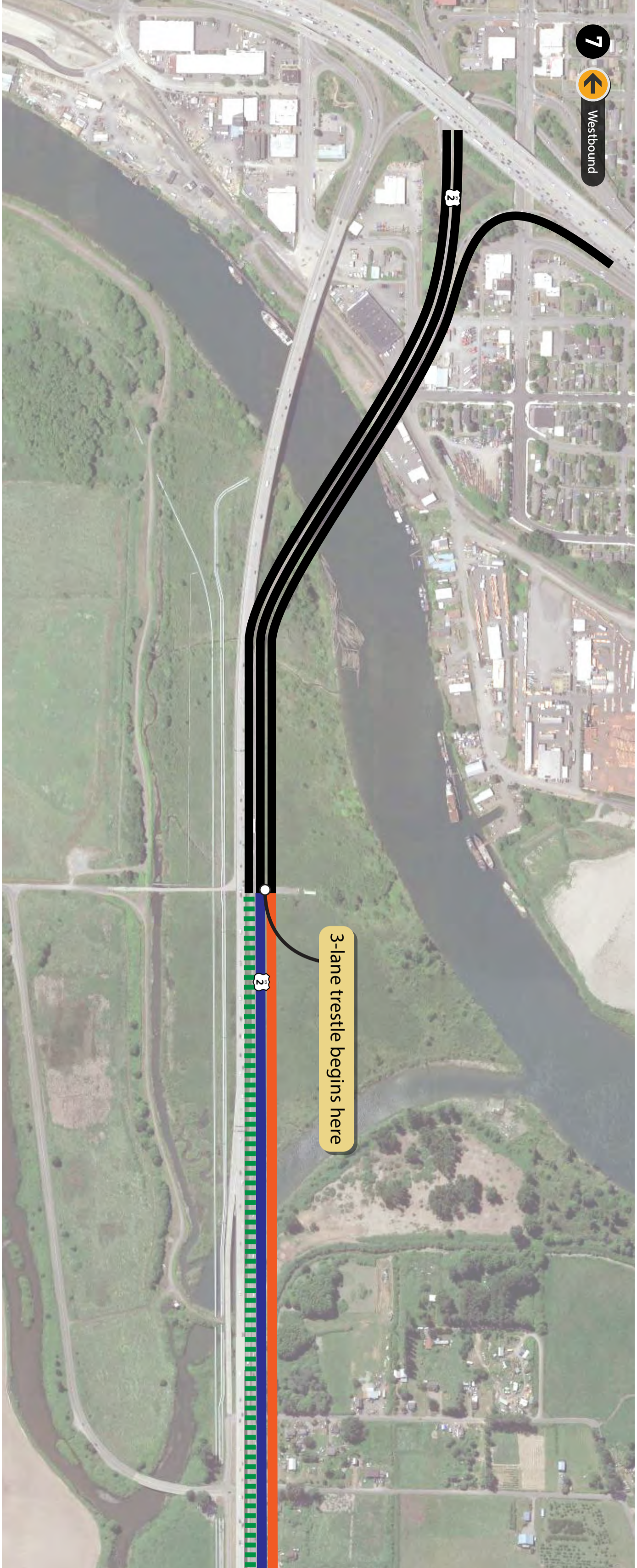
US 2/SR 204/20th St SE

Figure 2. Screening Concepts

July 26, 2017

	20 th St SE		Added 20 th St lane
	SR 204		Added SR 204 lane
	US 2 Main line		Added US 2 Main line lane
	Shared Lane		





8 Westbound

204

2

20th St SE

Improve Cavalero Rd

New Ramps to/from US 2



A → Eastbound

New connection

Close Sunnyside

More weaving distance

20th St SE

B → Eastbound

Upgrade 9th St SE

Make Sunnyside one-way westbound

Remove left turning movement at Sunnyside

20th St SE



Each of the concepts assumed that, by 2040, the westbound US2 trestle would be rebuilt with capacity for three lanes - two general purpose lanes and one HOV lane. This assumption is integral to the design of the concepts and the screening results.

TABLE 2- CONCEPTS INCLUDED FOR SCREENING

CONCEPT NUMBER	DESCRIPTION(REFER TO FIGURE 2 FOR DIAGRAMS)
Westbound Concepts	
1	New SR 204 Ramp
2	Dual lane SR 204 Ramp
3	Dual lane US 2 Ramp; lengthen SR204/ 20th St merge
4	Dual lanes US 2 and SR 204 Ramps
5	Relocate 20th St ramp to outside
6	Move 20th St ramp to rebuilt lower roadway
7	Move SR 204 ramp to rebuilt lower roadway
8	Relocate 20th St ramp to US2 south of interchange (reroute through Cavalero)
Eastbound Concepts	
A	Two lanes on SR 204 off ramp plus relocated Sunnyside
B	Two lanes on SR 204 off ramp plus reconfigured Sunnyside Blvd and 9th St
Concepts Considered but Not Screened	
NA	Reroute US 2 (e.g. SR 526 extension)
NA	Parallel bridge for Everett-bound traffic
NA	Eastbound: Two lanes on 20th Street off ramp

At this initial level of concept definition, the designs were kept simple enough for conducting a qualitative screening. It is evident that there are many design variations that could be examined later in the study evaluation. In particular, the following assumptions were made that could be applied to multiple concepts on the list:

- Ramp metering is NOT included but could be added to any roadway, along with ramp meter HOV bypasses.
- Lane management strategies to extend or modify merging/diverging areas.
- Hard shoulder peak running could be added westbound (to a rebuilt trestle).

- Rebuilding lower 20th Street SE between SR 204 and Homeacres Road for 2-way traffic; this allows the westbound left-hand off ramp from the trestle to lower 20th Street SE to be removed. Under current conditions, this left-hand off-ramp creates a tight weaving maneuver.

Screening Criteria

The project team developed a set of screening criteria that would be applied qualitatively to the concepts. As shown in **Table 3**, the criteria covered technical topics (e.g. degree to which the concepts address the identified issues from **Table 1**), likelihood of support from the public and agencies, high-level environmental impacts, potential for emphasizing transit and HOV priority, and implementation topics.

TABLE 3- SCREENING CRITERIA

CRITERIA		DEFINITION	
Addresses Identified Operational and Safety Issues	1	SR 204/20th Merge	Merge of westbound SR 204 and 20th Street
	2	US 2 drop lane merge	Drop from 2 to 1 lane on westbound US 2
	3	US 2 merge with SR 204/20th and downstream WB off-ramp	Merging of westbound US 2 and the SR 204/20th Street lanes followed by the left side off-ramp to lower 20th Street
	4	Sunnyside Intersection	Westbound in AM peak turning right onto SR 204; Eastbound queues turning left onto Sunnyside from SR 204
	5	EB Diverge to US 2 and SR204/20th St	Location eastbound in PM peak where lanes to US 2 and SR 204/20th Street diverge.
	6	High EB volume on SR 204 ramp	High volumes of ramp traffic in PM peak heading eastbound to SR 204; currently accommodated by 1 lane off-ramp
Likely Public Support		Anticipated public support based on input from local agencies and degree to which concept addresses the 6 issues above	
Likely Agency Support		Anticipated agency support based on degree to which concept addresses the 6 issues above, potential implementation complexity, and phasing potential	
Environmental Impacts		Likelihood of affecting sensitive environmental areas. Note: Rating scale is different for this criterion (see screening tab)	
Transit/HOV Emphasis		Ability to accommodate priority treatments for transit/HOV	
Phasing Potential		Ability to match ultimate US 2 trestle replacement, assumed to be constructed to the north of the existing westbound trestle	
Implementation Complexity		Degree of complexity to design and construct the concept. Considers potential duration of construction. Approximate proxy for cost. Note: Rating scale is different for this criterion (see screening tab)	
Improvements to System Operations		Degree to which overall study area traffic operations are likely improved, considering queuing, weave, and merge/diverge operations along the US 2 Trestle and the roadway approaches to the US2/SR204/20th St interchange. Also considers the eastbound up-grade on 20 th St SE from the interchange to Cavalero Rd.	

3.0 RESULTS

This section describes the results of concept screening. Each of the concepts (**Table 2**) was compared to the screening criteria (**Table 3**) and given a qualitative rating based on its ability to meet the criteria. A simple three-level rating system was used to indicate how the concept met each criterion:

- Minimal
- Somewhat
- Substantial

For most of the criteria, a ‘substantial’ rating meant that the concept performed the very well compared to that criterion and received a high rating score. For example, a concept that would improve the SR 204/20th Street SE merge received a positive rating of either somewhat or substantial. For two criteria ‘environmental impacts’ and ‘implementation complexity’, the rating scale was reversed. For example, a concept that would likely have minimal environmental impacts or could be implemented in a relatively simple manner would receive a higher rating score. For the final criterion, ‘Improvements to System Operations’, the minimal rating category included both a neutral (0) and a negative (-) rating options. This allows for the possibility of a concept having a negative impact on overall system operations.

Concepts 1 through 8 were presented to the IJR Support Team for selection of three alternatives for further analysis. Pedestrian and bicycle network improvements were developed independent of the interchange concepts as they were considered to move forward with any interchange concept selected. A sketch-level network improvement plan was presented to the IJR Support Team as an example of several options for network modifications. The bicycle and pedestrian network improvements would be further developed in conjunction with interchange design during the design phase.

A preliminary concept screening was conducted by the IJR Project Team based on professional judgement and review of existing data. Next, the qualitative screening of the Concepts 1-8 was conducted with the IJR Support Team at Meeting 4 on August 16, 2017. The results of the qualitative concept screening are outlined in **Table 4**. The highlighted concepts were the highest rated.

TABLE 4. QUALITATIVE CONCEPT SCREENING RESULTS

		Identified Operational And Safety Issues													
Highest Rated	1	2	3	4	5	6									
Ratings:	SR 204/20th Merge	US 2 drop lane merge	US 2 merge with SR 204/20th and downstream WB off-ramp	Sunnyside Intersection	EB Diverge to US 2 and SR204/20th St	High EB volume on SR 204 ramp	Likely Public Support	Likely Agency Support	Environmental Impacts	Transit/HOV Emphasis	Phasing Potential	Implementation Complexity	Improvement to System Operations	Overall Rating (Total +)	
Minimal	0	0	0	0	0	0	0	0	++	0	0	++	0 or -		
Somewhat	+	+	+	+	+	+	+	+	+	+	+	+	+		
Substantial	++	++	++	++	++	++	++	++	0	++	++	0	++		
Westbound Concepts															
1	New SR 204 Ramp	++	0	++	+	NA	NA	++	++	+	0	++	+	+	14
2	Dual lane SR 204 Ramp	+	0	++	++	NA	NA	+	+	+	0	0	+	0	9
3	Dual lane US 2 Ramp; lengthen SR204/ 20th St merge	0	++	++	+	NA	NA	+	+	+	0	+	+	0	10
4	Dual lanes US 2 and SR 204 Ramps	+	++	++	++	NA	NA	++	+	0	0	0	0	-	9
5	Relocate 20th St ramp to outside (could be 1 or 2 lanes)	++	0	++	+	NA	NA	++	++	+	+	++	+	+	15
6	Move 20th St ramp to rebuilt lower roadway	++	0	++	+	NA	NA	0	+	0	0	+	0	-	6
7	Move SR 204 ramp to rebuilt lower roadway	++	0	++	+	NA	NA	0	0	0	0	+	0	-	5

