

# Interstate 5/ Bakerview Road, Exit 258 Interchange Justification Report (IJR)

**SR MP 256.55 to 260.75**  
*(Northwest Avenue to Slater Road)*

June 12, 2017

**Sponsor:** City of Bellingham

**Prepared by:** WSDOT NW  
Region, Mount Baker Area



**City of Bellingham**  
Public Works Department

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# I-5/Bakerview Road Interchange Justification Report

MP 256.55 to MP 260.75

## STAKEHOLDER ACCEPTANCE

The undersigned parties concur with the Interchange Justification Report for the Bakerview Interchange at Interstate 5, Exit 258 as presented in this document. Concurrence with the Interchange Justification Report does not constitute approval of the Bakerview Interchange Improvements.

<p>This interchange Justification Report has been prepared under my direct supervision, in accordance with Chapter 18.43 RCW and appropriate Washington State Department of Transportation manuals.</p>	
<input checked="" type="checkbox"/> IJR Engineer of Record	<p>By: <u>[Signature]</u> WSDOT NW Region Mount Baker Area Engineering Manager</p> <p>Date: <u>6/14/17</u></p>
 <p><u>6/14/17</u></p>	
<input checked="" type="checkbox"/> Concurrence	<p>By: <u>[Signature]</u> WSDOT NW Region Traffic Engineering Manager</p> <p>Date: <u>21 June 17</u></p>
<input checked="" type="checkbox"/> Concurrence	<p>By: <u>[Signature]</u> WSDOT Assistant State Design Engineer</p> <p>Date: <u>6/26/17</u></p>
<input checked="" type="checkbox"/> Concurrence	<p>By: <u>[Signature]</u> WSDOT Development Services and Access Manager</p> <p>Date: <u>6/26/2017</u></p>
<input checked="" type="checkbox"/> Concurrence	<p>By: <u>[Signature]</u> FHWA Safety and Design Engineer</p> <p>Date: <u>6/27/2017</u></p>
<p><b>FINAL IJR MUST BE SUBMITTED FOR APPROVAL WHEN NEPA IS CONCLUDED</b></p>	

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June 27, 2017, 2017

HDE-WA/WA3182A198

Mr. Roger Millar  
Secretary of Transportation  
Department of Transportation  
Olympia, Washington

Attention: Barb De Ste. Croix, P.E.

**I-5/Bakerview Road - Interchange  
Justification Report – Finding of  
Engineering and Operational Acceptability**

Dear Mr. Millar:

This letter is in response to your request for a finding of engineering and operations for the I-5/Bakerview Road interchange modification in Whatcom County. The proposed interchange modification includes a new northbound on-ramp from westbound Bakerview Road to I-5. FHWA has reviewed the IJR and based on an engineering and operations review, the access request is considered acceptable. This finding is conditioned on the new and existing northbound on-ramps be merged together and form one access point on I-5. If there are no major changes in the design of the proposal, final approval may be given upon the completion of the environmental process. The IJR must be submitted to FHWA for final approval upon the completion of the NEPA process.

Please contact Don Petersen at (360) 534-9323 or [Don.Petersen@dot.gov](mailto:Don.Petersen@dot.gov) or Jeff Horton at (360) 753-9411 or [Jeff.Horton@dot.gov](mailto:Jeff.Horton@dot.gov) if you have any questions regarding this action.

Sincerely,

DANIEL M. MATHIS, P.E.  
Division Administrator

By: Donald A. Petersen  
Division Safety/Design Engineer

cc: Ricky Bhalla, MS 47329, Jeff Horton



# Table of Contents

<b>Executive Summary .....</b>	<b>Ex1-1</b>
Where is the proposed improvement located?.....	Ex1-1
What is the proposed improvement?.....	Ex1-1
What are the key findings/limitations? .....	Ex1-2
<b>Policy Point 1: Need for the Access Point Revision .....</b>	<b>PP1-1</b>
Purpose .....	PP1-1
Need .....	PP1-1
Goals for the proposed action .....	PP1-1
Study Area .....	PP1-2
Existing Conditions .....	PP1-3
Current and projected safety needs .....	PP1-4
The proposed improvement.....	PP1-4
<b>Policy Point 2: Reasonable Alternatives .....</b>	<b>PP2-1</b>
Consideration of alternatives .....	PP2-1
Evaluation of reasonable alternatives .....	PP2-2
Summary of alternatives and key findings.....	PP2-9
<b>Policy Point 3: Operational and Crash Analyses.....</b>	<b>PP3-1</b>
Traffic operations and collision analysis parameters.....	PP3-1
Traffic operations analysis with proposed improvement .....	PP3-7
Crash analysis .....	PP3-13
<b>Policy Point 4: Access Connections and Design.....</b>	<b>PP4-1</b>
Existing access connections and design.....	PP4-1
Proposed access connections and design.....	PP4-2
Relationship to future proposed interchange access .....	PP4-6
<b>Policy Point 5: Land Use and Transportation Plans .....</b>	<b>PP5-1</b>
Proposed improvements are compatible with land use and the transportation network .....	PP5-1
The proposed access point revision is compatible with transportation plans for the area .....	PP5-1
Projected development in the immediate area.....	PP5-3

<b>Policy Point 6: Future Interchanges</b> .....	<b>PP6-1</b>
Is the proposed improvement compatible with other new access points or access revisions? .....	PP6-1
<b>Policy Point 7: Coordination</b> .....	<b>PP7-1</b>
Coordination of projects and actions that are programmed and funded.....	PP7-1
<b>Policy Point 8: Environmental Processes</b> .....	<b>PP8-1</b>
Environmental process status .....	PP8-1
<b>Appendix</b> .....	<b>Appendix</b>
Appendix A Methods and Assumptions Document .....	A-1
Appendix B Conceptual Design.....	B-1
Appendix C Traffic Analysis.....	C-1
Appendix D Safety Analysis.....	D-1
Appendix E Alternatives Evaluation .....	E-1
Appendix F Environmental .....	F-1
Appendix G IJR Support Team Meetings and Key Activities.....	G-1
Appendix H Technical Memorandums.....	G-1
Appendix I Stakeholder Outreach.....	H-1
Appendix J Glossary .....	I-1

## Table of Exhibits and Tables

Exhibit EX1: Vicinity Map .....	Ex1-1
Exhibit PP1-E1: Bakerview IJR Study Area .....	PP1-2
Exhibit PP1-E2: I-5/Bakerview Road Interchange looking south .....	PP1-3
Exhibit PP1-E3: The Proposed Improvement .....	PP1-Error! Bookmark not defined.5
Table PP2-T1: Bakerview Interchange 2040 Trip Purpose .....	PP2-3
Exhibit PP2-E1: Alternative I-W: Widen Bridge .....	PP2-5
Exhibit PP2-E2: Alternative R-B New Northbound On-ramp .....	PP2-6
Exhibit PP2-E3: Alternative R-C: Combines new northbound and new southbound on-ramp to I-5 --	PP2-7
Exhibit PP2-E4: Alternative I-E: Full diamond interchange .....	PP2-8
Exhibit PP2-E5: Alternative R-R: New Northbound On-ramp and Roundabouts at two ramp terminal intersections .....	PP2-9
Table PP3-T1: Traffic Operations and Collision Analysis .....	PP3-1
Table PP3-T2: Mainline and Ramp Merge/Diverge LOS and Density.....	PP3-4
Table PP3-T3: Intersection LOS and Average Vehicle Delay.....	PP3-4
Exhibit PP3-E1: Traffic Volumes and Level of Service – No Build Conditions, PM Peak Hour .....	PP3-9



Exhibit PP3-E2: Traffic Volumes and Level of Service - Proposed Improvements, PM Peak Hour-----	PP3-11
Exhibit PP3-E3: I-5/Bakerview Freeway Study Area Analysis Segments and Intersections-----	PP3-13
Exhibit PP3-E4: Airport Drive and Bakerview Road Crash Analysis Intersection Road Segments-----	PP3-14
Table PP3-T5: I-5/Bakerview Road Interchange Recent Safety Projects-----	PP3-14
Table PP3-T6: Northbound Mainline - Observed Crashes by Crash Type and Injury Severity -----	PP3-15
Table PP3-T7: Southbound Mainline – Observed Crashes by Crash Type and Injury Severity -----	PP3-15
Table PP3-T8: Freeway Segments Fatal and All Injury Predicted and Expected Crashes -----	PP3-17
Table PP3-T9: I-5 Freeway Ramps Fatal and All Injury Predicted and Expected Crashes -----	PP3-18
Table PP3-T10: Maplewood Avenue/Bakerview Road/I-5 Intersection - Observed Crashes by Crash Type & Injury-----	PP3-19
Table PP3- T11: Maplewood Avenue/Bakerview Road/I-5 Intersection – Fatal and All Injury Predicted and Expected Crashes-----	PP3-18
Table PP3- T12: I-5 Southbound On-ramp Intersection – Observed Cashes by Crash Type & Injury -	PP3-18
Table PP3-T13: I-5 Southbound On-ramp Intersection – Fatal and All Injury Predicted and Expected Crashes -----	PP3-19
Table PP3-T14: I-5 Northbound Off-ramp Intersection – Observed Crashes by Crash Type & Injury-	PP3-19
Table PP3-T15: I-5 Northbound Off-ramp Intersection – Fatal and All Injury Predicted and Expected Crashes -----	PP3-20
Table PP3-T16: HSM Existing Crash Analysis for Bakerview Road Segments -----	PP3-21
Table PP3-T17: HSM Existing Crash analysis for Bakerview Road Intersections -----	PP3-21
Table PP3-T18: Bakerview Road/Northwest Aveune Intersection – Existing Total Crashes 2010 -2014 by Crash Type-----	PP3-22
Exhibit PP3-E-5: I-5/Bakerview Freeway Proposed Improvement Analysis Segments -----	PP3-23
Table PP3-T19: 2020 Opeing Year Fatal & Injury Predicted Crashes per year (No-build vs Build)-----	PP3-24
Table PP3-T20: 2040 Design Year Fatal & Injury Predicted Crashes per year by Alternative and Facility Type-----	PP3-25
Table PP4-T1: Existing Ramp Elements That Do Not Meet Design Manual Criteria -----	PP4-2
Table PP4-T2: Existing I-5 Mainline Vertical Clearances -----	PP4-2
Exhibit PP4-E1: Trosper Road Interchange soft-barrier separation with painted wide-lane-line-----	PP4-3
Exhibit PP4-E2: Existing and Proposed Northbound On-ramp Connection to I-5 Mainline and Proposed Ramp Cross Section -----	PP4-4
Exhibit PP4-E3: Vertical Clearances at Existing Bakerview Northbound Flyover On-ramp and Northbound I-5 Mainline -----	PP4-4
Exhibit PP4-E4: Interchange Spacing Existing and Proposed -----	PP4-7
Table PP5-T1: WCOG’s 2017 Six Year Transportation Improvement Program-Projects in Study Area	PP5-2
Exhibit PP5-E1: City of Bellingham’s recent development and projects under review – West Bakerview Area -----	PP5-3

Exhibit PP5-E2: City of Bellingham 2016 Comprehensive Plan – Future Land Use -----	PP5-4
Exhibit PP7-E1: State Transportation Improvement Program (STIP) Project locations-----	PP7-1
Table PP7-T1: State Transportation Improvement Program (STIP) Projects-----	PP7-1

## Executive Summary

The Interchange Justification Report (IJR) was prepared to address the engineering and operational feasibility of adding a second northbound on-ramp to I-5 from the Bakerview Road Interchange (Exit 258) in Whatcom County. The IJR lays out the interchange planning process, the evaluation of improvement alternatives, the proposed improvement, the impacts to the interstate system and local street system, and the coordination details with adopted local and regional plans that support and justify the request for an access revision. This report was prepared in accordance with the Washington State Department of Transportation's (WSDOT) Design Manual Chapter 550, (M 22-01.11 July 2014) and Federal Highways (FHWA) regulations.

### Where is the proposed improvement located?

The I-5/Bakerview Road corridor serves as the northern gateway to Bellingham from northwest Whatcom County and the lower mainland of British Columbia, Canada. This area is located within the Bellingham urban growth area and is rapidly transitioning from rural/semi urban into dense urban development.

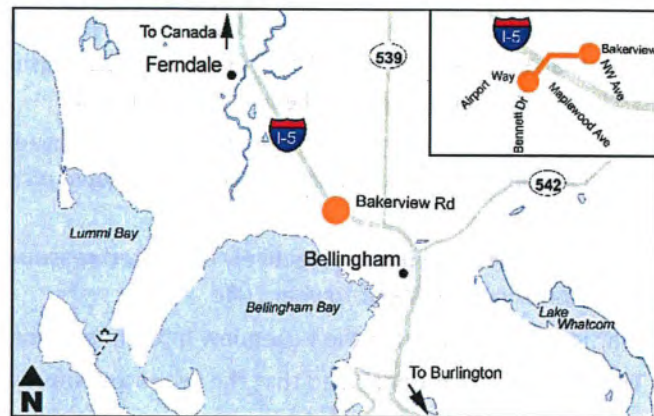
The proposed improvement is in response to several planning studies conducted over the last 10 years by the city of Bellingham, Port of Bellingham and WSDOT. Studies show that traffic will spike significantly in this section of I-5 over the next 20 years due to forecasted growth from cross-border demand, as well as residential, commercial and industrial growth.

These studies were supported by the IJR analysis, which showed that the I-5/Bakerview Road interchange would experience daily congestion and delays during peak travel periods. The analysis also revealed that the existing local street network and I-5/Bakerview Interchange would not provide adequate capacity for motorized vehicles.

### What is the proposed improvement?

The proposed improvement adds a second northbound on-ramp to I-5 at the Bakerview Interchange and reconfigures the existing vehicle lanes on Bakerview Road crossing the interchange. The new on-ramp will originate at the existing northbound off-ramp terminal. It will merge with the existing northbound on-ramp prior to making a single point connection to the I-5 mainline. The new on-ramp provides northbound access to I-5 for vehicle trips originating from the east side of the interchange. This reduces westbound vehicle trips across the Bakerview Road bridge which enables the vehicle through lanes on Bakerview Road to be reconfigured from the current two westbound lanes and one eastbound lane, to a new configuration of one westbound lane and two eastbound lanes. This provides needed eastbound capacity across the bridge and improved signalized ramp terminal operations

Exhibit EX1: Vicinity Map



Revisions to the I-5/Bakerview Interchange northbound on-ramp access point are as follows:

- Moves the gore nose 0.20 mi. south of its current location.
- Moves the on ramp merge (beginning of ramp taper) 0.25 mi. north of its current location.

The proposed improvement will improve travel along Bakerview Road through 2040 with no significant adverse impact on the operation and safety of the I-5 mainline and ramps.

## **What are the key findings/limitations?**

The following findings support the approval of a “finding of engineering and operational acceptability” for the I-5/Bakerview Interchange:

- The proposed I-5/Bakerview Interchange improvement to design and construct a second northbound on-ramp is consistent with long-range plans for the City of Bellingham, Whatcom Council of Governments (WCOG), and Whatcom County. The proposal supports regional economic vitality, and enhances overall vehicular and transit mobility in the study area.
- The improvements are consistent with WSDOT’s 2007-2026 Highway System Plan.
- The Washington State Legislature identified the proposed improvement to the I-5/Bakerview Interchange in 2015 as one of several Connecting Washington Projects (Project No. L2000119 I-5/Northbound on-ramp at Bakerview, \$10 million).
- Local corridor improvements compliment the proposed improvement to the I-5/Bakerview Interchange, but they will not be enough to resolve increased regional congestion and delays at key intersections.
- The study considered and objectively evaluated reasonable alternatives to accommodate future transportation needs out to year 2040.
- Traffic traveling through the Bakerview Interchange are primarily regional in nature.
- The safety analysis concluded that the proposed improvement would slightly increase collisions when compared to no build, on the mainline, neighboring ramps and the intersections along Bakerview. The increase was determined to be insignificant.
- The proposed improvement provides acceptable traffic operations on Bakerview Road out to year 2040 with no significant adverse impact on the operation and safety of the I-5 mainline and ramps.
- It is likely that a Documented Categorical Exclusion (DCE) will be issued for this proposal in accordance with the National Environmental Protection Act (NEPA) based on the environmental documentation prepared for the proposed improvement.

Limitations to the proposed improvement include:

- The proposed improvement maintains the current pedestrian access on the north side of the Bakerview Interchange but does not add bicycle lanes on the bridge over I-5.

# Policy Point 1: Need for the Access Point Revision

## Purpose

The purpose of this Interchange Justification Report (IJR) is to investigate and assess the existing and future transportation impacts associated with vehicular congestion and delays at the I-5/Bakerview Road interchange (Exit 258) and associated intersections in accordance with the Washington State Department of Transportation guidelines and FHWA regulations. This report will analyze alternatives and select a proposed option.

## Need

Existing traffic conditions on the I-5 mainline, ramps, and ramp terminal intersections at the I-5 Bakerview Road interchange are operating at or better than acceptable level-of-service (LOS) standards during peak travel demand. This is due to the lower cost capacity improvements completed by the city of Bellingham in 2013 on Bakerview Road within the interchange area. There has also been a significant drop in Canadian travelers that has offset some of the increase in local and regional travelers.

Future transportation forecasts show that the I-5/Bakerview Road interchange will experience daily congestion and travel delays during peak travel demand. The local street network, and Bakerview Road over I-5, does not provide adequate capacity for cars, trucks, and transit buses. Bellingham's improvements in 2013 added a sidewalk for pedestrians along Bakerview Road through the interchange area, but there was not enough room to add bicycle lanes.

The I-5/Bakerview Road corridor serves as the northern gateway to Bellingham from northwest Whatcom County and lower mainland British Columbia, Canada. It is a critical crossroad in the Whatcom County regional transportation system. The Bellingham International Airport area is immediately west of the interchange. Bakerview Road connects to extensive existing and proposed commercial, industrial and residential development to the east and west. The area surrounding the I-5/ Bakerview Road interchange and areas to the north of the interchange are also within the urban growth area of Bellingham and are rapidly transitioning from rural/semi urban into dense urban development.

## Goals for the proposed action

The proposed interchange modification will improve transportation capacity and access to regional employment, industrial and retail centers during peak travel demand while increasing opportunities for economic development. Specific goals addressed through improved mobility and access include:

- Reduce the impacts of roadway and intersection congestion during peak travel demand;
- Will not have a significant adverse impact on the operation and safety of I-5 and the affected local network;
- Maintains or reduces the severity and frequency of crashes;
- Ensure that the selected interchange improvement promotes effective and scalable transportation improvements consistent with the community's growth needs;
- Minimize impacts to the natural and built environment;
- Accommodate multi-modal traffic and freight in a safe and efficient manner

- Increase access to employment opportunities; and
- Support economic vitality.

## Study area

The study area is located on the I-5 corridor in Whatcom County, east of the Bellingham International Airport. I-5 is the main travel corridor through Whatcom County, and is the primary regional freight corridor through the City of Bellingham extending from Canada to Mexico.

The study area extends up to a half-mile on either side of the I-5 corridor from the Northwest Avenue Interchange (Exit 257), then northwest to the Bakerview Road Interchange (Exit 258) and then north to the Slater Road Interchange (Exit 260) as shown in Exhibit PP1-E1.

The primary focus of the analysis within the study area was the I-5/Bakerview Road interchange, the I-5 mainline, the ramp terminal intersections, and the on- and off-ramps to I-5. The analysis looked at 22 intersections. Intersections were evaluated for no-build and build conditions (including the proposed improvement), local street routing alternatives, and potential upstream or downstream impacts.

The following intersections and interchange areas are included in the study area:

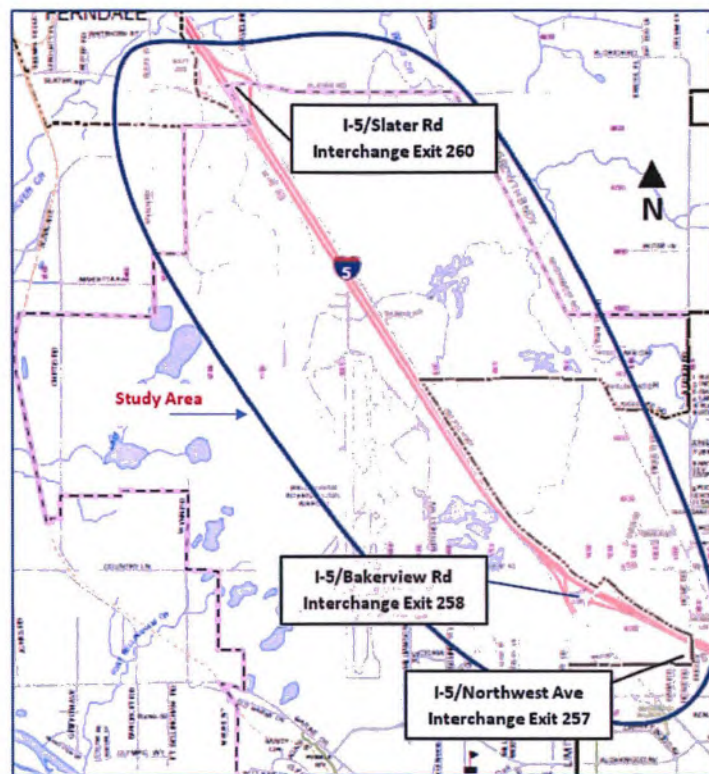
### A. Exit 260 I-5 at Slater Road

- Slater Road/Rural Road
- Slater Road/I-5 Southbound Ramps
- Slater Road/I-5 Northbound Ramps
- Slater Road/Pacific Highway
- Slater Road/Northwest Drive

### B. Exit 258 I-5 at Bakerview Road

- Bakerview Road/I-5 Southbound on-ramp
- Bakerview Road/I-5 Northbound off-ramp

Exhibit PP1-E1: Bakerview IJR Study Area



- Bakerview Road/Pacific Highway
- Bakerview Road/Arctic Avenue
- Bakerview Road/Northwest Drive
- Mahogany Street/Pacific Highway
- Mahogany Street/Arctic Avenue
- Mahogany Street/Northwest Drive
- Airport Drive/Airport Way
- Airport Drive/Bennett Drive
- Airport Drive/Bakerview Road/Maplewood Avenue /I-5 ramps

**C. Exit 257 I-5 at Northwest Avenue**

- Northwest Avenue /I-5 Northwest on-ramp
- Northwest Avenue /I-5 Northwest off-ramp
- Northwest Avenue /I-5 Southbound off-ramp
- Northwest Avenue /McLeod Road
- McLeod Road /Maplewood Avenue
- McLeod Road /I-5 Southbound on-ramp

*Exhibit PP1-E2: I-5/Bakerview Road Interchange looking south*



New roads in the study area include Mahogany Street and Arctic Avenue.

## Existing conditions

The I-5/Bakerview Road interchange was constructed in 1976, providing full-directional on- and off-ramp connections between I-5 and the local road network. The interchange bridge crossing Bakerview Road over I-5 was originally configured for one westbound through lane, one westbound left-turn lane, and one eastbound through lane with no sidewalks or bike lanes. The northbound on-ramp originates at a ramp terminal on the west side of the interchange. Since its construction, there has been dramatic growth in vehicular traffic accessing the interchange, mirroring significant residential and commercial land use changes in the area. The Bellingham International Airport has also experienced significant increases in passenger enplanements and industrial activity that has increased vehicle traffic in the area. Because of all this growth, the I-5/Bakerview interchange has long been a significant bottleneck for regional and local travelers.

In 2013, the city of Bellingham narrowed the existing lanes and shoulders across the I-5/Bakerview bridge and added an additional westbound through-lane and a sidewalk for pedestrians. The added lane doubled westbound vehicle capacity, reducing delays and traffic queues for westbound travelers. Approximately 45 percent of those westbound travelers are crossing the bridge to access the northbound on-ramp. With these improvements traffic operations at the I-5/Bakerview ramp terminal intersections improved to LOS B or LOS C in 2013. Improvements identified during the Bakerview Interchange Value Planning Study were completed in 2011.

However, delays and queuing from eastbound traffic was not addressed in the 2013 improvements. There remains only one eastbound lane across the Bakerview Road bridge. Bicycle access across the

interchange was not resolved either. For both circumstances, the width of the Bakerview Road Bridge did not provide room for any additional eastbound lanes, bike lanes, or a second sidewalk. While the 2013 improvements addressed near-term growth in traffic, the city, WSDOT and local agency partners recognized that additional improvements would be needed to address long-term transportation needs at the interchange and on the connecting local street network.

### *Regional travel demand*

Trip demand at the I-5/Bakerview interchange is predominately regional in purpose. Trip purposes include:

- Bellingham International Airport (ninth highest passenger volume airport in the six-state Northwest region).
- Regional employment center - Port of Bellingham, industrial, manufacturing, and service jobs.
- Retail shopping and regional commercial center.
- Higher education - community college and technical college access.
- Medical care facilities.
- Commerce/tourism –On a typical day, the number of Canadian visitors to Bellingham is equivalent to about nine percent of the city's population. The highest concentration of these trips are serviced by the I-5/Bakerview interchange.

## **Current and projected safety needs**

The freeway mainline and ramps at the Bakerview Road interchange do not currently experience a higher number of crashes than what is predicted for similar roadway facilities. However, as documented later in this report, the Bakerview Road segment approaching the intersection of Bakerview Road and Northwest Drive and the intersection itself, experience a higher number of collisions than expected on similar facilities.

Apart from these elements within the local road network, the freeway ramp terminal intersections are the only other elements within the existing crash analysis that exhibit a potential for safety improvements. For this reason, when choosing a proposed improvement, the IJR Support Team considered improvements to safety conditions at the freeway ramp terminal intersections.

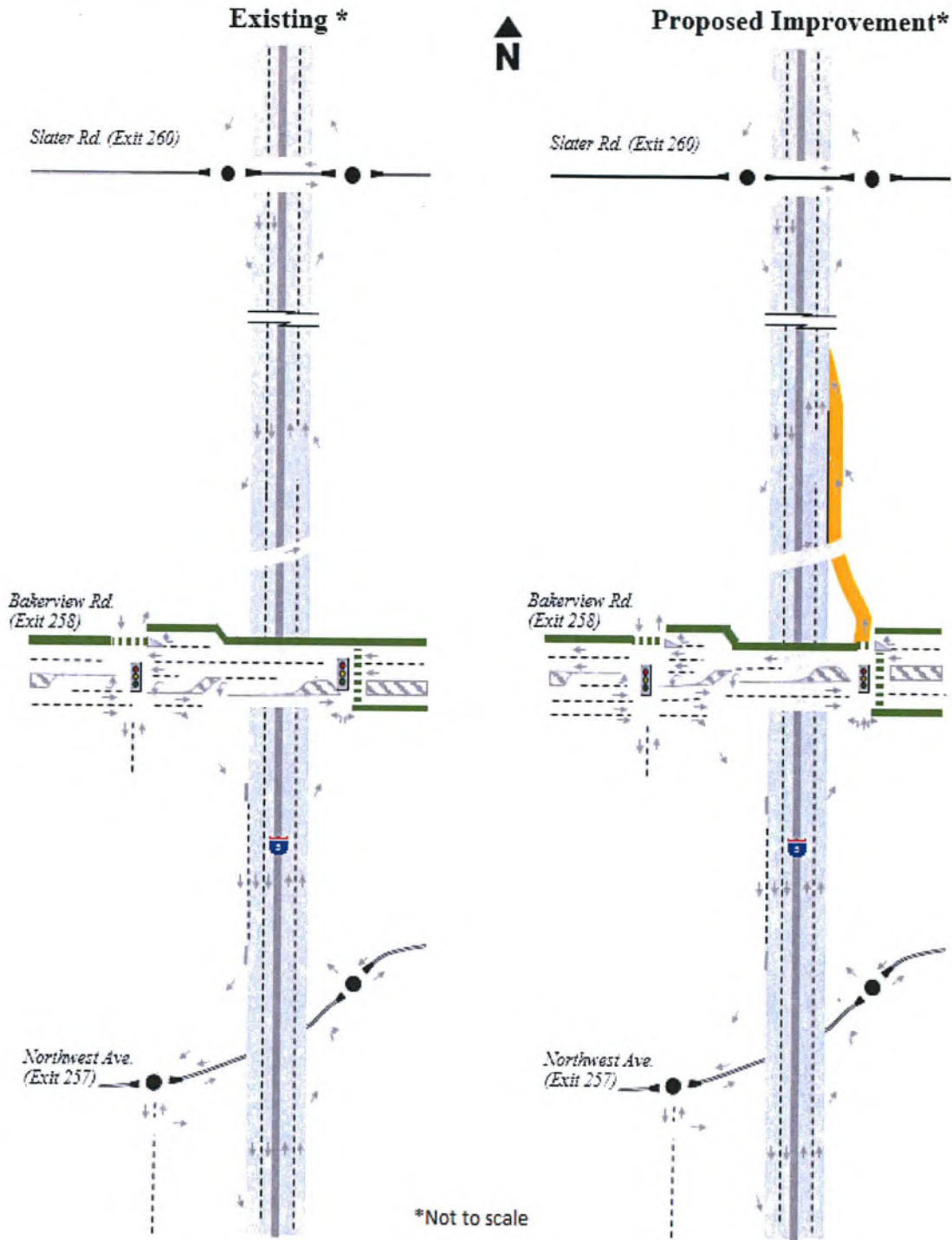
With traffic volumes projected to grow dramatically by 2020, the number of predicted collisions for all facility types will subsequently increase, which is represented in the 2020 “No Build” alternative. See the crash analysis section in Policy Point 3 for more detail.

## **The proposed improvement**

The proposed improvement includes a second northbound on-ramp highlighted in orange in Exhibit PP1-E3. The proposal modifies the northbound on-ramp connection to I-5. With the new northbound on-ramp, half of the westbound through volume across the Bakerview Bridge will shift to the new ramp, negating the need for two westbound through lanes. With only one westbound through lane needed, the width on the bridge can be dedicated to a second eastbound through lane across the bridge which enables improved intersection operations at all three of the ramp terminal intersections.



Exhibit PP1-E3: The Proposed Improvement



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## Policy Point 2: Reasonable Alternatives

### Consideration of alternatives

To address the project purpose and need, a range of alternatives were objectively evaluated by the IJR Support Team. Alternatives included local system improvements, nonmotorized improvements, intersection improvements, full rebuilds of the interchange, bridge widening, modification to existing ramps and the construction of new ramps. Transportation system management (TSM) such as ramp metering, advanced signal timing and other operational improvements were also reviewed to ensure that the alternatives did not preclude the ability to add TSM enhancements when needed. The no-build alternative was also evaluated.

Over the last decade, the city of Bellingham, WSDOT, and partner jurisdictions have studied and evaluated many transportation alternatives on the I-5/Bakerview Interchange. These studies included the Fairhaven to Slater Interstate 5 Master Plan (IMP) completed in 2008 and the I-5/Bakerview Road Interchange Value Planning Study (VPS) completed in 2011.

Other alternatives were also identified during the IJR Support Team's July 2015 brainstorming session attended by FHWA, WSDOT, the city of Bellingham, Whatcom Transit Authority, Whatcom Council of Governments, the city of Ferndale, Whatcom County, Lummi Nation and the Port of Bellingham. Seventeen alternatives were identified. Many of these alternatives included alternatives from the IMP and VPS studies mentioned above.

The IJR Support Team met three times during 2015 and 2016 to discuss and evaluate all 17 alternatives using criteria established by the IJR Support Team (see Appendix E). The criteria consisted of both qualitative and quantitative performance measures used to evaluate the alternatives' effectiveness in meeting the purpose and need for the project. Twelve alternatives were eliminated from consideration for the following reasons:

- The alternative did not satisfy the purpose and need for the project.
- The alternative was not technically or financially feasible.
- The alternative substantially duplicated another alternative, but offered little or no advantage for addressing the project's purpose and need.
- The alternative had substantial wetland environmental impacts.

From this evaluation, five alternatives were selected to undergo further analysis and review, along with the no-build and local system improvement alternatives. In addition to meeting increased vehicular demand, some of the alternatives also included non-motorized bicycle and pedestrian facilities that could be phased in when funding become available. However, preliminary analysis of local non-motorized facilities east and west of the interchange, together with the land use and trip making characteristics of the Bakerview Road corridor, raised concern that the non-motorized facilities would not attract the City's target audience. The City's nonmotorized goal is to provide facilities that focus on the "interested but concerned" travelers to reach their mode share goals. For these reasons, the City further noted that they were not ready to seek funding for the higher cost alternatives until they had an opportunity to investigate other nonmotorized options that would best meet their goals. The City also noted that they *support the recommended improvements in alternatives R-B or R-C, neither of which allow bicycle facilities or a new sidewalk across the south edge of the I-5 overpass...* (See Appendix H, page H-24).

## Evaluation of reasonable alternatives

The evaluation of reasonable alternatives included the following.

- no-build
- local street improvements
- I-5/Bakerview interchange modification (five alternatives were evaluated)

The following objectives guided the evaluation of alternatives:

<b>Safety</b>	Maintain or improve safety
<b>Effective / Scalable</b>	The project can be constructed with available funds and is scalable to address existing and future transportation demand without a loss in performance at the lowest cost.
<b>Mobility</b>	Maintains or improves motorized (vehicles, transit and freight) transportation system performance LOS D on the Bakerview interchange and I-5 mainline in 2020 and 2040.
<b>Transit</b>	Maintains or improves transit service LOS D on the Bakerview interchange and I-5 mainline in 2020 and 2040
<b>Non-motorized</b>	Maintains or improves non-motorized access and connectivity
<b>Maintenance</b>	Minimizes long-term maintenance
<b>Environment</b>	Minimal or no impact on the natural and built environment
<b>Meets access policy objectives</b>	Compatible with local, regional and state access objectives

### *No-build: Existing Conditions of the Bakerview Interchange*

The no-build alternative represents the baseline conditions of the transportation network in the study area plus funded or programed improvements that are scheduled to be open to traffic by the year of opening in 2020 or by the design year of 2040. The no-build alternative was used as a baseline comparison for identified alternatives. The no-build analysis included an evaluation of the local system.

#### **Advantages:**

- No additional right-of-way is needed.
- No environmental areas are impacted.
- Signalized off-ramp terminal intersections at the I-5/Bakerview Road interchange would be timed to minimize ramp queuing that affects I-5 mainline operations and safety.
- In 2020, the I-5 mainline operates at LOS D or better, except for the southbound section south of the Northwest Drive interchange (LOS E).
- In 2040, half of the I-5 mainline operates at LOS D or better.
- In 2020 and 2040 all of the I-5 mainline ramp merge/diverge sections operate at LOS D or better.

**Disadvantages:**

- In 2040, half of the I-5 mainline operates at LOS E. (See Policy Point 3 for more information).
- Signal timing that minimizes long off-ramp queues results in long delays and queuing along portions of Bakerview Road.
- In 2020 and 2040 PM peak, two of the three Bakerview Road I-5 ramp terminal intersections are at LOS F, failing to meet the LOS D standard.
- With the two on-ramp terminal intersections at LOS F, and well over capacity, implementation of TMS strategies, including ramp metering and advanced signal timing would be unfeasible.
- Transit operations and service that route via the Bakerview Road interchange are impacted and do not meet Whatcom Transportation Authority's (WTA) objectives for scheduled service.

*Local Transportation System Improvements*

The alternatives considered including an evaluation of reasonable local transportation system improvements, and modifications to the Bakerview Road interchange, that could meet the proposal's purpose and need without a change in access to the I-5 mainline.

**Origins, Destinations and Trip Purpose**

The evaluation of local system alternatives began with a look at the forecasted origins and destinations of trips accessing ramps or crossing the Bakerview interchange in 2040. Table PP2-T1 shows that approximately 44 percent of peak afternoon trips using the Bakerview interchange have a trip purpose to or from I-5 locations north of the Bakerview Road interchange in 2040. Another 32 percent are trips traveling to or from I-5 locations south of the Bakerview interchange. In total, 76 percent of the trips route to and from I-5 via the Bakerview interchange ramps. The remaining 24 percent of trips are traveling across the I-5 Bakerview Bridge for local trip purposes and are not using the I-5 on- or off-ramps.

*Table PP2-T1, Bakerview Interchange 2040 Trip Purpose*

<b>From</b>	<b>To</b>	<b>Trips</b>	<b>Percent of Trips</b>
local	I-5 north	1207	23.1%
I-5 north	Local	1064	20.4%
Local	I-5 south	989	19.0%
I-5 south	Local	681	13.1%
Local West	Local East	753	14.4%
Local East	Local West	522	10.0%

The volumes in Table PP2-T1 have been reduced by the application of a 20 percent mode shift for the local trips crossing east and west across the Bakerview Road interchange, and a 10 percent mode shift for the trips to and from the local system and I-5. These reduced trips shift to using local transportation system modal alternatives. See Appendix A, page A-9 for more information about mode shift.

The trip purposes accessing the Bakerview Road interchange indicate that northbound trips are tied to regional trip generators and trip attractors in close proximity to the interchange, and that most of the trips need access to/from I-5 for their trip.

- Of the forecasted 681 trips on I-5 traveling north to exit at the Bakerview off-ramp, none of them would enter at the upstream interchange at Northwest Avenue, as that short on-and-off movement on I-5 provides no benefit for local travelers.
- Of the forecasted 1207 trips from local origins on or near Bakerview Rd to destinations north on I-5, approximately 11 percent of them (127 trips) may get onto I-5 at the Bakerview interchange, travel

two miles north, and exit at the Slater Rd interchange. These shorter distance trips have some potential for diversion to the local transportation system, but the volume reduction would be insufficient to address the traffic congestion problems at the interchange.

- The remaining 89 percent of trips entering northbound at the Bakerview interchange are travelling further north to destinations that include Ferndale, Blaine, or across the border into Canada. Those trip distances would be too long and too circuitous on the local system, even if there were substantial investments made to the local system to attract those trips.