**Identified Operational
 And Safety Issues**

		Identified Operational And Safety Issues													
		1	2	3	4	5	6								
Highest Rated		SR 204/20th Merge	US 2 drop lane merge	US 2 merge with SR 204/20th and downstream WB off-ramp	Sunnyside Intersection	EB Diverge to US 2 and SR204/20th St	High EB volume on SR 204 ramp	Likely Public Support	Likely Agency Support	Environmental Impacts	Transit/HOV Emphasis	Phasing Potential	Implementation Complexity	Improvement to System Operations	Overall Rating (Total +)
<i>Ratings:</i>															
	<i>Minimal</i>	0	0	0	0	0	0	0	0	++	0	0	++	0 or -	
	<i>Somewhat</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	
	<i>Substantial</i>	++	++	++	++	++	++	++	++	0	++	++	0	++	
Westbound Concepts															
8	Relocate 20th St ramp to US2 south of interchange (reroute through Cavalero)	++	+	++	+	+	0	0	0	0	0	+	0	+	9
9	Reroute US 2 (e.g. SR 526 extension)														0
10	Parallel bridge for Everett-bound traffic														0
Eastbound Concepts															
A	Two lanes on SR 204 off ramp plus relocated Sunnyside	NA	NA	NA	+	0	++	+	+	+	0	+	+	+	9
B	Two lanes on SR 204 off ramp plus reconfigured Sunnyside Blvd and 9th St	NA	NA	NA	++	0	++	+	++	+	0	+	+	+	11

3.1 CONCEPT RATING RESULTS

At the fourth IJR Support Team meeting held on August 16, 2017, the qualitative evaluation by the project team was presented for review, along with a recommendation to pursue concepts 1, 3, and 5 as alternatives. After discussion and concurrence by the IJR Support Team that further investigation into the dual lane configuration from Sunnyside Road to the interchange would be advantageous, it was decided that concepts 1, 4, and 5 would be the alternatives for further analysis.

Further discussion resulted in the IJR Support Team recommending changing the US 2 trestle lane configuration assumption from a three-lane cross section to a four-lane cross section for both concept 4 and 5. The IJR Support Team recommended leaving Concept 1 as a three-lane US 2 cross section to help decision makers understand how well a three-lane US 2 trestle would function compared with a four-lane trestle.

The rationale for the recommended westbound concepts is as follows:

- **Concept 1: New SR 204 Ramp** – This concept addressed several of the operational and safety issues with a focus on improving the operations on SR 204 and 20th Street SE. It has good phasing potential and would likely receive good public and agency support.
- **Concept 3: Dual lane US 2 ramp along with lengthening the SR 204/20th Street SE Merge** – This concept focusses on providing sufficient US 2 capacity and makes some improvements to the existing merge of SR 204/20th Street SE. It has good phasing potential.
- **Concept 5: Relocate 20th Street SE ramp to outside** – This concept is similar to Concept 1, except that a new ramp is created for 20th Street SE connecting to the outside of the trestle. It could be readily tied to a new outside transit/HOV lane on the trestle and could be phased.

In the eastbound direction, the following concept was selected for further analysis:

- **Concept B: Two lanes on SR 204 off-ramp plus reconfigured Sunnyside Blvd SE and 9th St SE** – This concept added capacity to the SR 204 off ramp from US 2 and improved safety and operations at Sunnyside Blvd SE. It has good phasing potential and would likely receive good public and agency support. It rated better than Concept A, which would require a relocation of Sunnyside Blvd SE with possible environmental impacts.

Note that neither Concept A nor B specifically addressed the eastbound up-grade on 20th St SE leaving the interchange up to Cavalero Rd. The widening of 20th St SE (assumed in the 2040 baseline condition) should ease the queues that currently occur in this section, to be further analyzed as part of the concept evaluation phase.

Following initial evaluation and screening, three concepts were selected for further refinement and analysis. Concepts 1, 3, and 5 were renamed as Alternatives 1, 2, and 3, respectively, as shown in **Table 5**.

TABLE 5- CONCEPTS RECOMMENDED FOR EVALUATION

ALTERNATIVE	WESTBOUND CONCEPT NUMBER	DESCRIPTION	EASTBOUND CONCEPT NUMBER	DESCRIPTION
1	1	New westbound SR 204 Ramp	B	Two lanes on SR 204 off ramp plus reconfigured Sunnyside Blvd SE and 9 th St SE
2	3	Dual lane US 2 Ramp; lengthen SR204/ 20th St merge	B	Two lanes on SR 204 off ramp plus reconfigured Sunnyside Blvd SE and 9 th St SE
3	5	Relocate 20th St ramp to outside	B	Two lanes on SR 204 off ramp plus reconfigured Sunnyside Blvd SE and 9 th St SE

The alternatives were evaluated for operational performance and weighed against one another in terms of their ability to meet the project need to improve mobility while enabling integration with a future widened US 2 WB trestle. The operational analysis of each alternative for the AM peak hour of forecast year 2040 was used as the basis for comparison. The AM peak hour was chosen for comparison because traffic volumes on US 2 WB are significantly higher in the AM peak than the PM peak. The analysis includes planned Community Transit service and assumes peak commuter hour buses run near full seated capacity. The signalized intersections in the local network in Everett were assumed to be adjusted for signal optimization, to allow for maximum receiving capacity at the west end of US 2 to the extent possible with the existing infrastructure.

Table 6 compares the design elements of Alternatives 1, 2, and 3. Analysis results for the three alternatives are described in the *Traffic Operational Analysis Technical Memorandum* (February 2018). The alternatives and analysis findings were presented to the IJR Support Team for review at IJR Support Team Meeting 5, where it was decided to proceed with Alternative 3 (original Concept 5) as the Preliminary Preferred Alternative.

TABLE 6- 2040 CONCEPTUAL ALTERNATIVE DESCRIPTIONS

	Build			
	No-build	Alternative 1	Alternative 2	Alternative 3
WB				
Lanes on the trestle	2 GP + 1 HOV	2 GP + 1 HOV	3 GP + 1 HOV	3 GP + 1 HOV
HOV lane location	Outside	Outside	Outside	Outside
US 2 WB to US 2 WB on-ramp	1 lane	1 lane	2 lanes	2 lanes
SR 204 WB to US 2 WB on-ramp	1 lane each merge	1 lane	2 lanes merge to 1	1 lane
20th St WB to US 2 WB on-ramp		1 lane	1 lane	1 lane
US 2 WB to Ebey Island off-ramp	Closed	Closed	Open (US 2 only)	Closed
Ramp meters on SR 204 and 20th St	No	No	No	No
HOV ramp meter bypass lanes	No	No	No	No
EB				
US 2 EB to US 2 EB off-ramp	2 lanes	2 lanes	2 lanes	2 lanes
US 2 EB to SR 204 EB off-ramp	1 lane	2 lanes	2 lanes	2 lanes
US 2 EB to 20th St EB off-ramp	1 lane	1 lane	1 lane	1 lane
NB left turn to Sunnyside	Prohibited	Prohibited	Prohibited	Allowed
NB left turn to 9th St SE	Allowed	Allowed	Allowed	Allowed
Other				
20th St/SR 204	4-way stop	Signalized	Signalized	Signalized
Ebey Slough Bridge	One-way (EB)	Two-way	One-way (EB)	Two-way

APPENDIX I

EXISTING TRAVEL DEMAND MODEL UPDATE AND VALIDATION

March 7, 2017

Date: March 7, 2017
To: Michael Horntvedt (Parsons)
From : Will Lisska (Fehr & Peers)
Subject: Existing Travel Demand Model Update and Validation – US2/SR204/20th Street SE IJR

INTRODUCTION

This memorandum documents the update and validation of the Snohomish County Travel Model (SnoCo Model) to 2016 existing conditions for application on the US 2 / SR 204 / 20th Street Interchange Justification Report (IJR). The SnoCo Model was previously developed and validated by Fehr & Peers in 2014 for application on the 2015 Snohomish County Comprehensive Plan.

The purpose of this memorandum is to briefly describe the steps taken in updating the existing year SnoCo Model for the IJR analysis, including updating land use, refining network details, and validating at key study area locations. The finalized existing year model will be used as the baseline for developing the future year 2021 and 2040 demand models.

SNOHOMISH COUNTY TRAVEL MODEL

The travel demand forecasting framework for this study is based on the Snohomish County Travel Model (SnoCo Model). As described in the Methods & Assumptions Memo, the SnoCo Model is the most appropriate travel demand forecasting tool for the study area for the following reasons:

- Based on the 4,000 zone version of the Puget Sound Regional Council's travel demand model (PSRC 4k Model, Version 4.0.1).
- Includes the most up-to-date comprehensive planned land use and transportation assumptions within Snohomish County jurisdictions and unincorporated areas.
- Incorporates the land use and transportation assumptions of the recently adopted sub area plans in Lake Stevens (Lake Stevens Center and 20th Street SE).
- Consistency with PSRC Land Use Targets across region.

The SnoCo Model is implemented using the transportation planning software package EMME, version 4.2.5. This is the same software package used for applying the PSRC 4k Model.

BASE YEAR MODEL UPDATE

As described in the following sections, key travel demand model inputs and parameters including the traffic analysis zone (TAZ) system, the transportation network, and land use, were adjusted to better represent the existing study area.

TRAFFIC ANALYSIS ZONE (TAZ) SYSTEM

Compared to the traditional 1,000 zone version of the PSRC regional model, the Snohomish County Model (SnoCo Model) contains a more detailed Transportation Analysis Zone (TAZ) system within the cities of Everett, Lake Stevens, and Snohomish. **Figure 1** shows the traffic analysis zones (TAZs) within the study area. The PSRC TAZs are shown in the red outline and the SnoCo Model TAZs are shown in a black outline. The SnoCo model has a slightly more refined TAZ structure than the 4K version of the PSRC model, specifically more detail around the Lake Stevens Center area and the neighborhoods surrounding the 20th Street SE corridor between US 2 and SR 9.