#### **Alternative improvements to the local transportation system**

- As previously discussed, significant reductions to the 2020 forecast of both local and regional traffic volumes, would not address the congestion at the I-5 northbound on-ramp at the Bakerview Road interchange. Therefore, this strategy would not be sufficient to meet the purpose and need.
- Traffic volumes traveling across the Bakerview Road bridge to access the I-5 southbound on-ramp were low, and didn't warrant an extensive origin-destination analysis to estimate local and regional trip purpose. Therefore, diversion of trips from this on-ramp to local routes would not be sufficient to address the purpose and need.
- An operational strategy to ramp meter the Bakerview Road interchange on-ramps during peak demand periods was evaluated by the IJR Support Team during the Tier I alternatives evaluations. This strategy was not carried forward for additional Tier II or Tier III evaluations because ramp metering alone would not divert a significant volume of trips from the interchange necessary to reduce congestion on Bakerview Road. Therefore, this alternative did not meet the purpose and need. The Support Team recognizes as future volumes grow, that ramp metering could improve I-5 mainline traffic flow and safety, but found that it may actually increase delays and queuing at the on-ramps and could worsen Bakerview Road congestion. Even though this strategy was not directly tied to the purpose and need for the project, this alternative was not precluded.
- We also looked at trips traveling east and west across the I-5/Bakerview Road bridge to and from local destinations on either side of the interchange for potential reductions in traffic volumes. These trips have few, if any, reasonable available alternative routes. The closest connection to the north is the I-5 crossing at the Slater Road interchange, which would add 8.7 miles to a trip that is less than 0.6 miles when routing via the Bakerview interchange. Another local route exists to the south, which would add one mile to the trip, but most of that route is through residential neighborhood streets and school zones with 25 mph posted speeds. These roads are not designed, nor appropriate, for the arterial traffic volumes using Bakerview Road.
- The only other local route alternative would be a new connection over I-5. The IJR Support Team evaluated one alternative, (Alternative O-M) which was part of the original 17 alternatives considered. Alternative O-M would construct a bridge over I-5 for local traffic, aligned with Mahogany Road, 0.5 miles north of the existing Bakerview Road interchange, and would add 1.4 miles to the trip compared to a route using Bakerview Road across I-5. During the IJR Support Team's Tier I evaluations it was determined that a significant diversion of traffic from Bakerview Road to a new Mahogany Road bridge to the north was estimated to be unlikely. Also, the west

end of a new bridge may impact a large stormwater treatment pond. The estimated cost of \$8M to \$12M for the new bridge is in the same range as the proposed improvement, not including additional costs to mitigate for stormwater pond impacts nor the cost to add or improve local road connections east and west of the new bridge. For these reasons, the IJR Support Team did not carry Alternative O-M forward for additional Tier II and Tier III evaluations.

### *I-5/Bakerview Interchange Modifications*

The following five alternatives, required modifications to the I-5/Bakerview interchange. They were evaluated under the same objectives identified above for the no-build and local system improvement.

- Alternative I-W – Widened Bakerview Road bridge
- Alternative R-B (the proposed improvement) – second northbound on-ramp to I-5 from Bakerview Road
- Alternative R-C – New northbound on-ramp and new southbound loop on-ramps to I-5
- Alternative I-E – Full diamond interchange configuration with widened 5-lane bridge and realignment of Maplewood Road to Bennett Drive
- Alternative R-R – New roundabouts at the east and west ramp terminal intersections on Bakerview Road

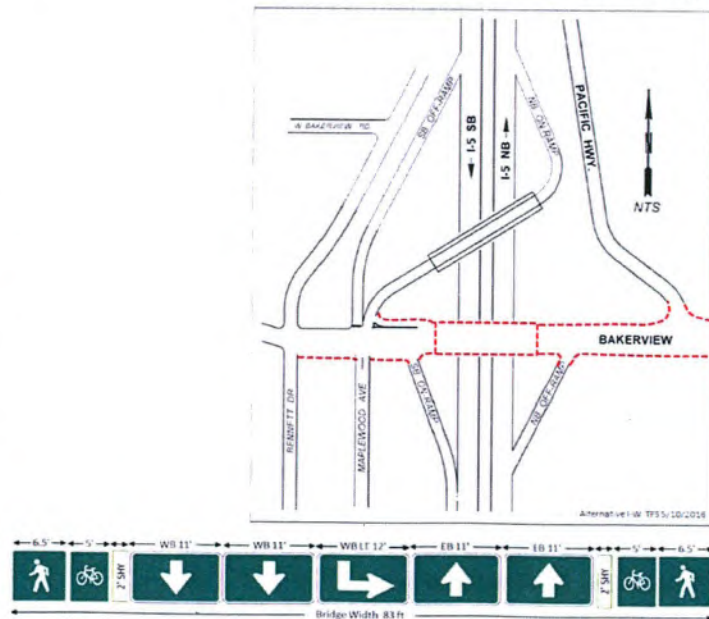
### Alternative I-W: Widen Bridge to 5-lanes

This alternative widens the Bakerview Road bridge to fit two westbound and two eastbound through lanes, and a westbound left turn lane. The widened bridge also provides room for bike lanes and pedestrian sidewalks westbound and eastbound across the bridge. All of the existing I-5 ramps and ramp terminal intersections remain unchanged.

#### **Advantages:**

- Achieves an acceptable LOS D or better in 2020 and 2040 at the Bakerview Road I-5 ramp terminal intersections.
- Has no adverse impact on I-5 mainline and ramp merge/diverge LOS (remains same as no-build)
- Has no adverse impact on upstream or downstream local road intersections (remains same as no-build).
- Significant reduction in queuing on northbound and southbound off-ramps.
- Significant reduction in westbound left-turn queue at the SB on-ramp terminal intersection.
- Adds a second eastbound through lane over the bridge providing traffic operational improvements at acceptable levels to year 2040 by adding additional capacity across bridge.

Exhibit PP2-E1: Alternative I-W: Widen Bridge



- Provides pedestrian and bicycle facilities on both sides of the bridge.
- Has the least impact to wetlands.
- Has the least amount of right-of-way needs.

**Disadvantages:**

- Does not provide the added benefit of eliminating the westbound left-turn to the southbound on-ramp to I-5.
- Estimated cost exceeds current available state funding.
- Cannot be constructed in phases

**Alternative R-B: New Northbound on-ramp to I-5 from Bakerview Rd. (Proposed Improvement)**

This alternative adds an additional northbound on-ramp on the east side of the interchange originating at the existing signalized northbound off-ramp terminal intersection. The existing northbound on-ramp would merge into the new northbound on-ramp before making one on-connection to the I-5 mainline.

With the new on-ramp, the Bakerview Road Bridge can be reconfigured for two eastbound through lanes, one westbound through lane and one westbound left turn lane without widening the bridge; however, there is no additional width available to add bike lanes and/or a second sidewalk.

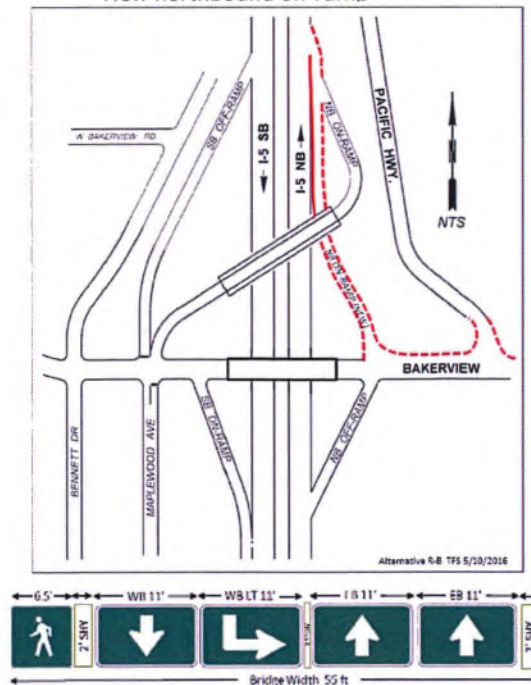
**Advantages:**

- Achieves an acceptable LOS D or better in 2020 and 2040 at the Bakerview Road I-5 ramp terminal intersections.
- Has no adverse impact on I-5 mainline and ramp merge/diverge LOS (remains same as no-build)
- Has no adverse impact on local road intersections
- Significant reduction in intersection queuing on southbound off-ramp.
- Significant reduction in westbound left-turn queue at the SB on-ramp terminal intersection.
- Improves traffic operations to year 2040 by removing over half of the westbound traffic over the bridge.
- Can be completed with current state funding.
- Has minor impacts to wetlands.

**Disadvantages:**

- Does not provide the added benefit of eliminating the westbound left-turn to the southbound on-ramp to I-5.
- Does not address bicycle access across the Bakerview Road Bridge.
- Right-of-way needed on the northeast quadrant of the Bakerview Interchange.

Exhibit PP2-E2: Alternative R-B:  
New northbound on-ramp





Alternative R-C: New northbound on-ramp with new southbound on-ramp from Bakerview Road to I-5

This alternative compliments alternative R-B by adding a southbound loop on-ramp to I-5 on the west side of the bridge, together with the new northbound on-ramp on the east side of the bridge. A new southbound loop ramp would eliminate the need for an existing westbound left-turn lane on Bakerview Road.

The new northbound on-ramp would merge with the existing northbound on-ramp before connecting to the I-5 mainline. The new southbound on-ramp would merge with the existing southbound on-ramp before connecting to the I-5 mainline. The new southbound on-ramp can be constructed as a second phase as funds become available. With the combination of these new on-ramps the Bakerview bridge can be reconfigured for two eastbound and two westbound through lanes without widening the bridge, however, there is no additional width available to add bike lanes and/or a second sidewalk.

**Advantages:**

- Achieves an acceptable LOS D or better to year 2040 at the Bakerview Road I-5 ramp terminal intersections.
- Has no adverse impact on I-5 mainline and ramp merge/diverge LOS (remains same as no-build).
- Has no adverse impact on local road intersections.
- Significant reduction in intersection queuing on southbound off-ramp.
- Compliments Alternative R-B, providing traffic operational improvements to year 2040 by removing over half of the westbound traffic over the bridge.
- Is scalable and can be constructed in phases based on funding availability.
- Provides an additional benefit by eliminating the westbound left turn movement from Bakerview Road to the southbound on-ramp to I-5.
- Observed largest reduction in total fatal and injury crashes on average from the No-Build alternative.

Exhibit PP2-E3: Alternative R-C: Combines new northbound and new southbound on-ramps to I-5



**Disadvantages:**

- Estimated total cost of both on-ramps exceeds current available state funding.
- Had the second highest environmental impact on wetlands.
- Right-of-way needed on the northeast quadrant of the Bakerview Interchange.
- Limited room for a new southbound on-ramp.
- Does not address bicycle access across the Bakerview Road bridge.

Alternative I-E: Full diamond interchange with widened 5-lane bridge and realignment of Maplewood Road to Bennett Drive

This alternative replaces the existing northbound on-ramp with a new on-ramp on the east side of the interchange originating at the existing signalized northbound off-ramp intersection. The existing southbound off-ramp is realigned to connect to a new signalized intersection with Bakerview Road and

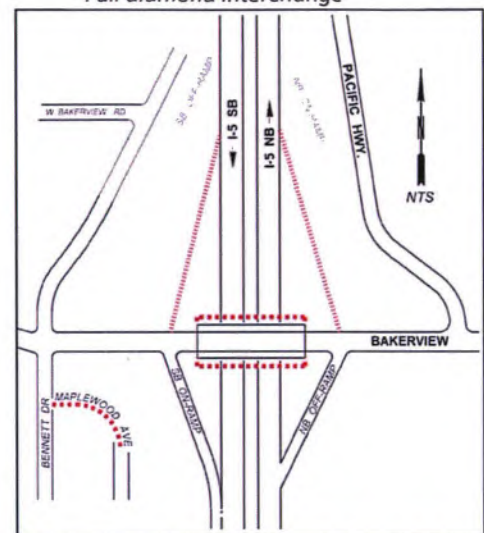
the existing southbound on ramp. The existing northbound on-ramp and southbound off-ramp will be demolished.

This alternative also includes widening the Bakerview Bridge for two eastbound and two westbound through lanes, eastbound and westbound left turn lanes, and sidewalks and bike lanes eastbound and westbound. Traffic operations were evaluated with and without the realignment of Maplewood Avenue to Bennett Drive. Realigning Maplewood Avenue to Bennett would improve left-turn movements from Bakerview Road to the southbound on-ramp to I-5.

**Advantages:**

- Achieves an acceptable LOS D or better to year 2040 at the Bakerview Road I-5 ramp terminal intersections.
- Has no adverse impact on I-5 mainline and ramp merge/diverge LOS (remains same as no-build).
- Has no adverse impact on local road intersections (remains same as no-build).
- Significant reduction in intersection queuing on southbound off-ramp.
- Improves traffic operations and capacity across bridge.
- Aligns on/off ramps intersections and removes an intersection.
- Provides pedestrian/bicycles facilities on both sides of the bridge.
- Is scalable and can be constructed in phases.

*Exhibit PP2-E4: Alternative I-E:  
Full diamond interchange*



**Disadvantages:**

- Does not provide the added benefit of eliminating the westbound left-turn to the southbound on-ramp to I-5.
- Estimated cost exceeds current available state funding.
- Medium to high environmental wetland impact.
- Right-of-way needs on the east and west side of the Bakerview Interchange.

**Alternative R-R: Roundabout at two ramp terminal intersections, widened bridge to 5-lanes, and a new northbound on-ramp to I-5**

This alternative adds an additional northbound on-ramp on the east side of the interchange originating at the existing northbound off-ramp terminal intersection. The existing northbound on-ramp would merge into the new northbound on-ramp before making one on-connection to the I-5 mainline.

The existing signalized ramp terminal intersections would be replaced with two-lane roundabouts. The southbound off-ramp would be modified to provide two left-turn lanes onto eastbound Bakerview Road. Eastbound Bakerview Road and the Bakerview Bridge would be widened for two eastbound and two westbound through lanes as well as a westbound left turn lane, sidewalks and bike lanes.

The existing westbound left-turn from Bakerview Road to the southbound on-ramp would remain unchanged and all existing ramps would remain unchanged except as noted above.

Staging of improvements will be determined by the traffic analysis.

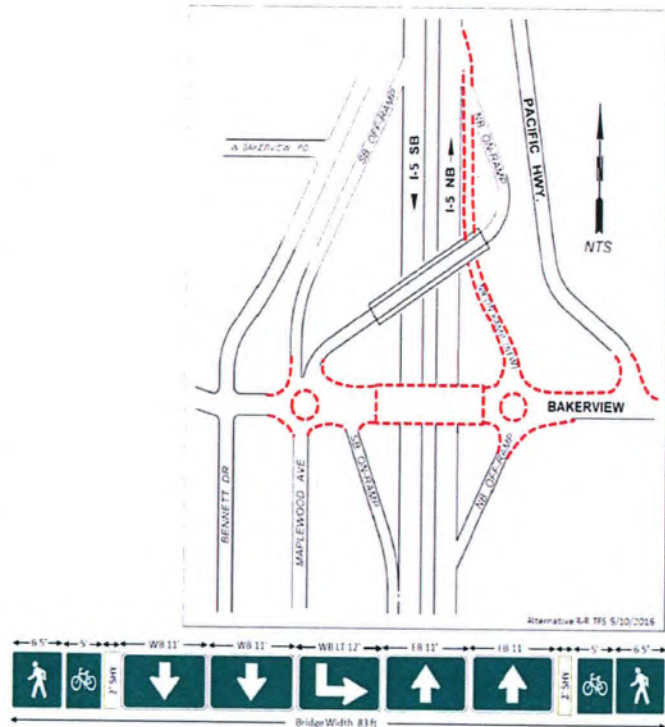
**Advantages:**

- Compliments Alternative R-B by removing over half of the westbound traffic over the bridge.
- Has no adverse impact on I-5 mainline and ramp merge/diverge LOS (remains same as no-build).
- Significant reduction in intersection queuing on northbound and southbound off-ramps.
- Provides pedestrian/bicycles facilities on both sides of the bridge.
- Can be constructed in phases

**Disadvantages:**

- Does not meet LOS D standard at all of the ramp terminal intersections.
- Roundabout at Bakerview/Maplewood/I-5 ramps intersection exceeds capacity. Eastbound movement experiences long delays and queuing.
- Roundabout worsens gaps for westbound left-turn to southbound on-ramp resulting in long delays and queues impacting upstream intersections.
- Long queues on northbound off-ramp.
- Estimated cost exceeds current available state funding.
- Right-of-way needs on the northeast quadrant of the Bakerview Interchange.

*Exhibit PP2-E5: Alternative R-R: New northbound on-ramp and roundabouts at two ramp terminal intersections*



**Summary of alternatives and key findings**

Four of the five alternatives achieve an acceptable LOS D or better to provide significant benefits compared to the future no build condition. The IJR Support Team recommended moving forward with Alternative R-B “New northbound on-ramp from Bakerview Road to I-5” as the preferred alternative (proposed improvement). The city of Bellingham agreed with that recommendation. Alternative R-B met the purpose and need of the project and provided acceptable traffic operations at year of opening 2020 and design year 2040. The analysis also showed that this alternative was the most efficient and cost-effective improvement with the least environmental impacts.

Alternative R-C also provided acceptable LOS at year of opening in 2040 and would provide additional benefits. It eliminates the westbound left turn from Bakerview Road to the southbound on-ramp to I-5, improving traffic flow and safety. It provides room on the Bakerview bridge for two westbound and two

eastbound travel lanes without widening the bridge. This alternative also had increased environmental impacts to wetlands and exceeded available state funding.

Only the roundabout alternative failed to meet the 2040 traffic operational needs. None of the alternatives would change the traffic volume to/from the freeway. Therefore mainline and ramp merge/diverge LOS remains the same as the no-build condition.

## Policy Point 3: Operational and Crash Analyses

### Traffic operations and collision analysis parameters

Within the study area, the primary focus of the operations and collision analysis was on the I-5 mainline, ramps, and the three ramp terminal intersections at the I-5/Bakerview interchange. The analysis also looked at 19 additional intersections in order to evaluate no-build conditions, local street routing alternatives, and potential upstream and downstream impacts to or from the proposed improvements.

The components of the transportation system within the study area evaluated in the traffic operations and collision analysis are identified in table PP3-T1.

Table PP3-T1: Traffic Operations and Collision Analysis

Analysis Period	Analysis Type	Traffic Operational Analysis				Collision Analysis				
		I-5 Mainline	I-5 Ramps Merge/Diverge	Ramp terminal intersections (Bakerview)	All other study area intersections	I-5 Mainline	I-5 Ramps Merge/Diverge	Ramp terminal intersections (Bakerview)	All other study area intersections	
2010 to 2014	Prior Years	Collisions					√	√	√	√
2015	Existing Conditions	No-build	√	√	√	√	√	√		
2020	Year of Opening	No-build	√	√	√	√	√	√		
		Reasonable Alternatives	√	√	√	√				
		Proposed Improvement	√	√	√	√	√	√	√	
2040	Design Year	No-build	√	√	√	√	√	√		
		Reasonable Alternatives	√	√	√	√				
		Proposed Improvement	√	√	√	√	√	√	√	

### Forecasted Traffic Volumes

The forecasting methodology used to determine the future traffic volumes is detailed in the Methods and Assumptions Document (Appendix A, page A-8). As an overview, the forecast methodology included the following:

- Whatcom Council of Governments' (WCOG) regional travel demand model was used to determine growth factors used to grow base year (2015) counts to future traffic volume forecasts for 2020 and 2040. The model distributes the highest percentage of daily trip generation to the PM peak hour based on model calibration to traffic counts.