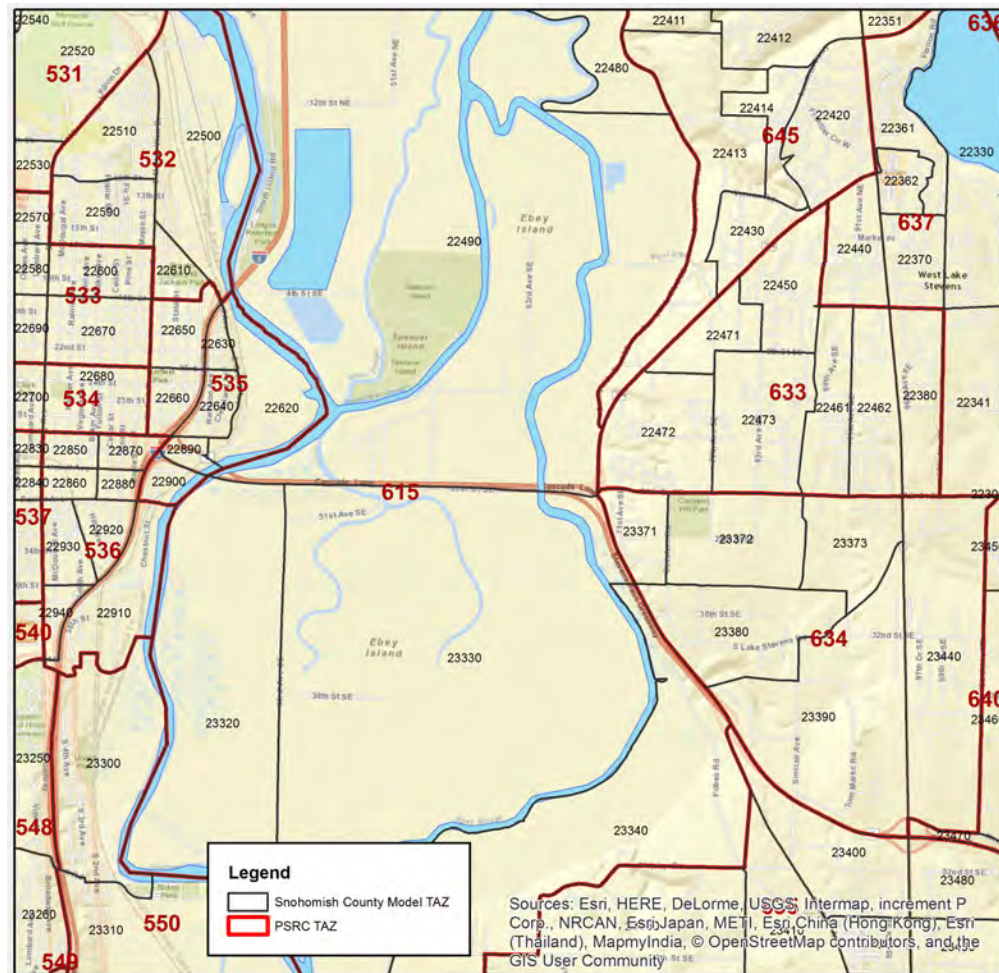


Figure 1: SnoCo Model Traffic Analysis Zone System within the Study Area

Due to the amount of zonal detail in the vicinity of the study area, it was determined that no additions or refinements to the TAZ system were necessary as part of the validation. Instead, refinements to the locations of centroid connectors that link TAZs with the model roadway network would result in similar routing improvement compared to the addition of zones. In other words, modifying centroid loading onto the network is a much more efficient method of improving the accuracy of traffic routing on a local network compared to modifying the TAZ system, and the centroid loading modification method provides comparable output improvements. This process is described in the following section.

NETWORK MODIFICATIONS

The SnoCo Model transportation network is a detailed representation of streets and transit service within Snohomish County and the surrounding region. The network consists of the following elements:

- **Traffic analysis zones (TAZs):** small geographic areas which serve as trip origins and destinations. In the model, TAZs are more explicitly represented by **Centroids** – points that represents the area’s center of “mass” (or the majority of its origins and destinations).
- **Links:** street and railway segments, each direction coded separately, with lengths, posted speeds, number of travel lanes, and capacities in maximum vehicles per hour as attributes.
- **Centroid Connectors:** special links that connect TAZ centroids to the street system, representing local access or in some cases driveways consolidated to a single segment.
- **Nodes:** points representing intersections, curvature, or locations where centroid connectors join the street network.
- **Turn penalties:** a nodal attribute that specifies vehicle turning movement limitations or restrictions.

The current SnoCo Model baseline network includes all major intersections and roadway segments within the traffic analysis study area, as defined in the Methods and Assumptions Memo. Our review of the network included confirmation that number of lanes, posted speeds, and turn penalties reflect actual “on-the-ground” conditions. To improve the accuracy of network representation and local traffic routing, several modifications were made to the study area network. In particular, several centroid connector were modified to better represent current access patterns to residential neighborhoods and commercial uses, improving the model’s representation of local traffic routing and driver origin-destination patterns. These zone and centroid modifications are summarized below and depicted in **Figures 2 and 3**.

- The centroid and connectors for TAZ 22472 are incorrectly depicted outside of the actual TAZ boundaries. The centroid was moved to more accurately reflect the location of TAZ, and a network tie-in location was also added along 20th Street SE at Cavalero Road.
- The connector for TAZ 22490, which includes the portion of Ebey Island north of the US 2 trestle, was modified to tie into 51st Avenue SE instead of Sunnyside Boulevard. Traffic loading onto Sunnyside Boulevard is primarily represented by the land use within TAZ 22413.

- The connector onto 20th Street SE for TAZ 23372 was modified to tie into the 83rd Avenue SE intersection, rather than between 79th Avenue and 83rd Avenue.
- Several modifications previously made to improve network routing in the vicinity of Lake Stevens Center for the SR 9 / SR 204 Intersection Improvement Study were also included in the demand model update for the IJR.
 - The centroid and connector for TAZ 22413 are incorrectly depicted outside of the actual TAZ boundaries. The centroid was moved to more accurately reflect the location of TAZ, and the network tie-in location of the centroid connector was maintained at Vernon Road / 81st Avenue NE.
 - The slip ramp from 4th Street NE / 92nd Avenue NE onto northbound SR 9 was added (omitted from baseline SnoCo Model network). This slip ramp provides egress onto northbound SR 9 from the Frontier Village Shopping Center, Target, the Lake Stevens Transit Center, and residential neighborhoods along 4th Street NE.
 - Additional centroid connectors were added to represent existing driveway access points at the Frontier Village Shopping Center (TAZ 22362) and the various 91st Avenue NE commercial properties (TAZ 22440).

In addition to zone and centroid modification, several roadway network improvements were applied to the SnoCo model to better represent the existing network and associated travel patterns. Along SR 204, the 71st Avenue SE access point was moved to the correct location north of the Sunnyside Boulevard SE intersection, and the 9th Street SE connector between Sunnyside Boulevard SE and SE 204 was added (See **Figure 4**). On US 2, the Bickford Avenue interchange was recoded to depict all on-ramp and off-ramps as individual links (see **Figure 5**).



Figure 2: SnoCo Model Baseline Scenario Network – Before Modifications

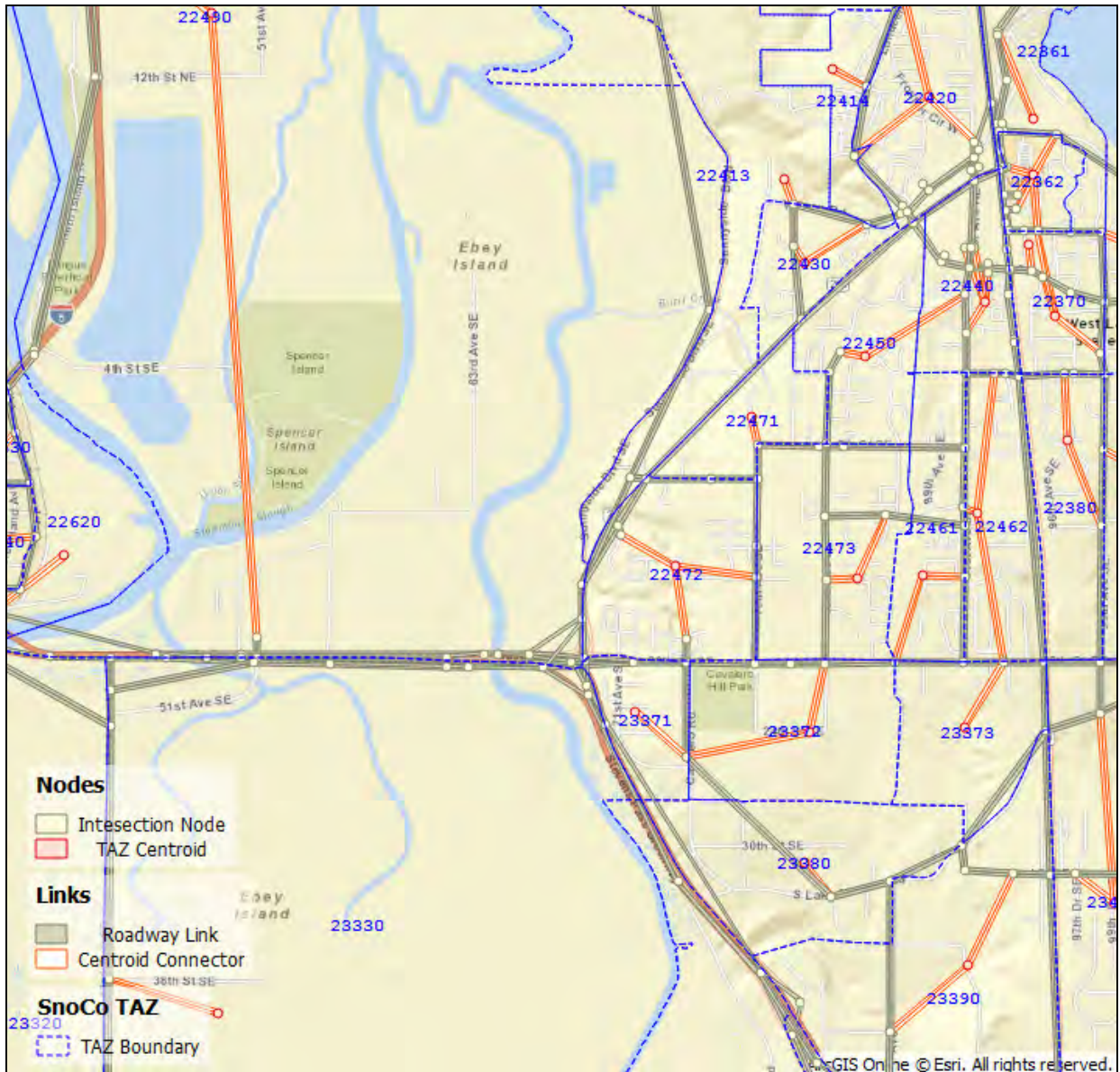


Figure 3: SnoCo Model Baseline Scenario Network – After Modifications

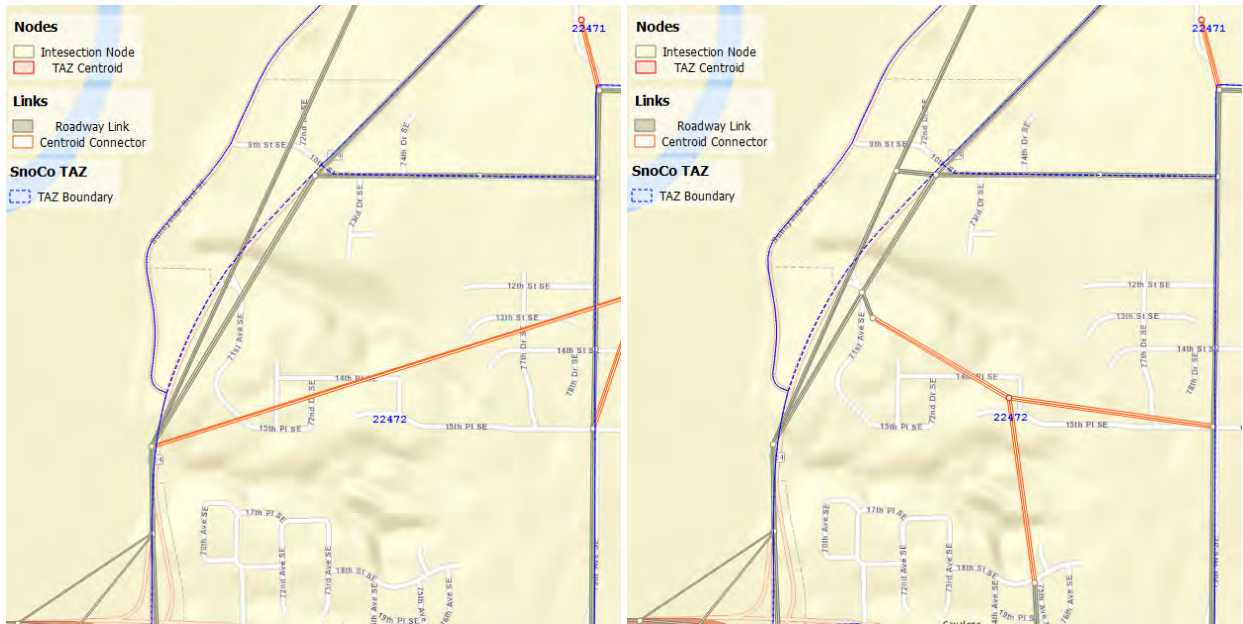


Figure 4: SnoCo Model Baseline Scenario Network Update on SR 204 Corridor



Figure 5: SnoCo Model Baseline Scenario Network Update at US 2 Interchange with Bickford Avenue

LAND USE

Model Contents

The SnoCo Model contains land use scenarios for a 2012 base year and the 2035 Comprehensive Plan horizon. For the base year, population and housing data are based on information from the PSRC regional land use estimates and input from Snohomish County planning staff. The household information contains estimates of housing units, households, household population, housing by income quartile, group quarter population, and total population. The employment information contains total employment and the individual sector groupings, Manufacturing-WTU (wholesale, transportation & utilities), retail-food services, FIRES (finance, insurance, real estate, & services), government-higher education, education-K12, and construction-resources.

The 2035 forecast was previously developed using the official PSRC release of regional land use forecasts, known as the Land Use Targets (September 2013). This dataset was explicitly designed to align with jurisdictional growth targets, and contains household and employment data for the years 2010, 2025, 2031, and 2035. The Land Use Targets were developed using a set of allocation methods that distribute jurisdictional growth targets to sub-jurisdictional zones based on available net development capacities and a series of policy-based preferential weights for certain centers, such as designated regional growth centers and other locally defined activity centers. Future year land use input assumptions for the 2035 SnoCo Model also reflect the Comprehensive Plan land use assumptions for Snohomish County and jurisdictions contained therein.

Due to privacy restrictions imposed by the Washington State Employment Security Department, direct access to the detailed land use input files by non-Snohomish County Staff is prohibited. For outside parties to run the model, Snohomish County Staff perform the SnoCo Model trip generation component using the land use files described above and provide the outputs needed to run all subsequent model steps. More specifically, they provide trip productions and attractions by TAZ, stratified by trip type, which can be input into the trip distribution component and used to complete the model run. Modifying these production and attraction files can be performed as a proxy to modifying the land use inputs. This process is described in the following section.

Review and Update

A vital component of calibrating the baseline model from 2012 to 2016 conditions is ensuring that land use input assumptions meet local and regional expectations. Snohomish County Staff provided aggregated households and employment totals (baseline 2012 and horizon year 2035) for several jurisdictions within and surrounding the study area: Arlington, Everett, Lake Stevens, Marysville, Monroe, City of Snohomish, and the entire County. This land use summary was reviewed by the planning and public works staff at each jurisdiction and/or compared to totals from the Comprehensive Plan land use element, and updates were suggested to make the baseline and future year inputs consistent with local land use expectations. As previously mentioned, the countywide land use is already consistent with the 2015 Snohomish County Comprehensive Plan, so only the jurisdictional changes

needed to be incorporated. Baseline model land use totals and suggested revisions are summarized in **Table 1**.

TABLE 1. BASELINE LAND USE SUMMARY – SNOCO MODEL UPDATE

Area	2015 Comprehensive Plan Baseline		Revised 2016 Baseline	
	Households	Employment	Households	Employment
Arlington Citywide ^a	6,254	8,415	6,254	8,415
Everett Citywide ^b	44,161	91,228	43,957	93,739
Lake Stevens Citywide ^c	9,220	4,090	9,550	3,594
Marysville Citywide ^d	19,295	11,702	23,064	12,316
Monroe Citywide ^e	5,183	7,937	5,007	7,779
Snohomish Citywide ^f	3,266	3,670	3,901	4,033
All Snohomish County	268,325	244,879	268,325	244,879

^a Confirmation via correspondence with Arlington Public Works staff, January 2017.
^b Revisions revisions via review of 2015 Everett Comprehensive Plan Land Use Element.
^c Suggested revisions via correspondence with Lake Stevens Public Works staff, September 2016.
^d Confirmation via correspondence with Marysville Public Works staff, January 2017.
^e Revisions via review of 2015 Monroe Comprehensive Plan Land Use Element.
^f Suggested revisions via correspondence with City of Snohomish Public Works staff, January 2017.

The 2016 baseline model land use was created by scaling the 2012 production and attraction file tables by the relative increase or decrease in land use indicated by jurisdictional staff. As previously described, direct access to the detailed model land use files by non-Snohomish County Staff is prohibited due to privacy restrictions imposed by the Washington State Employment Security Department. This process of directly modifying the production and attraction files can replicate the same outcome of adding or removing generalized land use totals to the model inputs while retaining privacy requirements for the actual land use totals.

MODEL VALIDATION

After updating the SnoCo model to a 2016 baseline, as described in the previous section, model outputs were validated against available data at key locations. The validation process compared the AM and PM peak hour model traffic volume outputs to observed counts on across two screenlines:

- **Screenline 1** – includes the segments of SR 204, 20th Street SE, and US 2 directly east of the US2/SR204/20th Street SE interchange

- **Screenline 2** – includes the westbound and eastbound segments of the US 2 trestle between the interchanges with I-5 and 51st Avenue SE

The screenline validation statistics for the SnoCo model are shown in **Table 3** for the AM peak hour and **Table 4** for the PM peak hour. The validation target for the each screenline was set to $\pm 10\%$ of actual traffic. As indicated by the results, the directional model volume totals for the screenlines are within $\pm 10\%$ of observed counts for both the AM and PM model scenarios and, thus, meet the validation target. It should be noted that certain locations comprising the Screenline 1 exceed the $\pm 10\%$ observed-to-model threshold, notably the eastbound directions of SR 204 and 20th Street SE during the AM peak hour (+31% and -23%, respectively). The model is closely replicating the total number of east-west AM peak hour trips across this screenline, but a noticeable share of these eastbound trips are being assigned to the SR 204 corridor instead of 20th Street SE and US 2. Additionally, the westbound direction of SR 204 and the eastbound direction of US 2 in Screenline 1 exceed the $\pm 10\%$ observed-to-model threshold for the PM peak hour model scenario (+25% and +47%, respectively)

As specified in the Methods and Assumptions Memo, a technique known as the “difference method” will be used to develop future year traffic forecasts and minimize the influence of localized model error (like that observed on the screenline). Rather than take the direct output from the future year model (which generally carries forward assignment error from the base year model), the difference method calculates the growth between the base year and the future year models, and adds that growth to an observed traffic count. For example, assume a road has an existing hourly volume of 500 vehicles. If the base year model showed a volume of 400 vehicles, and the future year model showed a volume of 650 vehicles, 250 vehicles would be added to the existing count for a future volume forecast of 750 vehicles.

Prior to import into the Vissim operations model, output from the SnoCo Model will be further calibrated to match observed roadway segment and turning movement count data within the study area model using origin-destination (O-D) matrix estimation methods in Visum and dynamic traffic assignment procedures in Dynameq. These processes are described in further detail in the Methods and Assumptions Memo.

TABLE 2. COMPARISON OF OBSERVED AND ESTIMATED EXISTING (YEAR 2016) AM PEAK HOUR VOLUMES AT EAST/WEST SCREENLINES - US2/SR204/20TH STREET IJR

Screenline 1 – east of US 2 Trestle							
#	Location	Observed Volumes		Model Volumes		Ratio (Model/Obs)	
		WB	EB	WB	EB	WB	EB
1	SR 204 east of US 2	937	464	1,090	607	16.3%	30.8%
2	20th Street SE east of US 2	922	298	874	231	-5.2%	-22.5%
3	US 2 Westbound east of SR204 interchange	1,603	-	1,680	-	4.8%	NA
4	US 2 Eastbound east of SR204 interchange	-	1,215	-	1,080	NA	-11.1%
Total		3,462	1,977	3,644	1,918	5.3%	-3.0%

Screenline 2 – east of I-5 on US 2 trestle							
#	Location	Observed Volumes		Model Volumes		Ratio (Model/Obs)	
		WB	EB	WB	EB	WB	EB
5	US 2 Eastbound east of I-5 interchange	-	1,716	0	1,549	NA	-9.7%
6	US 2 Westbound east of I-5 interchange	3,290	-	3,262	0	-0.9%	NA
Total		3,290	1,716	3,262	1,549	-0.9%	-9.7%

TABLE 3. COMPARISON OF OBSERVED AND ESTIMATED EXISTING (YEAR 2016) PM PEAK HOUR VOLUMES AT EAST/WEST SCREENLINES - US2/SR204/20TH STREET IJR

Screenline 1 – east of US 2 Trestle							
#	Location	Observed Volumes		Model Volumes		Ratio (Model/Obs)	
		WB	EB	WB	EB	WB	EB
1	SR 204 east of US 2	801	2,715	997	2,510	24.5%	-7.6%
2	20th Street SE east of US 2	498	1,021	541	1,073	8.6%	5.1%
3	US 2 Westbound east of SR204 interchange	1,653	-	1,661	-	0.5%	NA
4	US 2 Eastbound east of SR204 interchange	-	1,276	-	1,875	NA	46.9%
Total		2,952	5,012	3,199	5,458	8.4%	8.9%

Screenline 2 – east of I-5 on US 2 trestle							
#	Location	Observed Volumes		Model Volumes		Ratio (Model/Obs)	
		WB	EB	WB	EB	WB	EB
5	US 2 Eastbound east of I-5 interchange	-	4,461	0	4,583	NA	2.7%
6	US 2 Westbound east of I-5 interchange	2,215	-	2,337	0	5.5%	NA
Total		2,215	4,461	2,337	4,583	5.5%	2.7%

Count sources by location #:

1. December 2016 count (Traffic Data Gathering)
2. December 2016 count (Traffic Data Gathering)
3. November 2016 WSDOT Count
4. November 2016 WSDOT Count
5. WSDOT Permanent Recorder Data, 2016
6. WSDOT Permanent Recorder Data, 2016

Legend	
	Validation results within ±10%
	Validation results > ±10% and < ±20%
	Validation results > ±20%

ENVIRONMENTAL CONSIDERATIONS REPORT

March 2017

ENVIRONMENTAL CONSIDERATIONS REPORT

US 2/ SR 204 & 20th St SE Interchange Justification Report (IJR)

Snohomish County, WA

XL5205

WIN A00201Y

**Prepared by
Northwest Region**

March 2017

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1.0 Introduction

A high-level environmental review of the US 2/SR 204 & 20th Street (St) SE interchanges and surrounding areas (“Study Area”) (Figure 1) was completed to develop and compare alternatives for the Interchange Justification Report (IJR). The information presented primarily comes from online resources and databases, and GIS. A short reconnaissance field visit was also conducted. This memorandum provides a brief explanation of the environmental constraints in the proximity of interchanges. The attached Environmental Classification Summary (ECS) was used as a tool to gather information about the various environmental considerations typical for WSDOT projects. Conservative assumptions about the project were made. A narrative was then developed based on the answers in the ECS. The headings starting with section 3.0 below correspond with the ECS format.