Under 23 U.S. Code § 148 and 23 U.S. Code § 409, safety data, reports, surveys, schedules, lists compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential crash sites, hazardous roadway conditions, or railway-highway crossings are not subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

- Base-year traffic counts in the Study Area were used to determine the following analysis factors used for the 2015, 2020 and 2040 traffic operations analysis.
  - Mid-week PM peak hour volumes represent the highest demand period
  - Trucks make up 5 percent of the traffic volume
  - Transit vehicle trips are included in the overall traffic volumes
  - Volume is evenly distributed within the peak hour (a peak hour factor of 1.00)
- Pipeline development trips identified in relevant development plans and proposals that were not captured in WCOG's model were added to the future forecast volumes.
- The city of Bellingham has adopted transportation mode shift goals to reduce single occupant vehicle trips and automobile dependence while encouraging more walking, bicycling, and transit ridership. The mode shift goals shift half of the reduction in vehicle trips to bicycling. The other half shift to pedestrian, transit and work at home. A mode shift reduction in vehicle trips through the Bakerview interchange will not result in an equivalent number of bike, pedestrian and transit trips through the interchange as these modes will likely use other routes for their trip for reasons of comfort, safety and convenience. The City recommended, and the IJR Support Team concurred, to use mode shift to help inform the forecast methodology required for the IJR process. The following mode shift factors were applied to the 2040 design year traffic forecasts:
  - 20 percent reduction in vehicle trips on all local roads, including Bakerview Road across the interchange.
  - 10 percent reduction in I-5 ramp volumes at the Bakerview Road and Northwest Avenue interchanges.
  - 10 percent reduction in vehicle volume on the I-5 mainline.
  - The traffic forecast methodology is unable to assign volumes for bicycle, pedestrian, or changes to transit volumes, to specific road segments or intersections within the study area, resulting from the mode shift reductions.

The City indicated, and the Support Team concurred, that the mode shift factors should not be applied to the 2020 year of opening forecast volumes.

For more information see Appendix H pages H-17 to H-20 regarding mode shift goals, and pages H-9 to H-10 regarding bicycle and pedestrian route choice.

### *Traffic Operations and Collision Analysis Tools*

The analysis tools used to evaluate traffic operations and collisions for no-build conditions, and for the evaluation of alternatives, including the proposed improvement, are documented in the Methods and Assumptions Document in Appendix A, Page A-7. They are summarized below:

- Traffic operations analysis
  - Signalized intersections – Synchro 8.0
  - Un-signalized intersections – HCM 2010 using Synchro software
  - Roundabouts – Sidra 6.1, Sidra standard model and HCM 2000 signalized delay

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*Under 23 U.S. Code § 148 and 23 U.S. Code § 409, safety data, reports, surveys, schedules, lists compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential crash sites, hazardous roadway conditions, or railway-highway crossings are not subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.*

- I-5 freeway mainline operations and ramps merge and diverge – HCS 2010
- Collision analysis
  - Existing context of five years of historical collision data (2010 – 2014) summarized by type, cause and severity.
  - Current Safety Performance
    - Using the Highway Safety Manual (HSM) Freeway model with the Interchange Safety Analysis Tool (ISATe) to determine if the last five years of historical crash data (2010-2014) is typical for this type of freeway, ramps, and ramp terminal intersections for the last five years of traffic volumes.
    - Using the HSM Urban/Suburban model with the extended spreadsheets to determine if the last five years of historical crash data for Bakerview Road and Airport Drive is typical for this type of roadway and intersections for the last five years of traffic volumes.
  - Safety Performance of the preferred alternative
    - Using the HSM Freeway model with the ISATe spreadsheet to determine the predicted safety performance difference between the No-Build (current configuration) and the preferred interchange design for the years of 2020 and 2040.
    - Using the HSM Urban/Suburban model expanded spreadsheet to determine the predicted safety performance difference between the No-Build (current configuration) and the preferred design for Bakerview Road and Airport Drive for the years 2020 and 2040.

### *Measures of Effectiveness – Traffic Operations*

The measures of effectiveness used to evaluate alternatives, including the proposed improvement are listed below.

1. Vehicular level of service, including transit and freight vehicles should be no worse than LOS D during PM peak for:
  - I-5 mainline
  - I-5 ramps (merge/diverge)
  - I-5 ramp terminal intersections
  - All other study area intersections

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*Under 23 U.S. Code § 148 and 23 U.S. Code § 409, safety data, reports, surveys, schedules, lists compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential crash sites, hazardous roadway conditions, or railway-highway crossings are not subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.*

Tables PP3-T2 and PP3-T3 show vehicle delay and density associated with each level of service category for the I-5 mainline, ramps and ramp terminal intersections. The level of service standard is highlighted in yellow.

Table PP3-T2, I-5 Mainline and Ramp Merge/Diverge LOS and Density

Level of Service	I-5 Mainline Density (pc/mi/ln)	I-5 Merge/Diverge Density (pc/mi/ln)
A	≤ 11	≤ 10
B	≤ 18	≤ 20
C	≤ 26	≤ 28
<b>D</b>	<b>≤ 35</b>	<b>≤ 35</b>
E	≤ 45	≤ 43
F	> 45	> 43

Table PP3-T3, Intersection LOS and Ave. Vehicle Delay

Level of Service	Average Control Delay per Vehicle (seconds)		
	Signalized & Roundabout*	Two-way Stop Control**	All-way Stop Control*
A	≤ 10	≤ 10	≤ 10
B	≤ 20	≤ 15	≤ 15
C	≤ 35	≤ 25	≤ 25
<b>D</b>	<b>≤ 55</b>	<b>≤ 35</b>	<b>≤ 35</b>
E	≤ 80	≤ 50	≤ 50
F	> 80	> 50	> 50

\* average control delay of all approach legs

\*\* average control delay for worst approach leg

- Intersection queues should not block upstream intersections or travel lanes during PM peak
  - 95<sup>th</sup> percentile queue for vehicles
- Off-ramp queues should not impact I-5 mainline operations or safety
  - 95<sup>th</sup> percentile queue for vehicles
- Transit vehicles will experience a predictable trip through the study area with minimal delay (LOS D or better) in order to maintain service schedules and operational efficiency.
- Non-motorized network connectivity, convenience and comfort
  - Bicycle lanes
  - Pedestrian sidewalks

### Traffic operations analysis – no build

#### 2015 Existing Conditions, PM Peak Hour

Within the study area, all segments of the I-5 mainline and ramps are operating at, or better than the level of service standard of LOS D. Northbound, the highest density of traffic on the mainline occurs between the Bakerview northbound on-ramp and the Slater northbound off-ramp with a density of 30.0 pc/mi/ln (LOS D). Southbound, the highest density of traffic on the mainline occurs south of the Northwest Drive interchange with a density of 26.6 pc/mi/ln (LOS D). The on- and off-ramps are all operating at LOS C or better with merge/diverge densities ranging from 9.6 pc/mi/ln (LOS A) at the Bakerview northbound off-ramp to 25.9 pc/mi/ln (LOS C) at the Slater northbound off-ramp.

Study area intersections are all operating at, or better than the level of service standard of LOS D, and all but two intersections are at LOS C or better. The ramp terminal intersections at the Bakerview interchange are operating at LOS C or better.

Under 23 U.S. Code § 148 and 23 U.S. Code § 409, safety data, reports, surveys, schedules, lists compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential crash sites, hazardous roadway conditions, or railway-highway crossings are not subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.



Ramp traffic queues at all six of the study area I-5 off-ramps are minor with no upstream impact to the I-5 mainline. Eastbound and westbound intersection queues along Bakerview Road and Airport Drive do not affect upstream intersections.

Whatcom Transit Authority has three scheduled bus routes making 35 trips a day through the I-5/Bakerview interchange, either crossing interchange or traveling on or off the interchange on- and off-ramps. Transit ridership on these routes averages approximately seven passengers per trip.

There is one pedestrian sidewalk on the north side of the Bakerview interchange bridge connecting to sidewalks to the west on Airport Drive, and to a sidewalk east on Bakerview Road. There is a crosswalk across Bakerview Road at the Bakerview Road/I-5 northbound off-ramp terminal intersection, which connects to a sidewalk along Bakerview Road east of the interchange. There are no dedicated bicycle lanes across the interchange. The Bakerview Road interchange bridge has two-foot shoulders eastbound and westbound across the bridge. The nearest non-motorized crossings of I-5 north and south of the Bakerview Road interchange are as follows:

- To the north at the I-5/Slater Road interchange. There are no dedicated pedestrian or bicycle facilities along Slater Road, but there is an eight-foot sidewalk across the interchange bridge eastbound and westbound.
- To the south at the I-5/Northwest Avenue interchange. Northwest Avenue has bicycle lanes in both directions crossing under I-5 and a sidewalk on one side.

While there are no pedestrian or bicycle volume counts available within the study area, the city of Bellingham did evaluate the Bakerview Road interchange area for pedestrian and bicycle connectivity using ViaCity software. The evaluation provides GIS map graphics showing the extent of land parcels that would benefit from improved pedestrian and bicycle connectivity in and near the study area. What ViaCity does not do is provide an assessment of the qualitative aspects of sidewalk and bicycle connections, which may be more of a determinant of use if these facilities were in place at the interchange. Bellingham's Bicycle and Pedestrian Master Plans identify several lower speed, lower volume, lower stress walking and bicycling routes that provide possible alternatives to walking and biking on Bakerview Road, including across the Bakerview Road I-5 overpass during periods of peak traffic volumes. For more information, see Appendix H pages H-2 to H-16.

#### 2020 Year of Opening No Build Conditions, PM Peak Hour

Within the study area, all segments of the I-5 mainline are forecasted to operate at, or better than the level of service standard of LOS D with the exception of southbound I-5 south of the Northwest interchange at LOS E (density of 36.2 pc/mi/ln). Northbound, the highest density of traffic on the mainline occurs between the Bakerview northbound on-ramp and the Slater northbound off-ramp with a density of 33.0 pc/mi/ln (LOS D) which is nearing the density for LOS E conditions. The on- and off-ramps are all operating at the LOS D standard or better with merge/diverge densities ranging from 11.3 pc/mi/ln (LOS B) at the Bakerview northbound off-ramp to 29.2 pc/mi/ln (LOS D) at the Northwest Drive interchange southbound on-ramp.

Of the study area intersections, nine are forecasted to operate worse than the level of service standard of LOS D, and 13 operate at LOS D or better. Of the nine falling below the LOS standard, all but two have

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planned or funded improvements expected within the next five to ten-years, which will improve capacity and traffic operations. Specific details of those improvements have not been determined at this time. This did not allow for an evaluation of traffic operations for those planned or funded improvements. The remaining two intersections forecasted to fall below LOS D are the Northwest Avenue/ McLeod Road intersection (LOS E), and the Northwest interchange SB off-ramp terminal (LOS F). At the Bakerview interchange, two of the ramp terminal intersections are forecasted to operate below the level of service standard of LOS D during PM peak hour. Those intersections are:

- Bakerview Road/Maplewood/Road/I-5 ramps intersection operates at LOS F (delay of 85.4 sec/vehicle)
- Bakerview Road/Southbound on-ramp intersection at LOS F (delay of 389.4 sec/vehicle)

Ramp traffic queues at all six of the study area I-5 off-ramps are minor with no upstream impacts to the I-5 mainline. Eastbound and westbound intersection queues along Bakerview Road and Airport Drive impact upstream intersections as follows:

- Westbound approach leg 95<sup>th</sup> percentile queue at the Bakerview Road/SB on-ramp intersection is forecasted to block two upstream intersections in PM peak hour.
- Westbound approach leg 95<sup>th</sup> percentile queue at the Bakerview Road/NB off-ramp intersection is forecasted to block one upstream intersection in PM peak hour.
- Eastbound approach leg 95<sup>th</sup> percentile queue at the Bakerview Road/Maplewood/I-5 ramps intersection is forecasted to block one upstream intersection in PM peak hour.

Transit, bicycle or pedestrian facilities, connections or volumes reported for 2015 existing conditions above also apply to 2020 no build conditions.

#### 2040 Year of Opening No Build Conditions, PM Peak Hour

Within the study area, only half of the segments of the I-5 mainline are forecasted to operate at, or better than the level of service standard of LOS D with the remaining segments at LOS E. Northbound, the highest density of traffic on the mainline occurs between the Bakerview northbound on-ramp and the Slater northbound off-ramp with a density of 36.6 pc/mi/ln (LOS E). Southbound mainline segments beginning at the Slater SB on-ramp are all at LOS E with densities ranging from 38.1 to 40.7 pc/mi/ln. The on- and off-ramps are all operating at LOS D or better with merge/diverge densities ranging from 12.9 pc/mi/ln (LOS B) at the Bakerview northbound off-ramp to 30.6 pc/mi/ln (LOS D) at the Slater northbound off-ramp.

Of the study area intersections, eight are forecasted to operate worse than the level of service standard of LOS D, and 14 operate at LOS D or better. Of the eight falling below the LOS D only one intersection (Bakerview Road/Northwest Drive) does not have an improvement funded or planned at this time. The city of Bellingham has recently hired a consultant to evaluate safety and traffic operations at this intersection. Two intersections forecasted to fall below LOS D in 2020, the Northwest Avenue/ McLeod Road intersection, and the Northwest interchange SB off-ramp terminal, improve to LOS D or better in 2020 as a result of a reduction in traffic volumes attributed to the mode-shift factor explained on page PP3-2. At the Bakerview interchange, two of the ramp terminal intersections are forecasted to operate below the level of service standard of LOS D during PM peak hour. Those intersections are:

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- Bakerview Road/Maplewood/Road/I-5 ramps intersection operates at LOS F (delay of 95.4 sec/vehicle)
- Bakerview Road/SB on-ramp intersection at LOS F (delay of 457.7 sec/vehicle)

Ramp traffic queues at all six of the study area I-5 off-ramps are minor with no upstream impacts to the I-5 mainline. Eastbound and westbound intersection queues along Bakerview Road and Airport Drive impact upstream intersections as follows:

- Westbound approach leg 95<sup>th</sup> percentile queue at the Bakerview Road/SB on-ramp intersection is forecasted to block two upstream intersections in PM peak hour.
- Westbound approach leg 95<sup>th</sup> percentile queue at the Bakerview Road/Northbound off-ramp intersection is forecasted to block one upstream intersection in PM peak hour.
- Eastbound approach leg 95<sup>th</sup> percentile queue at the Bakerview Road/Northbound off-ramp intersection is forecasted to block one upstream intersection in PM peak hour.
- Eastbound approach leg 95<sup>th</sup> percentile queue at the Bakerview Road/Maplewood/I-5 ramps intersection is forecasted to block one upstream intersection in PM peak hour.

Transit, bicycle or pedestrian facilities, connections or volumes reported for 2015 existing conditions above also apply to 2040 no build conditions.

Refer to Exhibit PP3-E1 for level of service results and traffic volumes for 2015, 2020 and 2040 no-build traffic operations. Appendix C pages C87 to C89 provide a complete list of no-build results for level of service, traffic densities, intersection delay and queuing in the study area.

## Traffic operations analysis with proposed improvement

The proposed improvement adds a second northbound on-ramp at the I-5/Bakerview Road, originating from the east side of the interchange. The existing and new northbound on-ramps will merge before making one on-connection to the I-5 mainline. This change results in a 47 percent reduction in westbound through traffic across the I-5 Bakerview Bridge in 2020 and 2040, and makes it operationally feasible to reduce the number of westbound through lanes across the bridge from the current two down to one. This frees up space on the bridge to add a second eastbound through lane over the bridge and a second left-turn lane at the southbound off ramp. With these changes, the proposed improvement results in the following PM peak traffic operations in 2020 and 2040:

- Bakerview Road/SB on-ramp terminal intersection benefits from improved eastbound traffic flow resulting in more frequent and longer gaps in traffic for the westbound left-turn from Bakerview Road to the SB on-ramp.
  - 2020 no build LOS F, (389.4 seconds average delay)
  - 2020 with proposed improvement, LOS C (24.8 seconds average delay)
  - 2040 no build LOS F, (457.7 seconds average delay)
  - 2040 with proposed improvement LOS D, (25.4 seconds average delay)