2.0 Project Description

In the 2016 Legislative session, the Legislature provided funding, as part of the ESHB 2524.SL to develop an Interchange Justification Report (IJR) for the US 2 trestle, covering the SR 204 and 20th Street interchange at the eastern end of the westbound structure. The primary portion of US 2 is a trestle over the Snohomish River floodplain. It continues southeasterly south of Lake Stevens. SR 204 originates at US 2 and continues northeast through Lake Stevens and 20th St SE runs east- west between the flood plain below the US 2 trestle and the south part of the city of Lake Stevens. It has ramps to both US 2 and SR 204.

In fall 2016, WSDOT formed a project support team of representatives from Snohomish County, Community Transit, and the cities of Lake Stevens, Everett, Snohomish, Monroe, and Marysville. This team is currently working to identify existing issues and potential future improvements at the interchange. The project support team will provide feedback and direction on the future potential improvements throughout the duration of the study.

The IJR will complement the previous corridor study by looking at alternate improvement concepts that can be phased and incorporated into the longer-term replacement plan while providing near term operational and safety benefits.

3.0 Environmental Considerations

Table 1 contains the list of environmental considerations that may help in comparing alternatives. These are the topics from the ECS (Appendix). Each of these are considered in further detail in the sections following. Also in Table 1 is an estimate of the potential for budget or schedule impacts. This “weighting” is meant to help prioritize as alternatives are considered. For instance, impacts to migratory bird species may not be as important a consideration as impacts to endangered species.

This may not be an exhaustive list of environmental considerations. Also, the information provided is only preliminary, and is to be used for evaluating alternatives. More comprehensive environmental studies will be needed once an alternative is selected and funding is assigned.

Table 1. Environmental Considerations for US 2 SR 204 IJR

Report Section	Environmental Regulation or Consideration	Potential Risk to Schedule/Budget
3.1 Environmental Classification	NEPA and SEPA Classification	High
	Endangered Species Act	High
	National Historic Preservation Act: Section 106	High
3.2.1 Federal	US Army Corps of Engineers	High
	US Coast Guard	Low
	Section 4(f)	Medium
	Section 6(f)	Medium
	Farmland Conversion	Medium
3.2.2 State	Hydraulic Project Approval	Medium
	Section 401 Water Quality Certification	Medium
	Coastal Zone Management Certification	Low
	NPDES Construction Stormwater Permit	Low
	Temporary Erosion Sediment Control Plan	Low
3.2.3 Local	Critical Areas Ordinance Compliance	Medium
	Jurisdictional Stormwater Manual	Low
	Noise Variance	Low
	Floodplain Development Permit	Medium
	Shoreline Management Program	Low
3.2.4 Tribal	Tribal	High
3.2.5 Other	Migratory Bird Treaty Act	Low
	Essential Fish Habitat	Low
3.3 Environmental Context	Air Quality	Low
	Wetlands/Critical Areas/Resource Lands	Medium
	Hazardous Materials	Low
	Noise	Low
	Scenic Byways and State Scenic and Recreational Highways	Low
	Title VI/Environmental Justice	Low
	Water Quality/Stormwater	Low
	Visual Quality/Roadside Policy Manual/Aesthetics	Low

3.1 Environmental Classification

3.1.1. NEPA and SEPA Classification

Many WSDOT projects are Categorical Exclusions under NEPA and Categorical Exemptions under SEPA, and depending on the selected alternative, that may be the case for this project. If extensive changes to the existing roadway footprint are planned, further evaluation under NEPA and SEPA may be required. For NEPA, this could mean preparation of additional reports and information to comply as a Documented Categorical Exclusion. If that did not satisfy, an Environmental Assessment (EA) may need to be prepared to evaluate environmental impacts. For SEPA, an Environmental Checklist may need to be prepared. If significant impacts are determined in either case, an Environmental Impact Statement (EIS) would need to be prepared, though this is very unlikely.

3.1.2. Endangered Species Act

A federal nexus is anticipated through a Department of Army permit for Section 10 and 404 (see below). This would then trigger Section 7 Endangered Species Act (ESA) consultation with United States Fish and Wildlife (USFWS) and National Marine Fisheries Service (NMFS), collectively, the Services. A “no effect” call would be anticipated if all modifications took place above the ordinary high water mark (OHWM) of Ebey Slough and adjacent ditches. If any work took place below the OHWM, a “may effect, not likely to adversely affect” call would be expected since Ebey Slough and the tributaries to Ebey Slough are salmonid-bearing.

Depending on the extent and timing of the work, it would likely be within WSDOT’s programmatic agreements with the Services, which is a more streamlined process. If work needed to occur below the OHWM, or would have impacts to adjacent wetlands, there would be potential for impact to ESA-listed species and critical habitat. This could mean that it would fall outside of WSDOT’s programmatic agreement, and that formal consultation would be required with NMFS. This would result in longer timelines and more mitigation to obtain required federal permits.

3.1.3. National Historic Preservation Act: Section 106

A Cultural Resources Survey would need to be conducted for this project if any excavation is planned. The study area is not on Tribal land, but consultation with the Tulalip, Stillaguamish, Snoqualmie, Yakama, Sauk-Suiattle, and Snohomish Tribes will need to occur if any impacts are anticipated to Ebey Slough or adjacent wetlands. Early coordination is essential for a successful project design.

3.2 Permits & Approvals

The following list of permits and approvals may be required for the selected alternative.

3.2.1. Federal

US Army Corps of Engineers Section 10 and Section 404

Department of the Army (DA) Section 10 permit would be required for any work over, under, or in Ebey Slough. A DA Section 404 permit would be required for any discharge, dredge, or fill in Ebey Slough, jurisdictional ditches, or jurisdictional wetlands. Typically, if under 0.5 acres of impacts to wetlands are anticipated, a nationwide permit (NWP) could be used, which would be a faster permitting process than an individual DA permit.

US Coast Guard

A Bridge Permit from the US Coast Guard is required anytime work on a bridge may affect navigability of the waterway. If any of the alternatives included components in the middle of the channel, or that extended off the bridge above or into the waterway, a Bridge Permit would be needed. Obtaining a bridge permit would likely be a long process. Otherwise, work on top the bridge deck would only require routine coordination with the US Coast Guard.

Section 4(f)

There are Section 4(f) resources (parks) on both sides of US 2 (Figure 2). Assuming an increase of roadway footprint into the areas north and south of US 2, Section 4(f) evaluation would be required. If impacts to Section 4(f) resources cannot be avoided, the alternative with the least overall harm must be selected. Mitigation would be required for any impacts.

Section 6(f)

If funding from the Land and Water Conservation Fund was used to fund parks or improvements which may be impacted by an expansion of the roadway, then Section 6(f) would apply. The park to the south of the study area (Figure 2) would likely qualify as Section 6(f). In-kind mitigation would be required for any impacts.

Farmland Conversion

The entirety of the floodplain is used for agriculture per Snohomish County Code 30.32B SCC. If any of the land was converted to transportation use, a Farmland Conversion Impact Rating would need to be completed. Alternatives may need to be considered if impacts exceed the recommended allowable level.

3.2.2. State

Hydraulic Project Approval

The Washington Department of Fish and Wildlife (WDFW) requires a Hydraulic Project Approval (HPA) for any project that will use, divert, obstruct, or change the natural flow or bed of fresh waters or marine waters of the State (RCW 77.55.100). Any work below the OHWM of Ebey Slough or on the bridge over the slough will require an HPA.

Section 401 Water Quality Certification

Section 401 review by Ecology would be triggered with a DA permit. A nationwide DA permit would be a more simplified Section 401 review, whereas an individual DA permit would lead to a more complicated Section 401 review process. Typically, greater than 0.5 acres of wetland impacts would lead to an individual review.

Coastal Zone Management Certification

Any alternative would need CZM Certification because it would be in Snohomish County, which is a Coastal County. This is a short checklist that is submitted to Ecology.

NPDES Construction Stormwater Permit

Any construction project that has more than one acre of ground disturbance and may result in a discharge of stormwater to state waters is required to obtain coverage under the National Pollutant Discharge Elimination System (NPDES) Construction Stormwater General Permit (General Permit) issued by Ecology.

Temporary Erosion Sediment Control Plan

A Temporary Erosion Sediment Control Plan (TESC) is a standard part of any project and includes best management practices for erosion and sediment control.

3.2.3. Local

Critical Areas Ordinance Compliance

The study area is in unincorporated Snohomish County. The critical areas mapped in the study area include wetlands, streams, steep slopes, and a critical aquifer recharge area (Figure 3). Critical area reports would be prepared as part of any permit for the County per Snohomish County Code (SCC) 30.62A.130.

Jurisdictional Stormwater Manual

Stormwater management best management practices in the latest version of the Snohomish County Drainage Manual would need to be followed for any discharge from construction activities or as a result of expanded roadway.

Noise Variance

A noise variance or exemption may need to be obtained for any night work from Snohomish County, the City of Lake Stevens, and possibly the City of Everett.

Floodplain Development Permit

The area under the SR 2 trestle is mapped as a flood hazard and floodway fringe area (Figure 4). A permit would need to be obtained from Snohomish County for any roadway expansion per SCC 30.43C.

Shoreline Management Program

The floodplain under US 2 in the study area is mapped as “Resource” under Snohomish County’s Shoreline Management Program. This means the priority for this area is agriculture. Repair and maintenance of existing structures is an exemption under the SMP per SCC 30.44.120. If the project was not considered an exemption after coordination with the County, transportation facilities are a permitted use in that designation. Thus, depending on the nature and extent of the work, a shoreline substantial development permit may be required through the County. This may include a public hearing.

3.2.4. Tribal

The study area is not on Tribal land. See Section 3.1.3 above for further information regarding Tribal interest in the area.

3.2.5. Other Plans/Approvals

Migratory Bird Treaty Act

Swallow nests were observed under the trestle during a field visit in winter 2017. Compliance with the MBTA will be required for any work on the trestle. A biologist will need to complete a survey prior to construction, and netting may be required to exclude birds during construction.

Essential Fish Habitat

Ebey Slough is essential fish habitat for salmonids. Compliance with the Magnuson-Stevens Fishery Conservation and Management Act will need to occur concurrently with ESA Section 7 compliance for any work in Ebey Slough.

3.3 Environmental Context

3.3.1. Air Quality

No air quality concerns are anticipated for this study area.

3.3.2. Wetlands/Critical Areas/Resource Lands

Wetlands and streams are mapped on Figure 3. From the field visit in February 2017, the large mapped wetlands would likely be Category 1 or 2. Additional wetlands, likely Category 3 or 4, were observed under the existing trestle. Delineation of these wetlands and streams would need to be completed prior to construction. Any impacts to wetlands, streams, or their buffers will require mitigation.

There are a series of ditches throughout the floodplain that are salmon-bearing per SalmonScape (Figure 3). These ditches flow into Ebey Slough, which flows into Steamboat Slough, and then into the Puget Sound. Additional ditches were observed under the trestle during the February 2017 site visit. Delineation of these streams would need to be completed prior to construction. Any impacts to streams or their buffers will require mitigation.

There are also a number of fish passage barriers on Highway 204, in the project vicinity (Figure 3). If any work occurs to those culverts, they will need to be replaced with fish passable culverts.

There is a mapped bald eagle nest about ½ mile from the north end of the study area. This is not shown on the map because of the sensitivity of the data, but nests within a 1-mile radius must be confirmed by a biologist and reported. However, it is far enough away that project impacts are unlikely. A survey should take place once project design begins.

There is no mapped nesting habitat for marbled murrelets, although a biologist should conduct a site visit to nearby forested areas to assess habitat once project design begins.

Parks and public land in the study area include WDFW Ebey Island land (adjacent to Hwy 2, to the south) (Figure 2), and County land. Snohomish County owns much of the land underneath the trestle. The County leases the area for agriculture (Figure 4).

3.3.3. Hazardous Materials

There is no documented contamination to the soil and groundwater, or Underground Storage Tanks in the half-mile radius around the study area. Assuming no property purchase or permanent easements, a short Hazardous Materials report would be required once project design begins.

3.3.4. Noise

There are sensitive receptors (i.e., residential communities) east of SR 204 and US 2, adjacent to the study area (Figure 3). Any expansion of the roadway in the study area would likely be a Type 1 noise project, which would trigger a noise analysis. Noise abatement measures may need to be considered, particularly if the roadway is expanded or altered in a way that may affect the sensitive receptors.

3.3.5. Scenic Byways and State Scenic and Recreational Highways

The portions of US 2 and SR 204 in the study area are not scenic byways or state scenic and recreational highways.

3.3.6. Title VI/Environmental Justice

A detailed environmental justice analysis will need to be conducted for any expansion of right of way.

3.3.7. Water Quality/Stormwater

Any increase in impervious surface area over threshold, per the current WSDOT Highway Runoff Manual (HRM) minimum requirements, will trigger flow control and/or runoff treatment for stormwater. There are different stormwater treatment requirements depending on the amount and type of impervious surface added (see HRM for guidance). Ample room will need to be anticipated for those facilities and for conveyance. Additionally, even if the project does not add impervious surface, changes to the roadway (e.g., restriping into the shoulder) will need to be evaluated to ensure that the allowable runoff depth and runoff spread are not exceeded. A Type A hydraulic report, which contain the engineering justification for all drainage modifications that occur as a result of the project, is required.

3.3.8. Visual Quality/Roadside Policy Manual/Aesthetics

Temporary visual impacts can be expected due to the presence of construction equipment, construction personnel, temporary traffic barriers, and materials. The temporary encroachments will be visible to the traveling public and may be visible from neighboring properties.

Temporary impacts to visual quality can be controlled during construction by saving and protecting vegetation to the maximum extent possible, staging off the highway, and limiting the duration of construction. No mature native woody vegetation should be removed for staging or access.

Permanent impacts to visual quality can be expected due to additional pavement, changes to the alignment of the highway, stormwater treatment, and removal of vegetation to accommodate all construction activities. Permanent impacts to visual quality can be avoided by protecting existing vegetation where possible and can be mitigated by replanting and restoring the native vegetation according to the requirements of the Roadside Policy Manual. Hard surfaces should be designed to provide visual continuity within the corridor through colors, textures, and minimization of structures. Further visual assessment is required.

4.0 Long-term Environmental Commitments

Depending on the final design of the project, long-term environmental commitments may be needed, such as wetland monitoring.

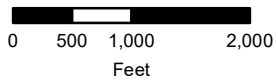
5.0 Summary

The scope of the current project is a study, not a designed project. The environmental information provided in this memo is high-level and preliminary, and is meant to assist in evaluating alternatives. In general, the more the chosen alternative expands into sensitive resources, the more environmental regulations are triggered, and the more time and budget would need to be allocated. The regulations and considerations that may have the greatest impact to schedule and budget are noted in Table 1.



Data Source: State Routes from WSDOT at scale of 1:24K;
 County Boundaries from WSDOT at scale of 1:24K;
 Wetlands data from Wetlands Inventory 2011

Produced by Ruth Park, NWR Environmental Services



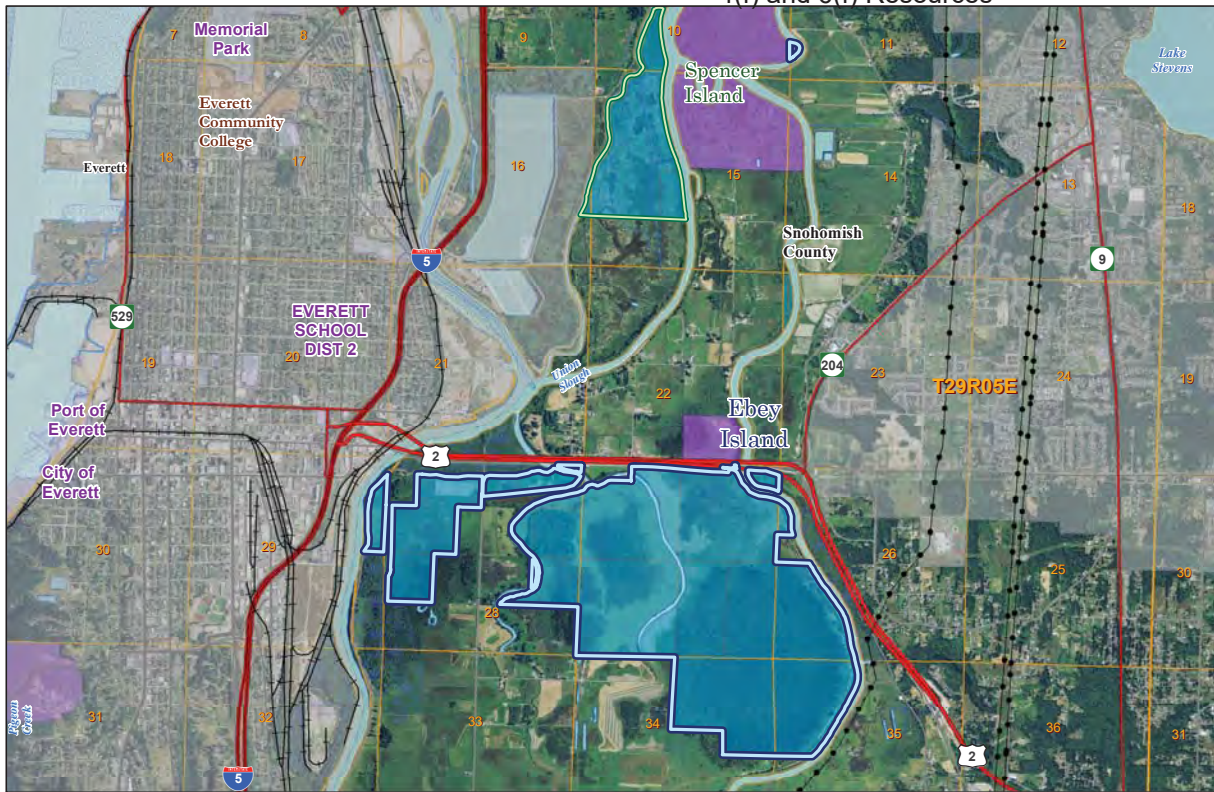
- Incorporated Cities
- Waterbodies
- Rivers & Streams

US 2/SR 204 Interchange Justification Report

Environmental Considerations in Study Area

Study Area
Figure 1

3/7/17



Snoqualmie Wildlife Area
Ebey Island



- WA Dept of Fish and Wildlife (WDFW) Administered Land**
- Featured Wildlife Area
 - Other Wildlife Area
 - Department Owned Land
 - WDFW Water Access Site



Disclaimer
Due to the dynamic nature of the data and the need to rely on outside sources of information, the Washington Department of Fish and Wildlife (WDFW) cannot accept responsibility for errors or omissions in the data and information contained in this product. There are no warranties that accompany the maps and information contained in this product. For more accurate information concerning the Wildlife Area Unit contact the WDFW Regional office that manages this unit.
Map Produced: January 2017

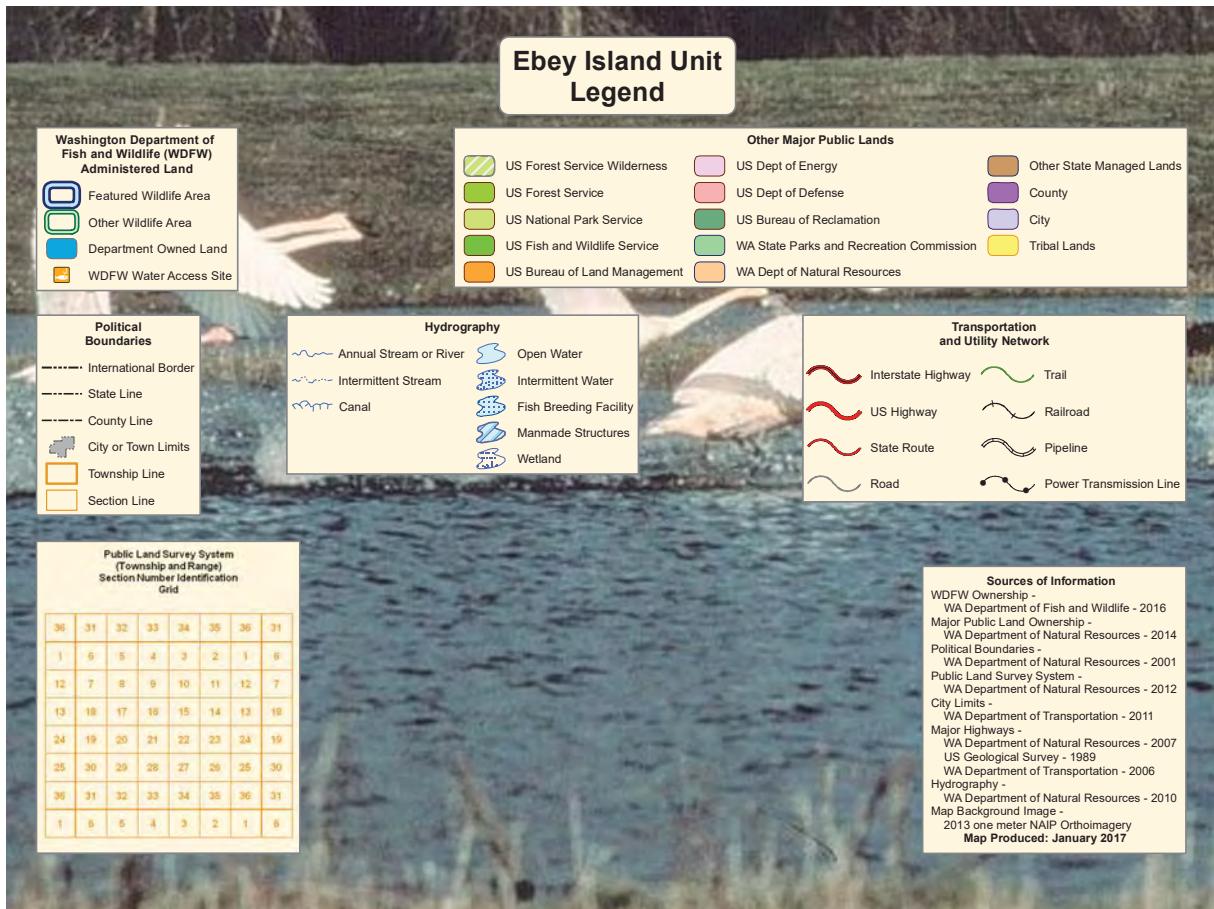
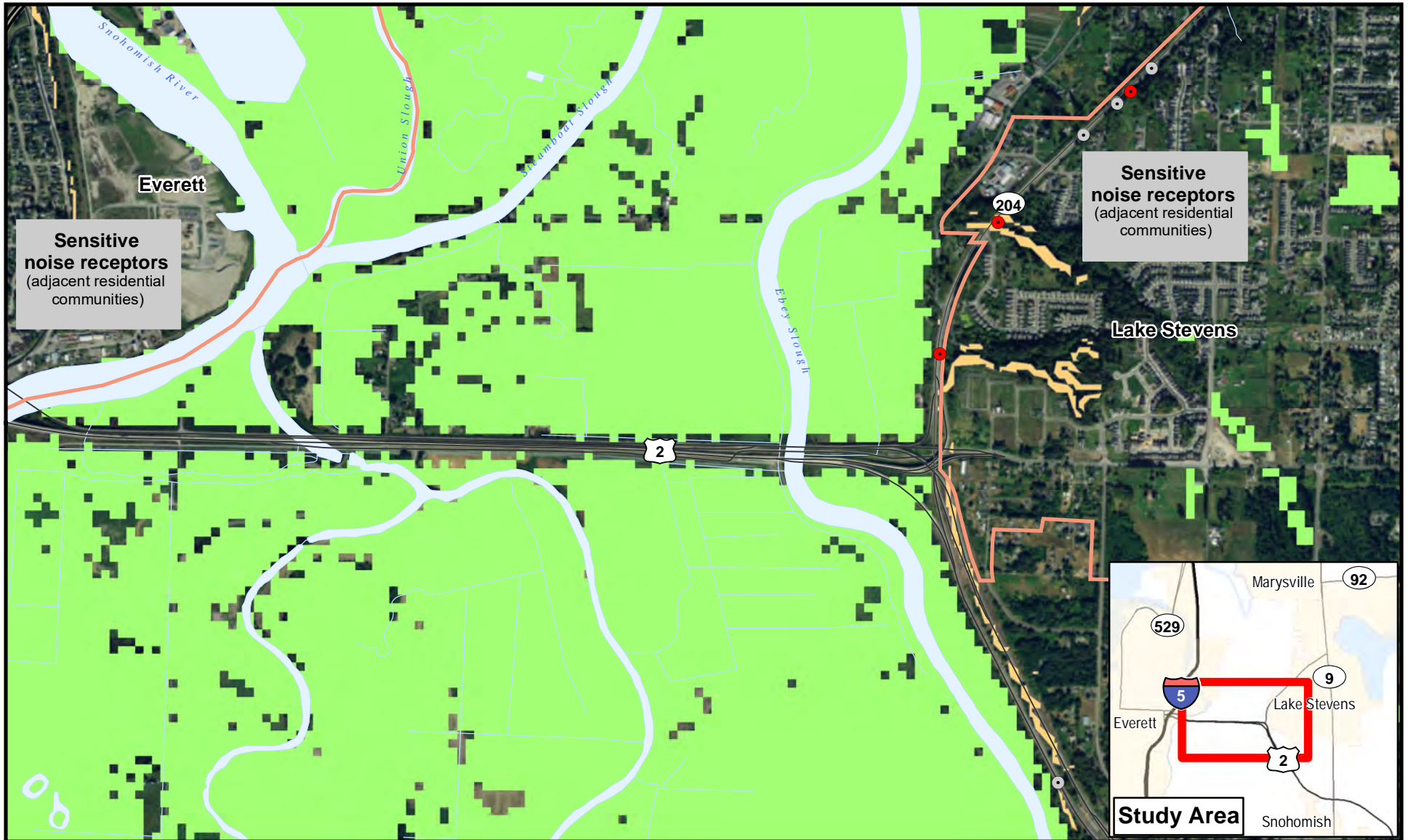
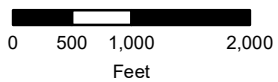