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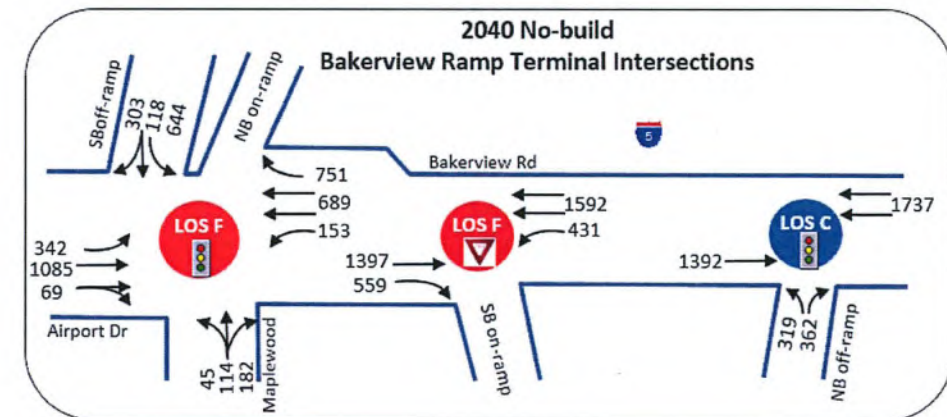
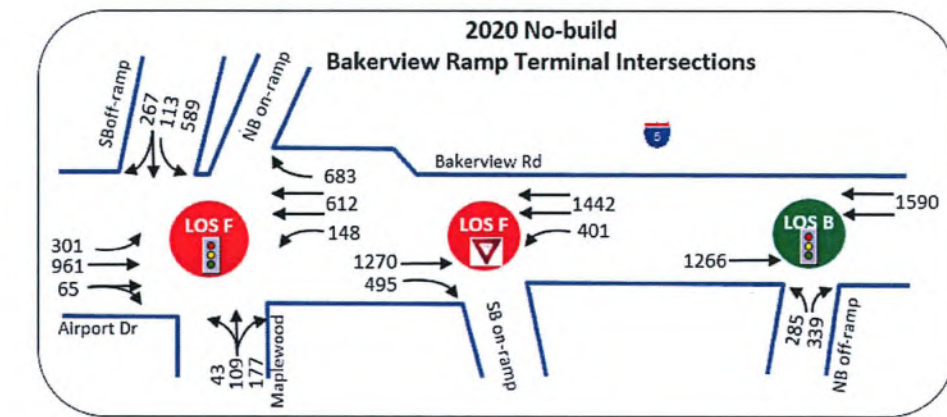
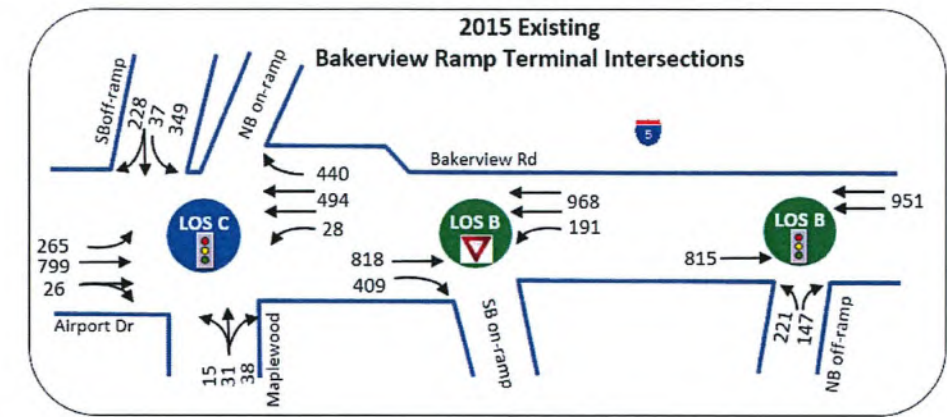
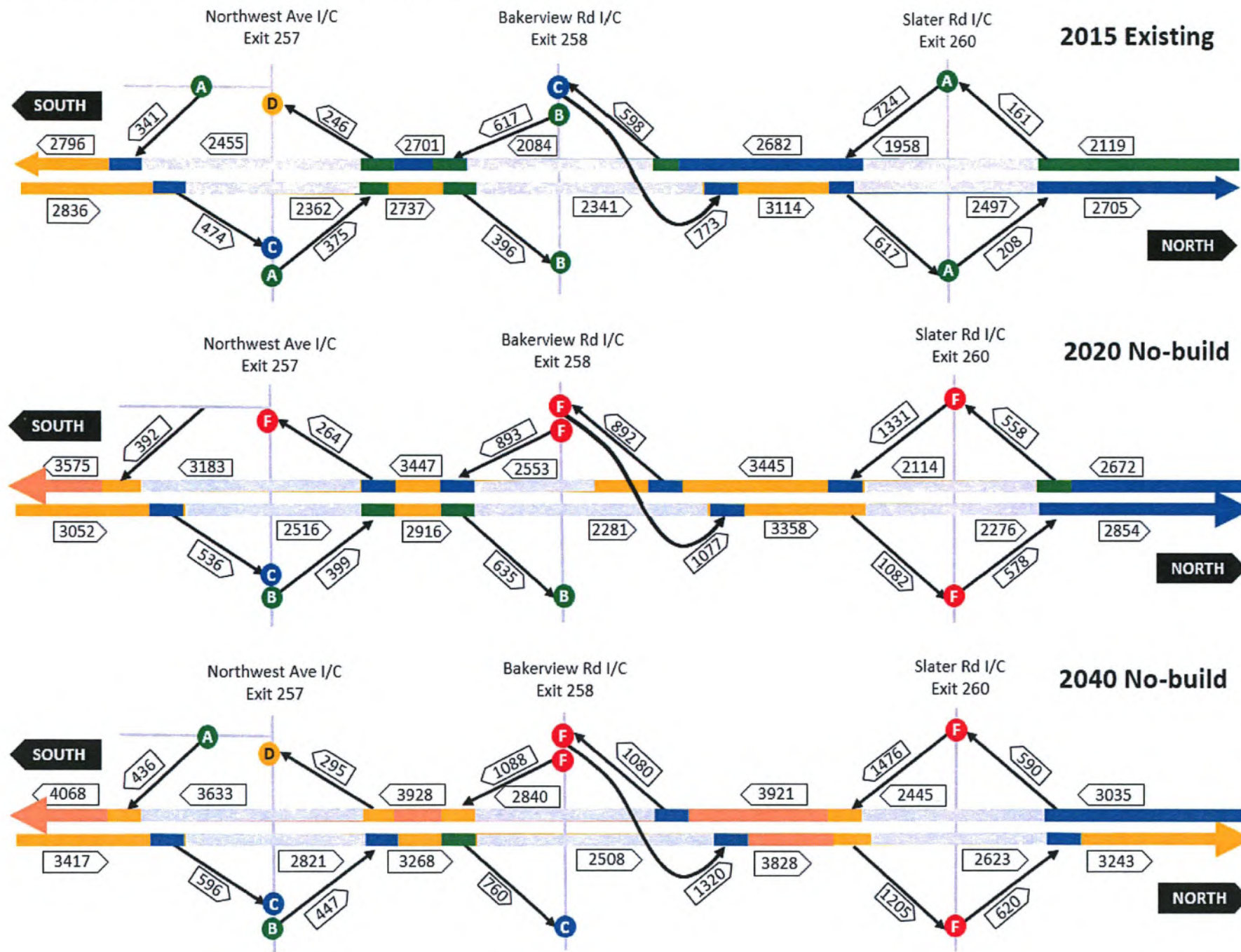
- Bakerview Road/Maplewood Road/I-5 ramp terminal intersection volumes are reduced by 17 percent in 2020 and 2040 due to a shift in westbound right-turn volumes to the new northbound on-ramp. The addition of a second left-turn lane (and a second receiving lane on Bakerview Road) at the SB off-ramp increases intersection capacity and allows for improved signal timing.
  - 2020 no build LOS F, (85.4 seconds average delay)
  - 2020 with proposed improvement, LOS D (46.3 seconds average delay)
  - 2040 no build LOS F, (95.4 seconds average delay)
  - 2040 with proposed improvement, LOS D (44 seconds average delay)
- Bakerview Road/Northbound ramp terminal intersection operations improve due to a 43 percent reduction in westbound through volumes that change to a right-turn movement to the new northbound on-ramp.
  - 2020 no build LOS B, (14.3 seconds average delay)
  - 2020 with proposed improvement, LOS A (9.7 seconds average delay)
  - 2040 no build LOS C, (25.8 seconds average delay)
  - 2040 with proposed improvement, LOS B (11.3 seconds average delay)
- I-5 mainline northbound and southbound volumes, traffic densities, and level of service are the same for the proposed improvement as they are for 2020 and 2040 PM peak no build conditions.
  - In 2020 all mainline segments in the study area operate at, or better than LOS D with the exception of southbound I-5 south of the Northwest Avenue interchange (LOS E).
  - In 2040 half of the mainline segments operate at, or better than LOS D. The other half operate at LOS E.
- I-5 ramp merge and diverge volumes, traffic densities and level of service are the same for the proposed improvement as they are for 2020 and 2040 PM peak no build conditions.
  - In 2020 all of the ramp merge/diverge connections to the I-5 mainline are at, or better than LOS D.
  - In 2040 all of the ramp merge/diverge connections to the I-5 mainline are at, or better than LOS D.
  - The proposed improvement, with two northbound on ramps originating at separate ramp terminal intersections may reduce platooning of traffic at the Bakerview NB on-ramp merge to the I-5 mainline. We were unable to quantify this potential benefit with the traffic analysis tools used.

Refer to Exhibit PP3-E2 for level of service results and traffic volumes for 2015, 2020 and 2040 traffic operations with the proposed improvement. Appendix C pages C87 to C89 provide a complete list of level of service, traffic densities, intersection delay and queuing for the proposed improvement within the study area.

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Exhibit PP3-E1: Traffic Volumes and Level of Service – No Build Conditions, PM Peak Hour



Level of Service			
LOS A & B		LOS E	
LOS C		LOS F	
LOS D		Not Evaluated	

I-5 Mainline & Ramp Volumes	
Signal	
Left-Turn Yield	

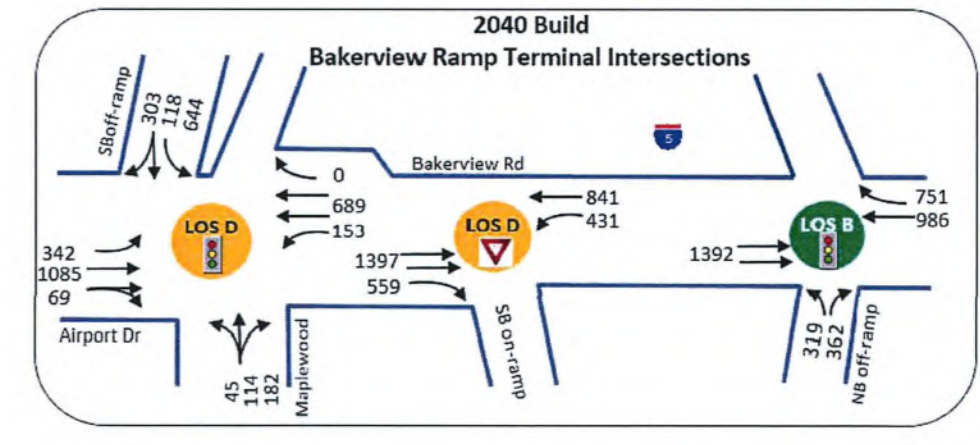
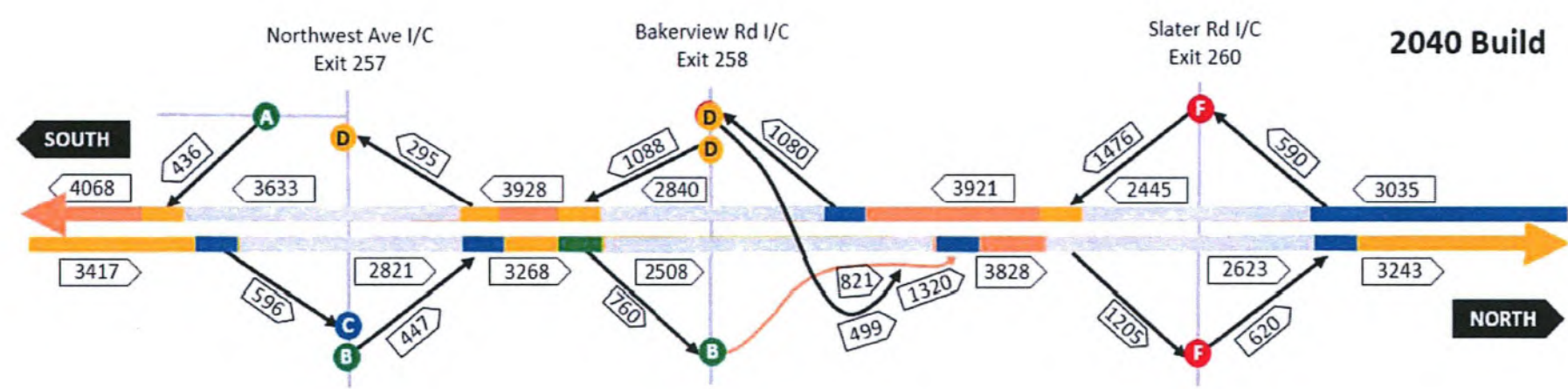
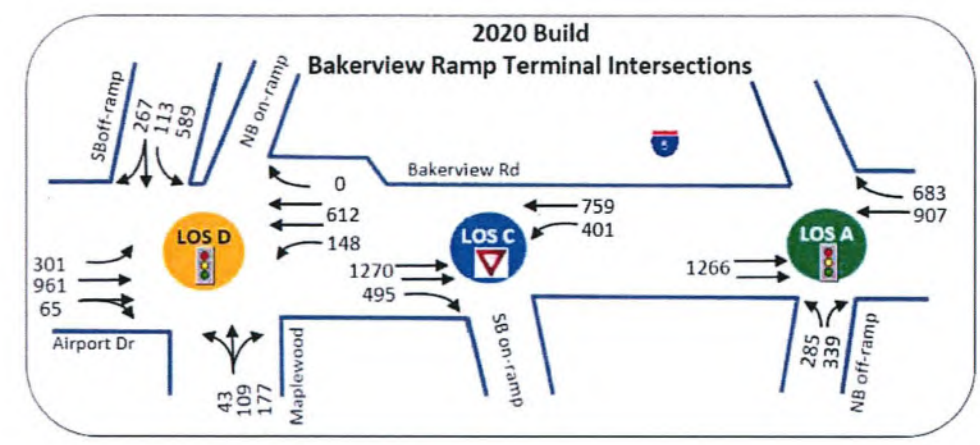
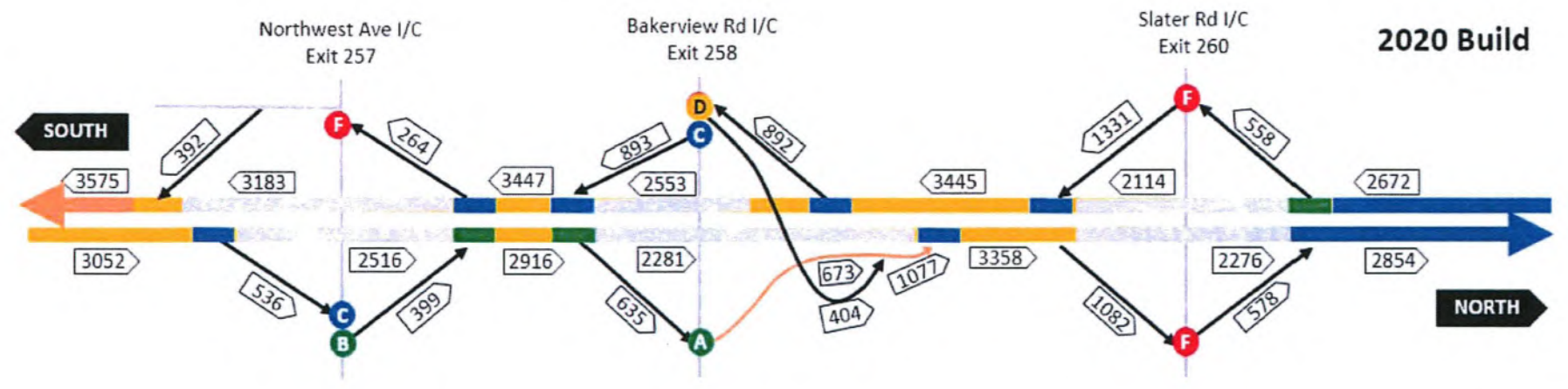
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Exhibit PP3-E2: Traffic Volumes and Level of Service - Proposed Improvements, PM Peak Hour



Level of Service			
LOS A & B		LOS E	
LOS C		LOS F	
LOS D		Not Evaluated	
		Signal	
		Left-Turn Yield	

I-5 Mainline & Ramp Volumes

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## Crash analysis

This section provides an overview for the IJR crash analysis given the following conditions: the existing (or observed) condition as well as a comparison between the no-build condition and proposed improvement for the opening year (2020) and design year (2040). Refer to the Glossary in Appendix J for further information about the terms used in the crash analysis portion of this report.

### Crash Study Years

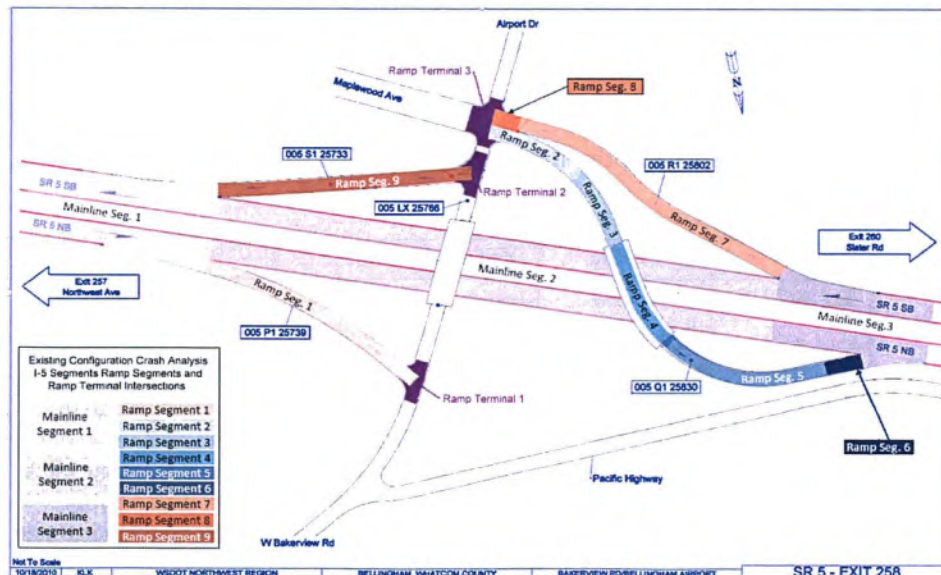
The five study years beginning January 1, 2010 through to December 31, 2014 were used to determine the current safety performance, and if that performance had more or less crashes than is typical for this type of design. The predicted safety performances of the no-build condition and the proposed design in the opening year of 2020 and design year of 2040 were used to determine if the proposed design is estimated to have a significant increase in crashes versus the no-build condition.

### Crash Study Area for Current Condition

The freeway and ramp analysis segments for analyzing the existing condition are shown in Exhibit PP3-E3 and are listed below:

- I-5 mainline, both directions, MP 257.23 – 258.30 is separated into three analysis segments
- I-5/Bakerview Road interchange ramps are separated into nine analysis segments
  - I-5 Northbound Off-ramp (analysis segment 1)
  - I-5 Northbound On-ramp (analysis segments 2 – 6)
  - I-5 Southbound Off-ramp (analysis segments 7 and 8)
  - I-5 Southbound On-ramp (analysis segment 9)
- I-5/Bakerview Road interchange, three ramp terminal intersections

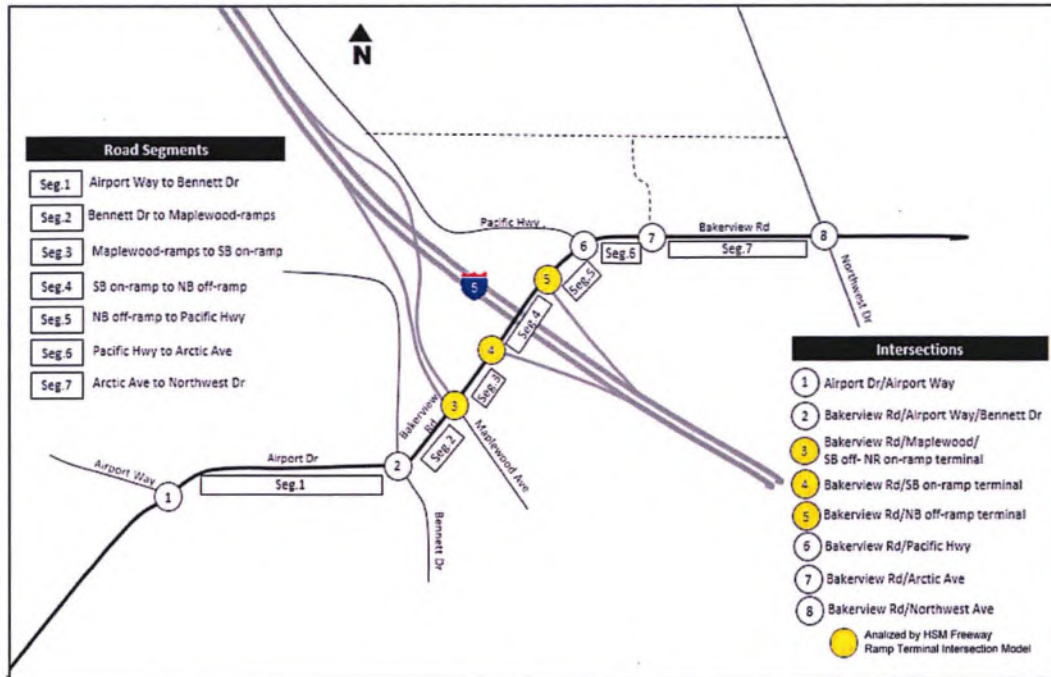
Exhibit PP3-E3: I-5/Bakerview Freeway Existing Condition Analysis Segments and Intersections



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The crash analysis intersections and road segments along Airport Drive and Bakerview Road are shown in Exhibit PP3-E4.