Figure 2



Data Source: State Routes from WSDOT at scale of 1:24K;
 County Boundaries from WSDOT at scale of 1:24K;
 Wetlands data from Wetlands Inventory 2011

Produced by Ruth Park, NWR Environmental Services



- WSDOT Fish Passage Inventory**
- Yes
 - No
 - Unknown
 - No fish use
- Barrier Status**
- Incorporated Cities
 - Waterbodies
 - Rivers & Streams
 - wetlands
- Critical Area Slopes**
- 33-100%
 - Greater than 100%

US 2/SR 204 Interchange Justification Report

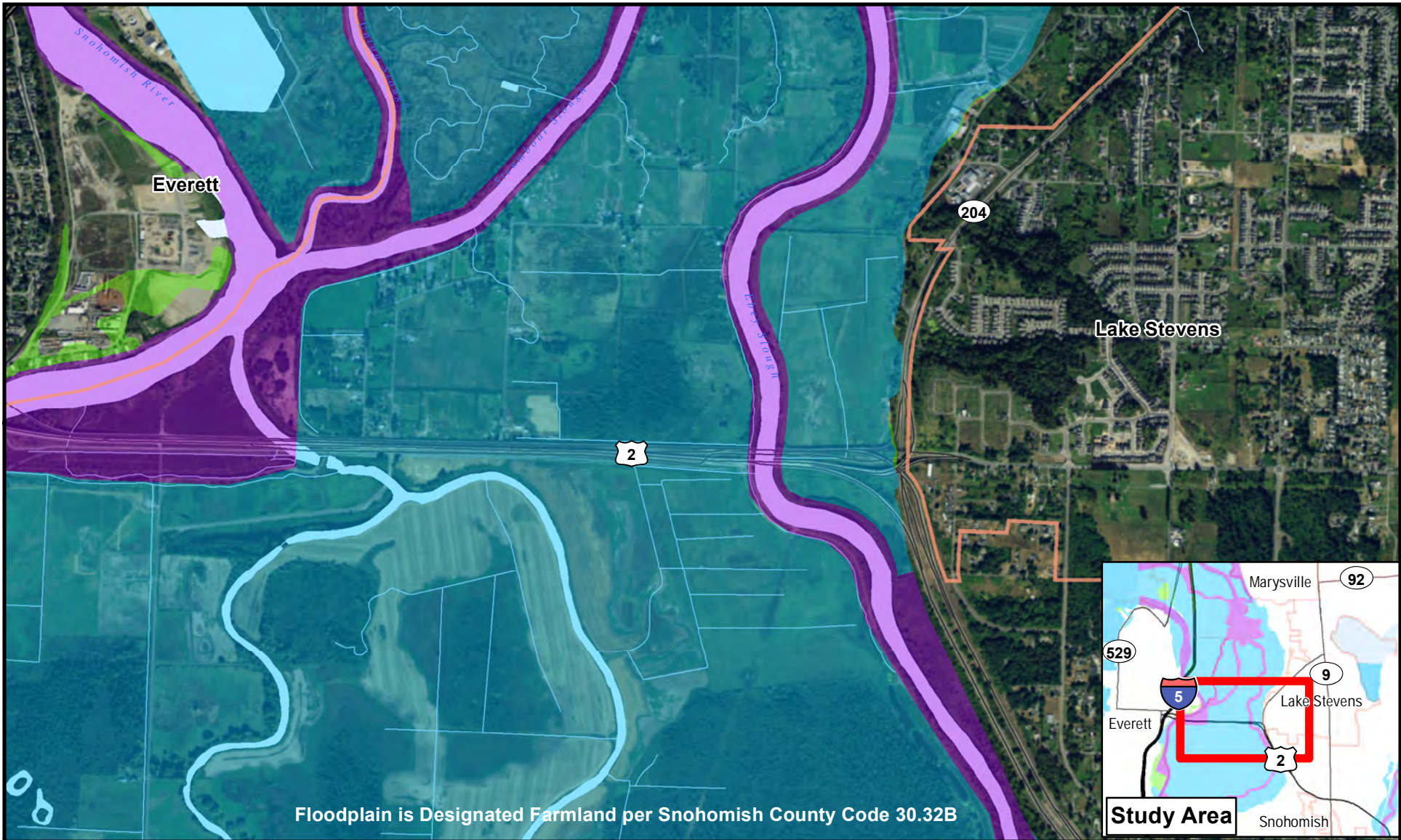
Environmental Considerations in Study Area

Critical Areas, Noise, and Fish Passage

Figure 3

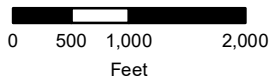
3/7/17





Data Source: State Routes from WSDOT at scale of 1:24K;
 County Boundaries from WSDOT at scale of 1:24K;
 Wetlands data from Wetlands Inventory 2011

Produced by Ruth Park, NWR Environmental Services



Nat'l Flood Hazard Layer Flood Zones

- Floodway
- 100 yr. (1% ACE)
- 500 yr. (0.2% ACE)

ACE = Annual Chance Elevations

Environmental Considerations in Study Area

- Incorporated Cities
- Waterbodies
- Rivers & Streams

US 2/ SR 204 Interchange Justification Report

Environmental Considerations in Study Area

Floodplain and Farmland

Figure 4

3/7/17



ECS Standard Report

WIN: A00201Y(ERS)

Project Title: US 2/SR 204 & 20th St SE Interchanges - IJR (ERS)

WSDOT APPROVAL

Region Environmental Manager

Date

Yared Bereded-Samuel

Region Environmental Contact

Phone:

NOTE: This is the typical form used for WSDOT projects once they have been funded. In this case, it was used to collect information for this IJR study, even though funding has not yet been assigned. Much of the standard language is past tense, or may sound awkward for this project. The purpose of this document is to provide an overview of the environmental constraints and issues that may need to be considered. Please see the full Environmental Considerations report for more detailed information pertinent to this IJR study.

PART 1 - PROJECT DESCRIPTION

WIN: A00201Y(ERS)

Project Title: US 2/SR 204 & 20th St SE Interchanges - IJR (ERS)

Pin(s):

Federal Aid Number: None

Intent of Documentation:

- Scoping (ERS)
- NEPA/SEPA Documentation (ECS)

Project Description:

IJR will complement the previous corridor study by looking at alternate improvement concepts that can be phased and incorporated into the longer term replacement plan while providing near term operational and safety benefits.

Purpose:

Need:

In the 2016 Legislative session, the Legislature provided funding, as part of the ESHB 2524.SL to develop an Interchange Justification Report (IJR) for the US 2 trestle, covering the SR 204 and 20th Street interchange at the eastern end of the westbound structure. The primary portion of US 2 is a trestle over the Snohomish River floodplain. It continues southeasterly south of Lake Stevens. SR 204 originates at US 2 and continues northeast through Lake Stevens. 20th St SE runs east- west between the flood plain below the US 2 trestle and the south part of the city of Lake Stevens It has ramps to both US 2 and SR 204.

In fall 2016, WSDOT formed a project support team of representatives from Snohomish County, Community Transit, and the cities of Lake Stevens, Everett, Snohomish, Monroe, and Marysville. This team is currently working to identify existing issues and potential future improvements at the interchange. The project support team will provide feedback and direction on the future potential improvements throughout the duration of the study.

The IJR will complement the previous corridor study by looking at alternate improvement concepts that can be phased and incorporated into the longer-term replacement plan while providing near term operational and safety benefits

Project Location:

SR: US 2, SR 204

Begin MP: 1.5

End MP: 2.8

WSDOT Region: NWR

Township/Section/Range: T29-0N R5-0E S 22,23,26 27

County/COUNTIES: Snohomish

Right of Way -- Check all that apply

Will ROW be acquired for this project? Yes No If 'no' skip indented questions.

If 'yes' will people and/or businesses be relocated and/or displaced? Yes No

Will early acquisition be necessary? Yes No

Statewide Transportation Improvement Program (STIP) Confirmation

Are All phases of the project included in the STIP? Yes No

If 'yes' list STIP/STIP addendum date:



ECS Standard Report

WIN: A00201Y(ERS)

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If 'yes' list STIP/STIP addendum date:

If 'no' attach plan for inclusion



WIN: A00201Y(ERS)

Project Title: US 2/SR 204 & 20th St SE Interchanges - IJR (ERS)

PART 2 - ENVIRONMENTAL CLASSIFICATION

The information provided is based on review of GIS data in the WSDOT Environmental Workbench and field reviews by qualified WSDOT staff.