Exhibit PP3-E4: Airport Drive and Bakerview Road Crash Analysis Intersections and Road Segments



As mentioned above, the intersections along Bakerview Road at the freeway ramp terminals (intersections 3 - 5) were analyzed as ramp terminal intersections using the HSM freeway ramp terminal intersection model. The rest of the intersections (1,2,5,6,7 & 8) were analyzed using the HSM Urban/Suburban intersection model. Crashes coded as "intersection related" were included in the intersection analysis. All other crashes were analyzed as segment related crashes.

### Recent Safety Projects

Table PP3-T5 tabulates recent projects completed prior from 2009 to 11/30/2016.

Table PP3-T5: I-5/Bakerview Road Interchange Recent Safety Projects

PROJECT	AGENCY	DATE	LOCATION	DESCRIPTION
Access Improvements	City of Bellingham	11/18/2016	Bakerview Road/ Pacific Highway I/S.	Installed median C-curb to restrict left-turns at the intersection of Bakerview Road and Pacific Hwy.
Pedestrian and Vehicle Mobility Improvements	City of Bellingham	Summer 2013	Bakerview Road from Bennett Drive to Arctic Avenue	Re-channelized lanes on Bakerview include the addition of a 2nd westbound travel lane, a right-turn drop lane to the northbound on-ramp and a continuous pedestrian pathway with a 6-foot sidewalk with pedestrian signals on the north side of the overpass.

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## Observed Crashes

The following sections report on the observed crash types, severity, and contributing factors for the existing conditions between the years of 2010 - 2014. The following crash data is presented separately for both the freeway and arterial facilities.

### Freeway Facility

The freeway facility consisted of three freeway segments, nine ramp segments and three ramp terminal intersections as defined in the *Crash Study Area* section above. In the observed study period, the entire freeway facility observed a total of 129 crashes at approximately 25.8 crashes per year.

Of the total observed freeway facility crashes,

- 32 percent occurred on the freeway mainline (8.2 per year)
- 5 percent on the freeway ramps (1.2 per year), and
- 63 percent at the freeway ramp terminal intersections (16.4 per year).

### Freeway Mainline

There were no fatal or serious injury crashes on the I-5 mainline within the study limits. Of the total crashes, roughly twelve percent resulted in injury.

Table PP3-T6: Northbound Mainline - Observed Crashes by Crash Type and Injury Severity

CRASH TYPE	Evident	Possible	Property Damage Only	2010 – 2014 [Total]	Percentage
Fixed object	1	1	13	15	56%
Rear-end	1		3	4	15%
Animal			4	4	15%
Sideswipe			2	2	7%
Other			2	2	7%
<b>Totals</b>	<b>2</b>	<b>1</b>	<b>24</b>	<b>27</b>	<b>100%</b>

Table PP3-T7: Southbound Mainline – Observed Crashes by Crash Type & Injury Severity

CRASH TYPE	Evident	Possible	Property Damage Only	2010 – 2014 [Total]	Percentage
Fixed object			6	6	43%
Overturn	1		2	3	22%
Rear-end		1	1	2	14%
Animal			2	2	14%
Sideswipe			1	1	7%
<b>Totals</b>	<b>1</b>	<b>1</b>	<b>12</b>	<b>14</b>	<b>100%</b>

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The most prevalent crash type that occurred on the freeway mainline in the observed study period was fixed object type crashes. The primary contributing factors for fixed object crashes were speed, driver distraction and inattention. The second most prevalent crash type was rear-end type crashes. Roughly, half of the crashes that occurred on the mainline occurred during the dark hours of the day.

Table PP3-T8: Freeway Segments Fatal and All Injury Predicted and Expected Crashes (See Appendix D, Exhibit D6, rows 20 & 21)

Project Element: Freeway Segments	Fatal and Injury (KABC) Crashes/year		
	(Predicted) Typical average number of crashes/year (cpy)	(Expected) Experienced average number of crashes/year (cpy)	Difference in Number of crashes/year (cpy)
Segment 1 MP 257.23 – MP 257.40	0.9	0.7	0.2 less cpy
Segment 2 MP 257.40 – MP 257.95	1.8	1.5	0.3 less cpy
Segment 3 MP 257.95 – MP 258.30	1.9	1.2	0.7 less cpy
<b>Totals</b>	<b>4.6</b>	<b>3.4</b>	<b>1.2 less cpy</b>

According to the HSM Freeway Mainline model, all of the existing mainline segments in the last five years have been experiencing 1.2 less crashes per year (expected vs. predicted) than is typical for this type of freeway with these volumes.

### Freeway Ramps

There was only one serious injury crash on the freeway ramps. It was on the I-5 Northbound on-ramp (Q1 25830) (see description below). There were no fatal crashes on any of the freeway ramps.

There were only six crashes that occurred on the four Bakerview Road interchange ramps that were ramp-related. The most prevalent crash type was rear-end crashes.

- I-5 Northbound Off-ramp (P1 25739): Two total crashes
  - One rear-end crash, property damage only
  - One animal crash, property damage only
- I-5 Northbound On-ramp (Q1 25830): Two total crashes
  - One serious injury bicyclist crash – the bicyclist attempted to cross the ramp near the mainline merge and did not grant right-of-way to the vehicle during dark lighting conditions
  - One fixed object crash in snow during dark that resulted in property damage only
- I-5 Southbound Off-ramp (R1 25802): One rear-end crash that resulted in possible injury
- I-5 Southbound On-ramp (S1 25733): One rear-end crash near the mainline merge on wet surface that resulted in property damage only

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Table PP3-T9: Freeway Ramps Fatal and All Injury Predicted and Expected Crashes. (See Appendix D, Exhibit D6, rows 33 & 34)

Project Element: Individual Ramps	Fatal and Injury (KABC) Crashes/year		
	(Predicted) Typical average number of crashes/year (cpy)	(Expected) Experienced average number of crashes/year (cpy)	Difference in Number of crashes/year (cpy)
NB Off-Ramp (P1 25739)	0.2	0.1	0.1 less cpy
NB On-Ramp (Q1 25830)	0.6	0.4	0.2 less cpy
SB Off-Ramp (R1 25802)	0.4	0.2	0.2 less cpy
SB On-Ramp (S1 25733)	0.3	0.2	0.1 less cpy
<b>Totals</b>	<b>1.5</b>	<b>0.9</b>	<b>0.6 less cpy</b>

According to the HSM Freeway Ramp model, in the last five years all of the existing ramps have been experiencing 0.6 less crashes (expected vs. predicted) than is typical for these types of ramps.

### Freeway Ramp Terminal Intersections

There were no fatal or serious injury crashes at any of the ramp terminal intersections. A more detailed description of each ramp terminal intersection's safety performance is provided in this section.

#### **I-5 Southbound Off-ramp/I-5 Northbound On-ramp/Maplewood Avenue/W. Bakerview Road**

There has been five evident injury crashes, five possible injury crashes and 19 property damage only crashes at this intersection. The three highest percentage crash types were rear-ends at 40 percent; entering-at-angle at 28 percent; and opposite-direction-one turning left and one going straight.

There was one pedestrian evident injury crash (in 2012) which involved a vehicle making a southbound right-turn at the I-5 southbound off-ramp striking a pedestrian walking westbound crossing the north leg of the intersection. This crash occurred prior to the pedestrian improvements constructed in 2013 by the city of Bellingham. (See Table PP3-T10)

Table PP3-T10: Maplewood Avenue/Bakerview Road/I-5 Intersection - Observed Crashes by Crash Type & Injury

CRASH TYPE	Evident	Possible	Property Damage Only	2010 – 2014 [Total]	Percentage
Rear-end	2		10	12	40%
Entering-at-angle	1	3	4	8	28%
Opposite-Dir 1LT-1STR	1	2	3	6	21%
Sideswipe			2	2	7%
Pedestrian	1			1	3%
<b>Totals</b>	<b>5</b>	<b>5</b>	<b>19</b>	<b>29</b>	<b>100%</b>

This I-5 southbound off-ramp terminal intersection has, in the last five years, experienced 0.4 more injury crashes/year (equivalent to one crash every three years) than is typical for this type of intersection. (See table PP3-T11)

Under 23 U.S. Code § 148 and 23 U.S. Code § 409, safety data, reports, surveys, schedules, lists compiled or collected for the purpose of identifying, evaluating, or planning the safety enhancement of potential crash sites, hazardous roadway conditions, or railway-highway crossings are not subject to discovery or admitted into evidence in a Federal or State court proceeding or considered for other purposes in any action for damages arising from any occurrence at a location mentioned or addressed in such reports, surveys, schedules, lists, or data.

The number of enter-at-angle and opposite direction left-turn crashes is higher than what is typical for this type of intersection. The distribution of enter-at-angle and opposite direction left turn crashes includes vehicles travelling in the following directions:

- Six westbound towards Airport Drive
- Four southbound towards Southbound I-5
- Three eastbound towards town
- One northbound towards Northbound I-5

The primary contributing factor for 50 percent of these crash types was “disregard control” meaning they ran the stop light.

Table PP3-T11: Maplewood Avenue/Bakerview Road/I-5 Intersection - Fatal and All Injury Predicted and Expected Crashes (See Appendix D, Exhibit D6, rows 40 & 41)

Project Element: Ramp Terminal Intersection	Fatal and Injury (KABC) Crashes/year		
	(Predicted) Typical average number of crashes/year (cpy)	(Expected) Experienced average number of crashes/year (cpy)	Difference in Number of crashes/year (cpy)
I-5 Southbound Off-ramp/ I-5 Northbound On-ramp/ Maplewood Avenue/ West Bakerview Road (Terminal 3)	1.7	2.1	On average there have been 0.4 more cpy (rate: 1 crash in 2 yrs)

#### I-5 Southbound on-ramp Intersection

Roughly, 75 percent of the total crashes occurred prior to the city of Bellingham’s re-channelization project along Bakerview Road in 2013. In addition, roughly 75 percent of all crashes occurred in the eastbound direction.

The number of rear-end crashes per year that occurred following the 2013 project was on average 1.5 crashes per year (two in 2013 and one in 2014).

Table PP3-T12: I-5 Southbound On-ramp Intersection - Observed Crashes by Crash Type & Injury

CRASH TYPE	Evident	Possible	Property Damage Only	2010 – 2014 [Total]	Percentage
Rear-end (77% EB)	1	2	10	13	65%
Others: 1 FO, 1 ODLT, 2 OD (EB), 1 SS		1	6	7	35%
<b>Totals</b>	<b>1</b>	<b>3</b>	<b>16</b>	<b>20</b>	<b>100%</b>

In the last five years, the I-5 southbound on-ramp terminal intersection has experienced 0.3 more crashes/year (equivalent to one crash every three years) than is typical for this type of intersection. (See Table PP3-T13)

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The number of rear-end crashes that occurred at this intersection is higher than what is predicted for a similar intersection.

Table PP3-T13: I-5 Southbound On-ramp Intersection - Fatal and All Injury Predicted and Expected Crashes (See Appendix D, Exhibit D6, rows 40 & 41)

Project Element: Ramp Terminal Intersection	Fatal and Injury (KABC) Crashes/year		
	(Predicted) Typical average number of crashes/year (cpy)	(Expected) Experienced average number of crashes/year (cpy)	Difference in Number of crashes/year (cpy)
I-5 Southbound On-ramp (Terminal 2)	0.6	0.9	On average there have been 0.3 more cpy (rate: 1 crash in 3 years)

### I-5 Northbound Off-ramp Intersection

This ramp terminal intersection has experienced, in the last five years, 14 entering-at-angle crashes and 14 rear-end crashes. Roughly half of the total number of rear-end crashes occurred in 2012. The average number of rear-end crashes occurring in all of the other study years was 1.5 per year (one in 2010 and 2013, and two in 2011 and 2014). (See Table PP3-T14)

Roughly, 80 percent (11) of the total enter-at-angle crashes involved a vehicle travelling eastbound striking a vehicle making the northbound left from the off-ramp. The primary contributing factor listed for roughly 65 percent (7) of these 11 crashes was “disregard control” for the vehicle travelling eastbound, which means that the vehicle ran the stop light.

Table PP3-T14: I-5 Northbound Off-ramp Intersection - Observed Crashes by Crash Type & Injury

CRASH TYPE	Evident	Possible	Property Damage Only	2010 – 2014 [Total]	Percentage
Entering-at-angle		4	10	14	42%
Rear-end		5	9	14	42%
Others	1	2	2	5	16%
<b>Totals</b>	<b>1</b>	<b>11</b>	<b>21</b>	<b>33</b>	<b>100%</b>

This I-5 northbound off-ramp terminal intersection has, in the last five years, experienced 0.6 more injury crashes/year (approximately one crash every two years) than is typical for this type of intersection. (See Table PP3-T15)

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The number of rear-end and enter-at-angle crashes at this intersection are higher than what is predicted for a similar roadway facility.

Table PP3-T15: I-5 Northbound Off-Ramp Intersection - Fatal and All Injury Predicted and Expected Crashes (See Appendix D, Exhibit D6, rows 40 & 41)

Project Element: Ramp Terminal Intersection	Fatal and Injury (KABC) Crashes/year		
	(Predicted) Typical average number of crashes/year (cpy)	(Expected) Experienced average number of crashes/year (cpy)	Difference in Number of crashes/year (cpy)
I-5 Northbound Off-ramp/ West Bakerview Road (Terminal 1)	1.0	1.6	On average there have been 0.6 more cpy (rate: 1 crash in 2 years)

**Ramp Terminal Summation**

All three of the ramp terminals together, on average, have been experiencing 1.3 more crashes per year than similar ramp terminals, according to the HSM Freeway Model severity distribution.

Arterial Facility

The West Bakerview urban arterial analysis was divided into seven roadway segments and nine intersections along Bakerview Road, west and east of I-5. Three of the intersections were analyzed as interchange ramp terminal intersections.

No fatal or serious injury crashes occurred in any of the Bakerview Roadway segments or at the Bakerview Road intersections within the study limits.

The three main crash types have been rear-ends (49 percent); opposite-direction-left-turn (23 percent); and enter-at-angle (17 percent).

**Bakerview Road Segments**

With the exception of Segment 7 (Arctic Road to Northwest Drive), the remaining Bakerview Road segments either have been experiencing the typical number of crashes for similar roadway segments or just 0.1 crashes/year (1 crash in 10 years) higher. (See Table PP3-T16)

Segment 7 is Bakerview Road between Arctic Road and Northwest Drive. In the last five years this segment has been experiencing 0.6 more crashes/year (2 crashes in 3 years) more than is typical for this type of roadway segment. The number of rear-end crashes per year occurring within this segment is higher than what is predicted for a similar roadway facility. Roughly 95 percent (17) of the 18 total rear-end crashes occurred in the eastbound direction toward the Northwest Drive intersection. See Appendix D for a detailed analysis of this segment.

The number of enter-at-angle crashes per year occurring within this segment is also higher than what is typical for similar roadway segments. Roughly 40 percent of the enter-at-angle crashes involved a vehicle making a northbound left from the Starbucks driveway and not granting right-of-way to a vehicle travelling east on Bakerview Road.

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Table PP3-T16: HSM Existing Crash Analysis for Bakerview Road Segments (See Appendix D, Exhibit D2, HSM "Urban Existing", Tab "Report", Columns E & F, rows 17 to 23)

Project Element: Bakerview Rd. Segments	Fatal and Injury Crashes/year (KABC)		
	(Predicted) Typical average number of crashes/year (cpy)	(Expected) Experienced average number of crashes/year (cpy)	Difference in number of crashes/year (cpy)
Segment 1	0.4	0.4	0.0
Segment 2	0.1	0.2	0.1 more cpy (rate: 1 crash in 10 years)
Segment 3*	0.2	0.1	0.1 less cpy
Segment 4*	0.1	0.2	0.1 more cpy (rate: 1 crash in 10 years)
Segment 5*	0.1	0.1	0.0
Segment 6	0.1	0.1	0.0
<b>Segment 7</b>	<b>0.7</b>	<b>1.3</b>	0.6 more cpy (rate: 1 crash in 2 years)

### Bakerview Road Intersections

The three ramp terminal intersections (intersection 3, 4 & 5) were reported on previously in the "Freeway Ramp Terminal Intersections" section of this report so will not be reported on here.

The remaining intersections, with the exception of Intersection 8 (Bakerview Road/Northwest Drive), either have been experiencing the typical number of crashes for similar roadway segments, or just 0.2 crashes/year (1 crash in 5 years) higher than is typical of these types of intersections. (See Table PP3-T17)

Table PP3-T17: HSM Existing Crash Analysis for Bakerview Road Intersections (See Appendix D, Exhibit D2, "HSM\_Urban-Suburban Existing", Tab "Report", Columns E & F, rows 25, 26, 30, 31 & 32)

Project Element: Bakerview Rd. Intersections	Fatal and Injury Crashes/year (KABC)		
	(Predicted) Typical average number of crashes/year (cpy)	(Expected) Experienced average number of crashes/year (cpy)	Difference in number of crashes/year (cpy)
Intersection 1	0.3	0.3	0.0
Intersection 2	0.9	0.9	0.0
Intersection 3*			
Intersection 4*			
Intersection 5*			
Intersection 6	0.2	0.4	0.2 more cpy (rate: 1 crash in 5 years)
Intersection 7	0.8	0.7	0.1 less cpy
Intersection 8	2.0	7.8	5.8 more cpy

\* These intersections are reported in the Ramp Terminal Intersections section of this report in tables PP3-T11, T13 and T15

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The Bakerview Road/Northwest Drive intersection has been experiencing 5.8 more injury crashes/year than is typical for this type of intersection. This intersection accounts for 60 percent of the total crashes that occur at Bakerview Road intersections.

As shown in Table PP3-T18, the number of rear-end crashes occurring at this intersection exceeds what is typical for this type of intersection. Roughly 40 percent (28) of the total rear-end crashes occurred in the eastbound direction, 35 percent (25) westbound, 15 percent (12) northbound and 10 percent (6) southbound. The number of opposite direction left-turn crashes occurring at this intersection also exceeds what is typical for this type of intersection. Roughly 65 percent (21) of the total opposite direction left turn crashes occurred in the westbound direction, 20 percent (7) eastbound and the remaining 15 percent (5) were split in the north- and southbound directions.

Table PP3-T18: Bakerview Road, Northwest Avenue. Intersection - Existing Total Crashes 2010-2014 by Crash Type

Crash Type	Evident Injury	Possible Injury	PDO	2010 – 2014 [Total]	Percentage
Rear-end	2	21	48	71	49%
ODLT	3	9	21	33	23%
Enter-at-angle	2	4	18	24	17%
Sideswipe		1	4	5	3%
Bike	2	1		3	2%
Other			3	3	2%
Fixed Object		2	1	3	2%
Pedestrian	1	1		2	1%
Overturn	1			1	1%
<b>Totals</b>	<b>11</b>	<b>39</b>	<b>95</b>	<b>145</b>	<b>100%</b>

The City of Bellingham has hired Transpo Group, Inc. as a consultant to study existing and future safety issues at the Bakerview Road/Northwest Drive intersection for all modes and users of the transportation system. In November 2016, they began the “Northwest/Bakerview Intersection Safety Study”. Recommendations for both short-term and long-term intersection improvements are expected in late March or early April 2017.

### *Crash Analysis for Proposed Improvement*

The following section compares the safety performance of the “No Build” (not changing anything) and the “Build” proposed improvement (adding a new northbound on-ramp) for both the 2020 opening year and 2040 design year to determine if the proposed improvement significantly increases crashes.

### *Crash Study Area for Proposed Improvement*

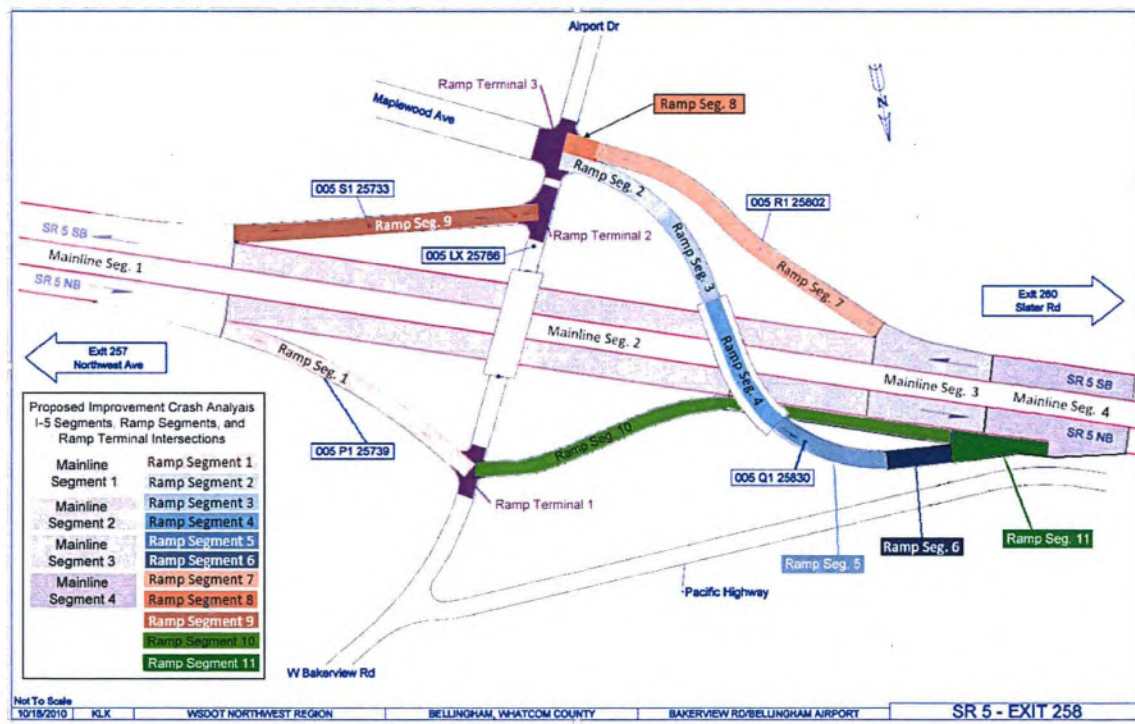
The freeway and ramp analysis segments for analyzing the proposed improvement are shown in Exhibit PP3-E5 and are listed below:

- I-5 mainline, both directions, separated into four analysis segments
  - I-5 mainline segment 1, MP 257.19 – MP 257.40

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- I-5 mainline segment 2, MP 257.40 – MP 257.96
- I-5 mainline segment 3, MP 257.96 – MP 258.16
- I-5 mainline segment 4, MP 258.16 – MP 258.55
- I-5/Bakerview Road interchange ramps separated into eleven analysis segments
  - I-5 Northbound Off-ramp (one analysis segment 1)
  - I-5 Northbound On-ramp (five analysis segments 2-6)
  - I-5 Southbound Off-ramp (two analysis segments 7-8)
  - I-5 Southbound On-ramp (one analysis segment 9)
  - I-5 Second Northbound On-ramp (two analysis segments 10-11)
- Three I-5/Bakerview Road interchange ramp terminal intersections
  - NB Off-Ramp & New On-Ramp Terminal Intersection (Terminal 1)
  - SB On-Ramp Terminal Intersection (Terminal 2)
  - SB Off-Ramp & NB On-Ramp Terminal Intersection (Terminal 3)

Exhibit PP3-E5: I-5/Bakerview Freeway Proposed Improvement Analysis Segments



### Assumption for the New Northbound On-Ramp Intersection

The new leg of Ramp Terminal 1 servicing the new Northbound on-ramp is a right-in-only movement but the HSM Freeway Ramp Terminal model does not yet accommodate this type of intersection. If the model is coded without a left turn lane, because right-in-only intersections don't have left-turn lanes,

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the model assumes that vehicles have to stop in the through lane to turn left generating many more rear-end crashes. So it was determined, in order to get the best estimate of crashes, the assumption is to code the model with left-turn lanes.

**Opening Year Analysis**

The opening year used for this analysis was 2020. In the 2020 no build alternative the study area is predicted to experience, on average, 23.2 fatal and all injury crashes per year. In the 2020 build proposed improvement, the study area is predicted to experience on average, 26.8 fatal and all injury crashes per year.

The safety analysis performed for the opening year shows that with the implementation of the proposed improvement, these roadways and intersections will experience 3.6 more fatal and all injury crashes per year than other similar roadways and intersections. These 3.6 crashes according to crash severity distribution have a 96% change of being possible evident injury crashes and only a 3% chance of being fatal or serious injury crashes.

While each facility type experiences a modest increase in crashes, the freeway ramp terminal intersections and Bakerview Road segments observe the highest percent increase in crashes for fatal and all injury predicted crashes per year. This increase can be attributed to a new ramp terminal intersection leg and new ramp. See Table PP3-T19 for more detail.

*Table PP3-T19: 2020 Opening Year Fatal & Injury Predicted Crashes per year (No-Build vs. Build)*

See Appendix D, Exhibit D6, rows 63 & 64, 75 & 76, 81 & 82; Exhibit D4 (Urban-Suburban No-Build-2020); Exhibit D7 (Urban-Suburban Build R-B-2020)

	Freeway Mainline	Ramps	Ramp Terminal Intersections	Bakerview Road Segments	Bakerview Road Intersections	Overall
2020 No Build	7.3 cpy	2.2 cpy	5.3 cpy	1.8 cpy	6.6 cpy**	23.2 cpy
2020 Build	7.5 cpy	2.5 cpy	7.0 cpy*	2.4 cpy	7.4 cpy**	26.8 cpy
Difference in Number of crashes/year (cpy)	0.2 more Build cpy	0.3 more Build cpy	1.7 more Build cpy	0.6 more Build cpy	0.8 more Build cpy	3.6 more Build cpy

\* The predicted fatal and all injury build crashes for the Ramp Terminal Intersections is likely higher than will be realized because the ramp terminal model over predicts crashes at intersection 5. The HSM ramp terminal model has no way to analyze a right-in only at intersection 5. It required that we also assume a left turn lane at this intersection.

\*\* The predicted fatal and all injury build crashes for the Bakerview Road Intersections is higher than will be realized because it does not accurately portray the crash reduction with the existing access management (right-in right-out) at the intersection of Pacific Highway and Bakerview Road (Intersection 6) which was installed on 11/18/2016.

**Design Year Analysis**

The design year used for this analysis was 2040. In the 2040 no-build alternative, the study area is predicted to experience, on average, 27.7 fatal and all injury crashes per year. In the 2040 build proposed improvement, the study area is predicted to experience, on average, 31.0 fatal and all injury crashes per year.

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The proposed improvement, compared to the no-build alternative, is anticipated, on average, to have 3.3 more fatal and all injury crashes per year than other similar roadways and intersections. These 3.3 crashes according to crash severity distribution have a 96% chance of being possible or evident injury crashes and only a 3% chance of being fatal or serious injury crashes. See Appendix D, Exhibit D6, rows 103 & 104, 115 & 116, 121 & 122; Exhibit D5 (HSM\_Urban-Suburban\_No-Build – 2040); Exhibit D8 (Urban-Suburban\_Build R-B-2040)

Table PP3-T20: 2040 Design Year Fatal & Injury Predicted Crashes per year by Alternative and Facility Type

	Freeway Mainline	Freeway Ramps	Ramp Terminal Intersections	Bakerview Road Segments	Bakerview Road Intersections	Overall
2040 No Build	8.5 cpy	2.6 cpy	5.8 cpy	3.3 cpy	7.5 cpy**	27.7 cpy
2040 Build	8.7 cpy	3.0 cpy	7.9 cpy	3.0 cpy*	8.4 cpy**	31.0 cpy
Difference in number of crashes/year (cpy)	0.2 more Build cpy	0.4 more Build cpy	2.1 more Build cpy	0.2 Less Build cpy	0.9 more Build cpy	3.3 more Build cpy

\* The predicted fatal and all injury build crashes for the Ramp Terminal Intersections is likely higher than will be realized because the ramp terminal model over predicts crashes at intersection 5. The HSM ramp terminal model has no way to analyze a right-in only at intersection 5. It required that we also assume a left turn lane at this intersection.

\*\* The predicted fatal and all injury build crashes for the Bakerview Road Intersections is higher than will be realized because it does not accurately portray the crash reduction with the existing access management (right-in right-out) at the intersection of Pacific Highway and Bakerview Road (Intersection 6) which was installed on 11/18/2016.

### Crash Analysis Findings for Proposed Improvement

This analysis indicates that the proposed improvement increases the number of crashes on the I-5 freeway mainline, freeway ramps, ramp terminal intersections, and West Bakerview Road in the opening year by 3.6 fatal and all injury crashes/year and in the design year by 3.3 fatal and all injury crashes/year. These crash increases in 2020 and 2040, according to crash severity distribution, have a 96% chance of being a possible or evident injury crashes and only a 3% chance of being fatal or serious injury crashes.

This proposed improvement adds a new leg to ramp terminal 1, a new northbound on-ramp, and moves the NB On-ramp connection to the I-5 mainline further north. Considering the new ramp and the new conflict points at ramp terminal 1, the difference of three fatal or all injury crashes is not a significant increase in crashes to the I-5 mainline and the local roadway system.

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## Policy Point 4: Access Connections and Design

### Existing access connections and design

The Bakerview interchange is a fully directional freeway-to-local road interchange providing access to and from Bakerview Road within and east of the interchange; Airport Drive west of the interchange; and Maplewood Avenue south of the interchange. There are four ramps connecting the I-5 mainline to Bakerview Road at three ramp terminal intersections as follows:

- The SB off-ramp and NB on-ramp connect to Bakerview Road and Maplewood Avenue at a signalized ramp terminal intersection west of the I-5 mainline.
- The SB on-ramp connects to Bakerview Road at an unsignalized ramp terminal intersection west of the I-5 mainline
- The NB off-ramp connects to Bakerview Road at a signalized ramp terminal intersection east of the I-5 mainline.

### *Interchange Spacing*

The I-5/Bakerview Road interchange (Exit 258) and interchanges upstream and downstream from it at the I-5/Northwest Ave interchange (Exit 257) and at the I-5/Slater Road interchange (Exit 260), are all within an urban classified section of I-5 and all are service interchanges (freeway-to-local road interchanges). Accordingly, the minimum spacing requirement between the centerline of each of the three interchanges is one mile, DM Ch. 1360.02(3). Existing interchange spacing meets the minimum requirement between the Bakerview and Slater Interchanges where spacing is 2.47 miles, but not between the Bakerview and the Northwest Interchanges where spacing is 0.66 miles.

### *Ramp Connection Spacing*

The minimum ramp connection spacing requirement between service interchanges for on-ramp to off-ramp (weaving) is 1600 feet as measured from gore nose to gore nose. Within an interchange the minimum ramp connection spacing, off-ramp to on-ramp, is 500 feet (DM Ch. 136 Exhibit 1360-3). Within the study Area, all three interchanges currently meet the minimum ramp spacing criteria.

Spacing for the existing interchanges and ramps are shown graphically in Exhibit PP4-E3.

### *Ramp Geometrics*

There are 12 ramps within the three interchanges in the Study Area. All of the ramps are currently single-lane with tapered on- or off-connections to the I-5 mainline. The ramp merge and diverge design manual criteria are currently met at nine of the twelve ramps. The ramps currently meet design manual criteria for acceleration and deceleration lengths at nine of the twelve ramps. The ramps currently meet stopping sight distance design manual criteria at nine of the twelve ramps. The ramps not meeting design manual criteria are listed in Table PP4-T1.

Table PP4-T1: Existing Ramp Elements That Do Not Meet Design Manual Criteria

Ramp Location	Ramp Element	Minimum Standard	Actual	Meets Standard?
Bakerview I/C northbound on-ramp	Merge distance	50:1 Taper (760')*	678'	No
Bakerview I/C northbound off-ramp	Stopping sight distance	226'	200'	No
Slater I/C northbound on-ramp	Merge distance	50:1 Taper (600')	580'	No
Northwest I/C northbound on-ramp	Acceleration distance, ramp seg.2	910'	550'	No
Northwest I/C northbound off-ramp	Diverge distance	15:1 Taper (180')	140'	No
	Stopping sight distance	245'	200'	No
Northwest I/C southbound on-ramp	Acceleration distance, ramp seg.2	910'	650'	No
Northwest I/C southbound off-ramp	Deceleration distance, ramp seg.2	522'	448'	No
	Stopping sight distance	397'	100'	No

\*Minimum standard for merge distance is based on a 50:1 taper applied to the existing ramp's 15.2 ft width

### Vertical Clearances

Within the study area, all vertical clearances over or under the I-5 mainline exceed the minimum standard of 16 feet. See table PP4-T2 for a list of existing clearances.

Table PP4-T2: Existing I-5 Mainline Vertical Clearances

Location	Vertical Clearance	Actual Clearance	Minimum Standard
Northwest Interchange (Exit 257)	NB I-5 Mainline Over Northwest Ave	16' 04"	16'
	SB I-5 Mainline Over Northwest Ave	20' 00"	16'
Bakerview Interchange (Exit 258)	NB I-5 Mainline Under Bakerview Rd	17' 11"	16'
	SB I-5 Mainline Under Bakerview Rd	16' 11"	16'
	NB I-5 Mainline Under NB on-ramp	16' 08"	16'
	SB I-5 Mainline Under NB on-ramp	16' 07"	16'
Slater Interchange (Exit 260)			
	NB I-5 Mainline Under Slater Rd	16' 09"	16'
	SB I-5 Mainline Under Slater Rd	18' 05"	16'

## Proposed access connections and design

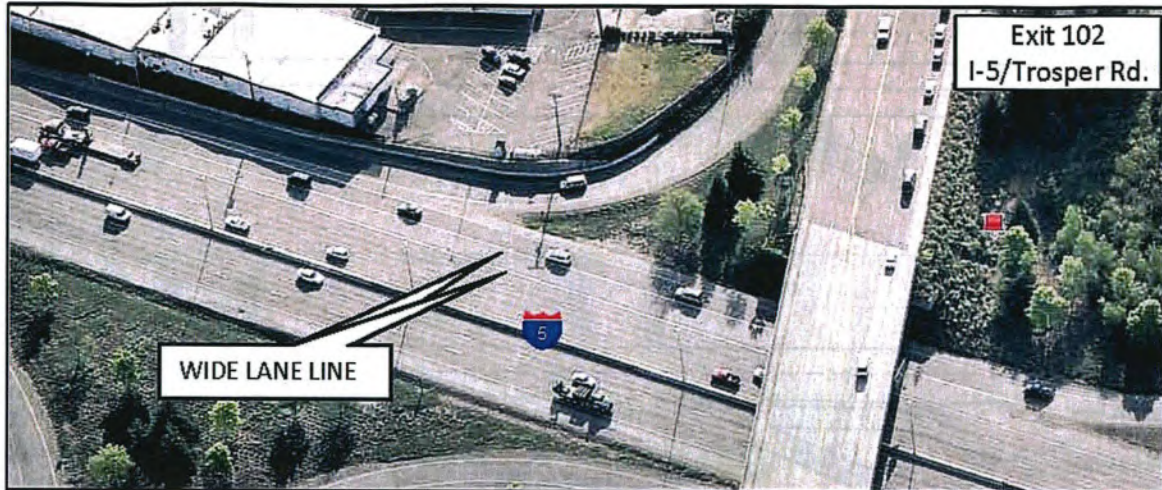
The proposed improvement adds a second (new) northbound on-ramp originating at the existing signalized Bakerview Road/Northbound off-ramp terminal intersection located on the east side of the interchange. The existing northbound flyover on-ramp will merge into the new northbound on-ramp prior to making one on-connection to the I-5 mainline. The merge of the existing and new ramps will be soft-barrier separated with a painted wide-lane-line between the I-5 mainline and acceleration lane of the northbound ramp similar to the Troser Road Interchange for the northbound on-ramp to I-5 in Tumwater as represented in *Exhibit PP4-E1*.

The proposed improvement shifts the northbound on-ramp connection (begin merge) approximately 1360 feet north of the existing on-connection and lengthens the merge section to 700 feet. With the



proposed improvement, the existing northbound on-ramp merge length listed in Table PP4-T1 will be lengthened to meet Design Manual criteria.

*Exhibit PP4-E1: Trosper Road Interchange soft-barrier separation with painted wide-lane-line.*



### *Design Analysis*

The conceptual design for the proposed improvement's new northbound on-ramp indicates potential for design analysis and mitigation measures for one or more of the following design elements and would need to be further evaluated during the design phase of the project:

- Fitting the new ramp's cross section, including shoulders and barriers, within the width available between the I-5 mainline through-lane and the existing flyover ramp bridge pier. See Exhibit PP4-E2 showing a potential ramp cross section within the existing width available.
- Vertical clearance between the new ramp and the existing flyover ramp. See Exhibit PP4-E3 showing the existing vertical clearances as posted on WSDOT's Bridge Engineering Information System website.
- Stopping sight distance on the new ramp where it approaches the pier for the existing flyover ramp.