NEPA Classification: FHWA Categorical Exclusion (CE) 23 CFR 771.117

SEPA Classification: Categorical Exemption -

Subsection: C22: Project within the existing operational ROW

Subsection: WAC 197-11-800(26) Repair, reconstruction, restoration, retrofitting, or replacement of any transportation facilities within the existing right of way (including ferry docks, bus transfer station, pedestrian paths and bike lanes) provided it conforms to pre-existing design, function and location and does not add automobile lanes or change capacity.

Endangered Species Act (ESA)

USFWS Consultation Type: Informal

Completion date:

NOAA Consultation Type: Informal

Completion date:

National Historic Preservation Act: Section 106 – Check all that apply.

Has a Cultural Resources Specialist reviewed this project? Yes No If 'yes', provide date:

Is the project on tribal lands? Yes No If 'yes', list tribe:

Is the project exempt under the 2012 Programmatic Agreement with FHWA & SHPO? Yes No
If 'yes', list exemption:

Is the project located on Forest Service land? Yes No
If 'yes' is the project exempt under the 2012 Programmatic Agreement with USFS? Yes No
If 'yes' list exemption:

Was a Cultural Resources Survey completed for this project? Yes No
If 'yes', Historic Cultural Archeological resources will be affected. See attached.

The project is not exempt under either Programmatic Agreement. DAHP concurrence is required:
Consultation and concurrence by _____ and/or _____ is required
Date of approved Section 106 MOA: _____ See attached.



WIN: A00201Y(ERS)

Project Title: US 2/SR 204 & 20th St SE Interchanges - IJR (ERS)

PART 3 - PERMITS & APPROVALS

Federal: Check all that apply

- US Army Corps of Engineers
 - Section 404 Section 10
 - Nationwide Type:
 - Individual
- US Coast Guard
 - General Bridge Act Coordination is required to complete NEPA.
 - Contact Date:
 - Private Aids to Navigation (non-bridge projects)
- Section 4(f)
 - De minimis approval
 - Temporary Occupancy approval
 - Section 4(f) Evaluation See attached.
- Section 6(f) Compliance (RCO/NPS)
 - See attached
- Wild and Scenic Rivers Review
 - Coordination with administrator required.
 - MOA attached
- Authorization for Use of Federal Land
 - Issuing Agency:
- Farmland Conversion
 - see attached NCRS documentation

Local: Check all that apply

- Critical Areas Ordinance Compliance (CAO) Ecology
 - Issuing Agency: Snohomish County
 - List CAO Permits:
 - See Notes Section Below
- Jurisdictional Stormwater Manual
 - Issuing Municipality: Snohomish County
- Noise Variance (e.g. nighttime construction or maintenance)
 - Issuing Agency: Snohomish County, City of
- Flood Plain Development Permit
 - Issuing Agency: Snohomish County
- Shoreline Management Program
 - Issuing Agency: Snohomish County
 - Permit Type: Substantial Development

State: Check all that apply

- Hydraulic Project Approval (HPA)
 - General Hydraulic Project
 - Type:
- Section 401 Water Quality Certification
 - Certifying Entity:
- Aquatic Use Authorization (WDNR)
- Coastal Zone Management Certification (CZM)
 - County:
- Forest Practice Approval
 - Issuing Agency:
- NPDES Construction Stormwater Permit
 - General Individual
- Temporary Erosion Sediment Control Plan (TESC)
- GEO 05-05 See attached

Tribal

Name of tribe:
 List of permits and approvals:
 See Notes Section Below

Other Plans/Approvals: Check all that apply

- Migratory Bird Treaty Act -- See attached.
- Bald Eagle Protection Act -- See attached.
- Essential Fish Habitat (EFH) -- See attached.
- Marine Mammal Protection Act -- See attached.
- Other -- See Notes.

Notes

1. 4(f) lands to north and south of Interchange. However, no federal funds means no 4(f) impacts.
2. Possible 6(f) depending on impacts.
3. Consult with Tulalips re: possible impacts to Treaty Rights.
4. Assume work below the Ordinary High Water Mark (OHWM) of Ebey Slough (for bridge piers) and below OHWM of ditches.
5. Agriculture is practiced in much of the surrounding area and any development would be subject to Snohomish County Code 30.32B as well as Federal Farmland Conversion through NRCS
6. CAO permits: clear and grade, critical aquifer recharge area

WIN: A00201Y(ERS)

Project Title: US 2/SR 204 & 20th St SE Interchanges - IJR (ERS)

PART 4 ENVIRONMENTAL CONTEXT -- CHECK ALL THAT APPLY.

The information provided is based on review of GIS data in the WSDOT Environmental Workbench and field reviews by qualified WSDOT staff.

Air Quality

1. Is the project exempt from Air Quality conformity requirements per WAC 173-420-110? Yes No
 If 'yes' list exemption: _____ and skip questions 2 & 3.
 Project construction will comply with federal, state and local requirements.
 If 'no' continue.
2. Will an air quality study be required? Yes No If 'yes', see attached. Check all that apply:
 The project is located in a Maintenance Area for: CO PM10 PM2.5
 The project is located a Non-attainment Area for: CO PM10 PM2.5
3. Is the project listed in the MTP TIP? Yes No If 'yes', give MTP Adoption date: _____

Wetlands/Critical Areas/Resource Lands

1. Will wetlands be impacted by the project? Yes No If 'no' skip to question 2.
 Is a site review is required by a wetland specialist? Yes No If 'yes' provide completion date: _____
 Will a wetland delineation and discipline report be required? Yes No If 'yes' provide completion date: _____
 Estimated temporary wetland impacts (acres) tbd Estimated permanent wetland impacts (acres): tbd
 Estimated permanent wetland buffer impacts (acres) tbd
 Will mitigation be required? Yes No If 'yes,' see attached
2. Will the project affect fish, wildlife or habitat? Yes No If 'yes' list or attach documentation: _____
3. Is the project located in a Sole Source Aquifer? Yes No If 'no' skip to question 4.
 The project is exempt from EPA approval. The project received EPA approval on _____
4. Is the project located in a critical aquifer recharge area? Yes No If 'no' skip to question 5.
 Check only those that apply. The project is exempt requires approval from the county: Snohomish
5. Will the project impact a geologically hazardous area? Yes No If 'yes', see attached.
6. Will the project require work in water or below the estimated OHWM? Yes No If 'no' skip to question 7
 If work in water will be required, list waterbodies: _____
 Will the project require work in Relatively Permanent Waters (RPWs)? Yes No
 If 'yes', attach map showing RPW connectivity.
7. Is the project located in a 100-year floodway? Yes No
 Is the project located in a 100-year floodplain? Yes No
8. Will agricultural land be converted to transportation use? Yes No If 'no' skip to question 9.
 If 'yes' attach NRCS report and provide agricultural land classification: _____
9. Will other resource lands (i.e. Forest lands, mineral resource lands) be impacted? Yes No If 'yes', see attached.

Hazardous Materials

1. Does the project require excavation below the existing ground surface? Yes No
 If 'no' skip to question 2. If 'yes' answer questions 1a & 1b, then go to question 2.
- a. Is the project located within ½ mile radius of any Ecology listed sites that have the potential of impacting the project during construction?
 Yes No
- b. Will groundwater be encountered in an area of known contamination? Yes No



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2. Will any properties be acquired as part of this project? Yes No If 'no' skip to question 3.
If "yes" answer 2a and 2b, then go to question 3:
- a. Are any of the properties listed on Ecology's databases? Yes No
- b. Are any of the properties not listed on Ecology's databases a high risk due to historic land use (i.e. gasoline station, auto-body shop, or dry cleaner)?
 Yes No
3. Based on the information above and the project specific activities, is there a potential for the project to acquire any known or potentially contaminated properties, or encounter contaminated soils, groundwater or surface water? Yes No
- If 'no' check box A. If 'yes' check box B and complete a Hazardous Materials Analysis Report.
- A. Based on the proposed project description and construction activities, WSDOT is unlikely to assume liability for cleanup of contaminated soil or groundwater as part of this project, and it is concluded that no significant, unavoidable adverse impacts that cannot be mitigated for are expected for the following reasons: 1) No known or suspected contaminated properties are being acquired; 2) Soil disturbance is anticipated to be less than 1 foot below ground surface with no known or suspected contamination; 3) Contaminated groundwater will not be encountered as part of this project. No further investigation is warranted at this time.
- B. A "right sized" Hazardous Materials Analysis Report is required. Attach a copy to this form. (If you have questions or concerns, please contact a Hazardous Materials Specialist).

Noise

1. Is this project a Type 1 noise project? Yes No
If 'yes', are sensitive receptors located adjacent to or within the project? Yes No If 'yes' See attached.
2. Do previous noise mitigation commitments exist within or adjacent to the project limits? Yes No If 'yes' See attached.
3. Is a noise study required? Yes No If 'yes' See attached.

Scenic Byways and State Scenic and Recreational Highways

1. Is the project located on a Scenic Byway? Yes No
If 'no', skip to question 2. If 'yes' provide name:
2. Is the project located on a State Scenic and Recreational Highway? Yes No
If 'yes' provide name: _____ and scenic classification of _____
(per Utilities Accommodation Policy Manual M 22-86) See attached.

Title VI / Environmental Justice (EJ)

1. Will the project require detailed EJ analysis? Yes No
If 'no', provide exemption number and description.

Water Quality/Stormwater

1. Will the project increase runoff? Yes No
2. Will the project affect water quality? Yes No
If 'yes', treatment for new or existing impervious surfaces will be consistent with the guidance and requirements in the WSDOT Highway Runoff Manual, unless the project stormwater runoff is treated by a local jurisdiction with a more stringent Stormwater Management Manual.
3. Does a TMDL waterbody have the potential to receive a discharge? Yes No
If 'yes' list the waterbodies and pollutants of concern:



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4. Does A 303d waterbody have the potential to receive a discharge? Yes No

If 'yes' list the waterbodies and the pollutants of concern:

Visual Quality/Roadside Policy Manual/Aesthetics

1. Will the project disturb the roadside? (e.g. Cuts, fills, new lighting, clearing & grading, realignment, structures) Yes No

If 'yes', review by a Landscape Architect is required. See attached.

2. Will the project disturb Resource Conservation Areas? (see Roadside Policy Manual M3110) Yes No

If 'yes', review by a Landscape Architect is required. See attached.

Long-Term Environmental Commitments

1. Were previous long-term environmental commitments (environmental commitments that extend beyond the end of the construction phase such as wetland monitoring, preservation of landscape buffers, etc.) made within the project limits? Yes No

If 'yes', see attached.

2. Will the project create long-term environmental commitments (environmental commitments that extend beyond the end of the construction phase such as wetland monitoring, preservation of landscape buffers, etc.)? Yes No

If 'yes', see attached.

Summary

1. Briefly describe environmental issues likely to affect design and mitigation measures for this project.

Any increase in roadway may trigger Endangered Species Act, Section 106, Section 401, a floodplain permit, and critical areas compliance, among other regulations.

Type A Hydraulic Report may be required.

List of Attachments



ECS Standard Report

WIN: A00201Y(ERS)

Project Title: US 2/SR 204 & 20th St SE Interchanges - IJR (ERS)