Exhibit PP4-E2: Existing and Proposed Northbound On-ramp Connection to I-5 Mainline and Proposed Ramp Cross Section

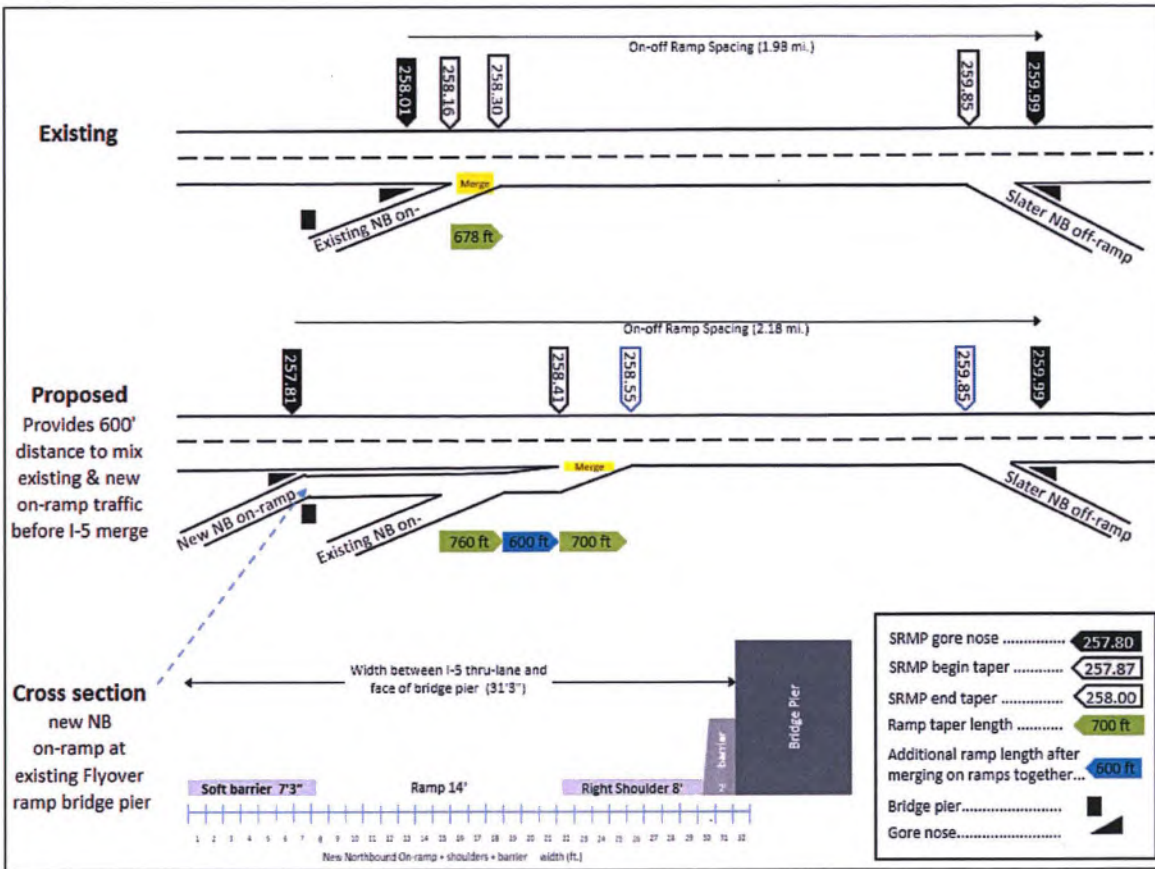
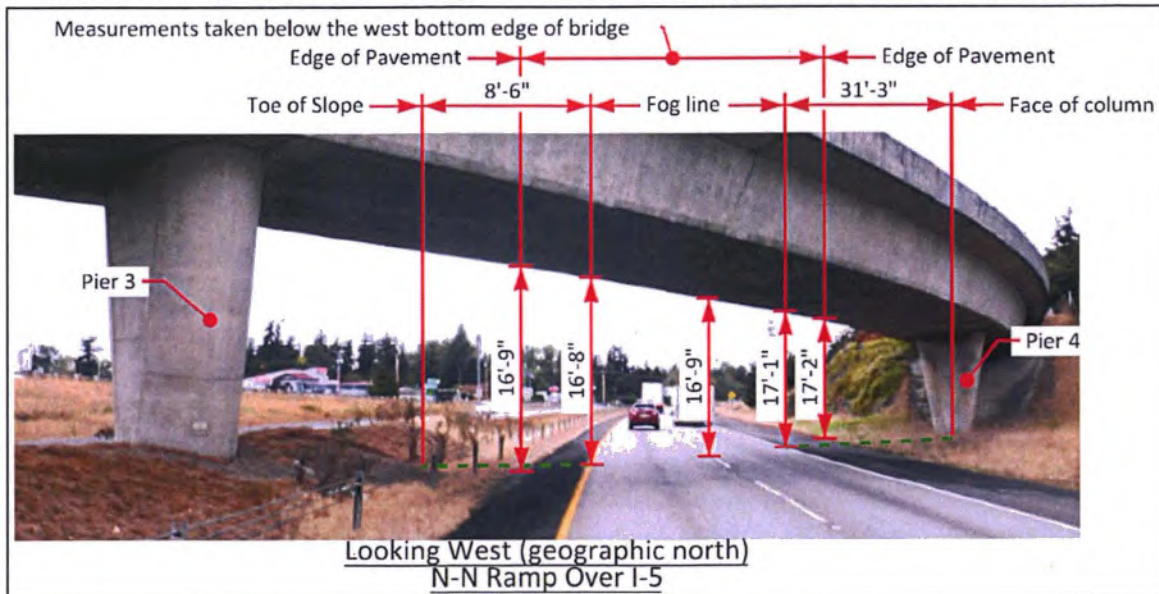


Exhibit PP4-E3: Vertical Clearances at Existing Bakerview Northbound Flyover On-ramp and Northbound I-5 Mainline



In addition to the northbound on-ramp revisions and potential design analysis ramp elements noted above, the proposed improvement also includes the following revisions at the I-5/Bakerview Road interchange:

- On the Bakerview bridge over I-5
  - Eliminates one of the two westbound through-lanes on the bridge
  - Adds a second eastbound through-lane on the bridge
- At the Bakerview Road/I-5 Ramps/Maplewood Avenue intersection
  - Adds a second left-turn lane on the southbound off-ramp
  - Revised signal timing to reduce intersection delay and queuing
  - Adds a second eastbound through lane on Bakerview Road.
- At the Bakerview Road/Northbound off-ramp terminal intersection
  - Adds a second eastbound through approach lane
  - Adds a new northbound on-ramp leg to the intersection
  - Changes the left turn lane on the northbound off-ramp to a shared left/through lane
  - Revises the westbound approach leg as one through-lane and one right-turn drop lane to the new northbound on-ramp
  - Sidewalk and crosswalks are revised for pedestrian safety and access due to the aforementioned intersection changes.
  - Revised signal timing due to the aforementioned intersection changes.

The proposed improvement will not modify the I-5 interchanges and ramps at Northwest Avenue (Exit 257) and Slater Road (Exit 260), and, except as previously noted in this section, it will not modify the I-5 mainline or the local roads within the Study Area.

I-5 Interchange and ramp spacing will remain the same as documented in this report for existing conditions, with the exception of the following:

- Ramp spacing (gore nose to gore nose) between the Bakerview NB off-ramp and NB on-ramp changes.
  - Existing is 2640 feet.
  - Proposed improvement estimated to be 1584 feet.
  - Minimum spacing requirement is 500 feet.
- Ramp spacing (gore nose to gore nose) between the Bakerview NB on-ramp and Slater NB off-ramp changes.
  - Existing is 1.98 miles
  - Proposed improvement estimated to be 2.18 miles
  - Minimum spacing requirement is 1600 feet. (0.3 miles)

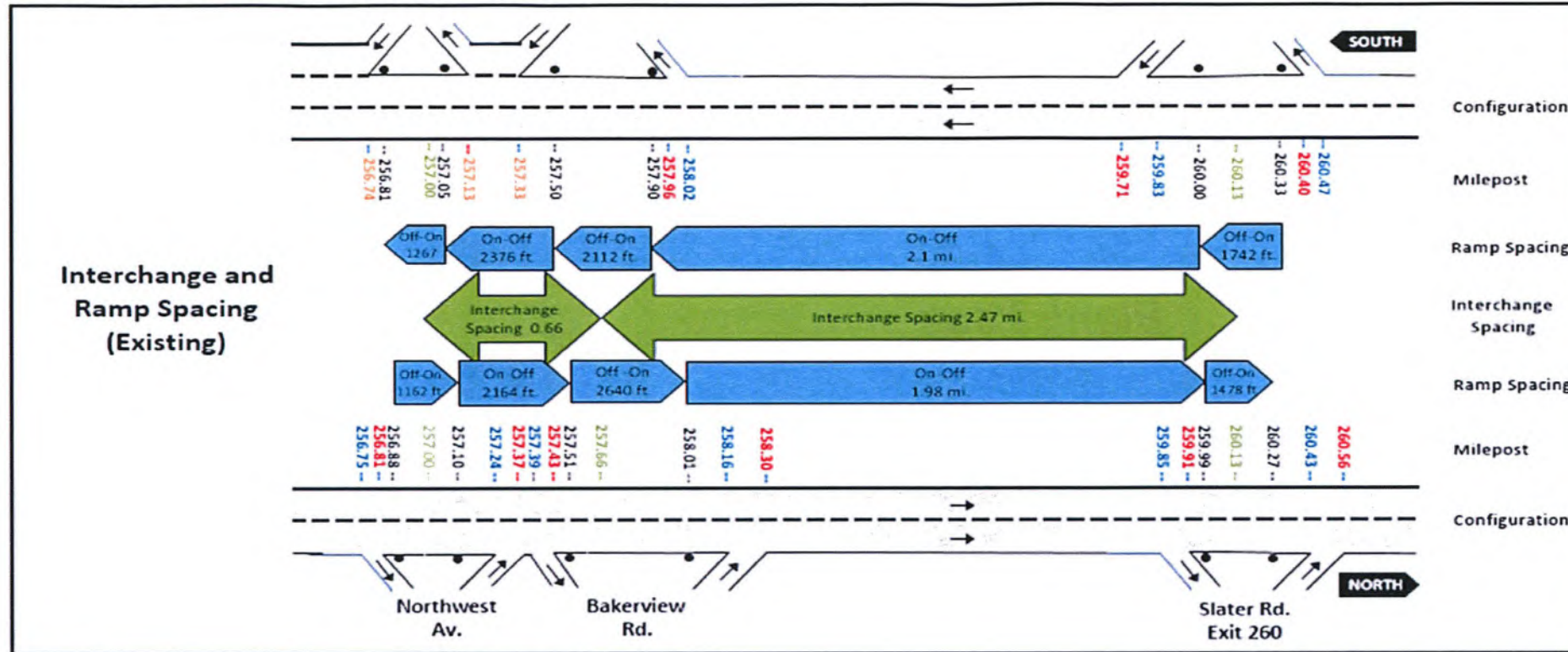
Refer to Exhibit PP4-E3 for a sketch of the I-5 interchange and ramp spacing within the study area, existing and with the proposed improvement.

## **Relationship to future proposed interchange access**

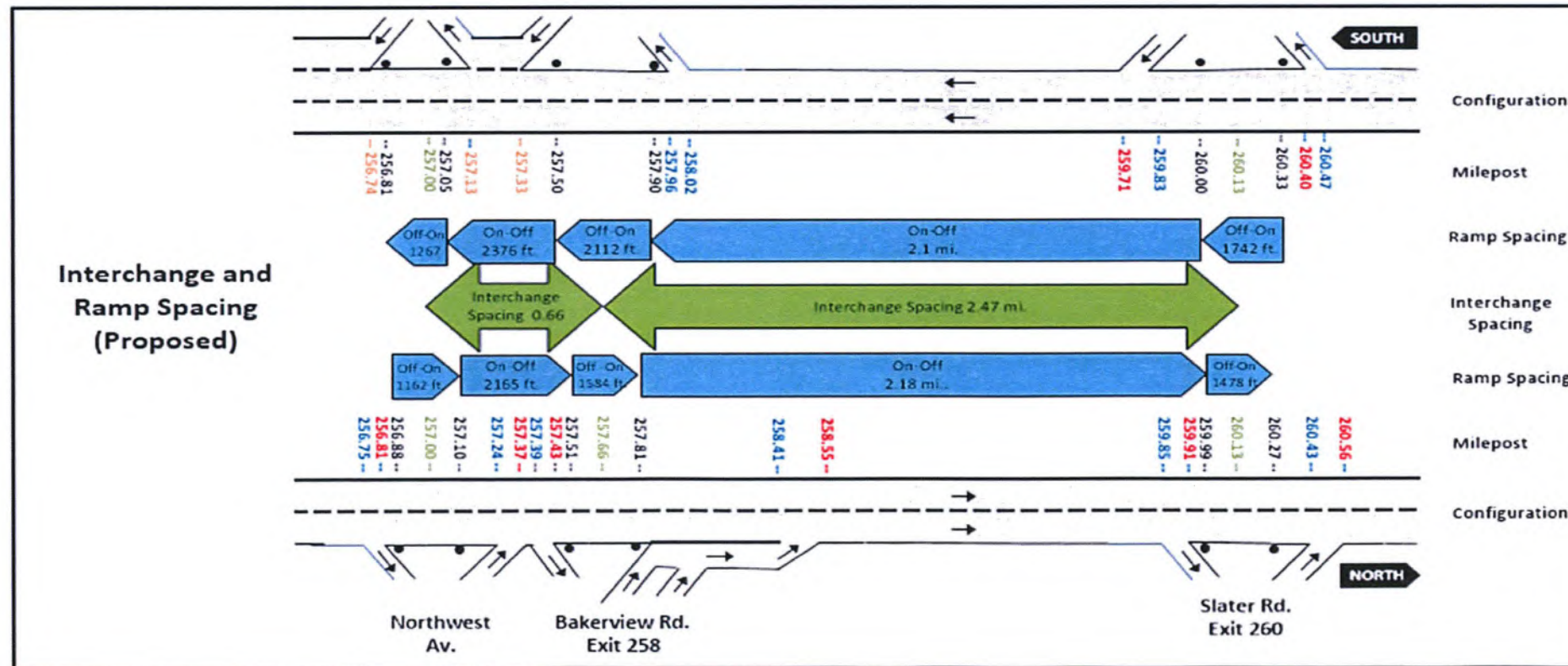
There are no future proposed interchange modifications to the I-5/Northwest Avenue interchange that would change the existing interchange or ramp spacing.

At the I-5/Slater Road interchange, there are funded mobility improvements to the ramp terminal intersections, and for upstream and downstream intersection from the ramp terminal intersections that may result in some modifications to the ramps at the Slater interchange. Existing interchange spacing will not change, but there may be minor changes to ramp spacing between the Bakerview and Slater interchanges.

Exhibit PP4-E3: Interchange Spacing Existing and Proposed



- Mileposts:**
- 257.00 Center of interchange
  - 257.10 Gore nose
  - 258.30 Begin ramp taper
  - 258.42 End ramp taper
  - 258.42 Begin/end auxiliary lane



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## Policy Point 5: Land Use and Transportation Plans

### Proposed improvements are compatible with land use and the transportation network

The proposed improvement at the I-5/Bakerview Interchange, which adds a second (new) northbound on-ramp is consistent with long range plans for the City of Bellingham, Whatcom Council of Governments (WCOG), and Whatcom County. As discussed in Policy Point 3, WCOG, in conjunction with Whatcom County, City of Bellingham and other local jurisdictions within Whatcom County used land use and transportation data to calibrate and update the regional travel demand model in 2014. The travel demand model was used to forecast future growth on the regional network. This information was then used for the 2016 comprehensive plan updates for the Whatcom County, City of Bellingham and other local jurisdictions within the County. In addition to the land use and transportation forecast data, the City of Bellingham has adopted policies in their comprehensive plan to improve the multimodal transportation network by emphasizing improvements for transit, ride sharing, biking and walking in the transportation system. As identified in Policy Point 3, a mode shift factor of 10 percent was used for I-5 and 20 percent for Bakerview Road and ramps accessing the interstate. The mode shift factors are consistent with the City of Bellingham’s comprehensive plan mode shift goals.

### The proposed access point revision is compatible with transportation plans for the area

The proposed improvement is consistent with state, regional, county and local comprehensive and transportation plans.

**City of Bellingham Comprehensive Plan:** In 1998, the City rezoned the area around the I-5/Bakerview Interchange for more intense urban development and in 2006 identified the interchange as a future transportation bottleneck based planned growth and development as well as increases in regional traffic conditions. Additionally, the City conducts an annual concurrency review of the transportation system within their jurisdiction to monitor the transportation system. The proposed improvement at the Bakerview Road interchange, along with local street improvements in the study area, are identified in WCOG’s 2017 Six-year Transportation Improvement Program as illustrated in Table PP5-T1 below.

Table PP5-T1: WCOG’s 2017 Six Year Transportation Improvement Program – Projects in Study Area

Jurisdiction	Project Name	Description	Year	Total Cost
Bellingham	Mahogany Ave	New east/west street between Northwest Ave and Pacific Highway with full arterial street standards	2017	\$8.5 M
Bellingham	Northwest Ave/Bakerview Intersection	Intersection Safety and Feasibility Study	2017	\$575,000
Bellingham	W Horton Road	New east/west multimodal arterial street construction	2018	\$15 M
Whatcom	W Horton Road	New east/west multimodal arterial road construction	2018	\$5.4 M
WSDOT	I-5/Northbound Onramp from Bakerview	Connecting Washington Project, new northbound on-ramp from Bakerview Road to I-5	2017-2021	\$10 M
WSDOT	I-5/Slater Road Interchange	Connecting Washington Project will include re-design and construction of five intersections on Slater Road from Northwest Ave to Rural Ave	2019-2025	\$21 M

**Fairhaven to Slater Interstate 5 Master Plan:** In 2008, WSDOT and its local agency partners identified the following set of improvement strategies pertaining to the Bakerview IJR study area.

- Rebuild the Northwest Avenue interchange as a Single point urban interchange (SPUI) or as a diamond with roundabouts or signals at the ramp terminals.
- Rebuild the Bakerview Road interchange as a SPUI.
- Build roundabouts or signals at the Slater Road interchange ramp terminal intersections
- Construct collector-distributor lanes, northbound and southbound, connecting to the Bakerview Road, Northwest Avenue and Guide Meridian interchanges to address substandard interchange spacing.
- Construct auxiliary weave lanes, northbound and southbound, between the Bakerview Road and Slater Road interchanges.
- Preserve the right-of-way to create space in the median of I-5 for managed lanes (one lane in each direction) to provide flexibility for Transit, HOV or HOT lanes when needed in the future.
- Active Traffic Management improvements; adaptive ramp metering, lane use control signs, variable speed limits, adaptive signal systems and more.
- Improvements to nonmotorized connectivity crossing I-5
- Local street improvements that remove trips from I-5

**Whatcom Regional Transportation Plan:** The Whatcom Council of Governments identified the I-5/Bakerview Interchange as a potential problem in their 2012 Regional Plan, as amended. The proposed improvement was also identified in the 2015, 2016 as well as the 2017 WCOG Transportation Improvement Program.

**Bellingham International Airport Master Plan:** In 2009, the Bellingham International Airport identified potential traffic-related impacts of Airport growth on the I-5/Bakerview Interchange and surrounding regional transportation network. As a result, the airport partnered with the city of Bellingham, WSDOT, and local agencies to implement low-cost short term improvements to address current interchange congestion. The Bellingham International Airport adopted their Master Plan in 2015.

**Bakerview Interchange Value Planning Study (VPS):** Additional alternatives for the Bakerview Road interchange were investigated again in 2011 with the VPS. The VPS identified several lower cost improvement recommendations, including the proposed improvement for this IJR.

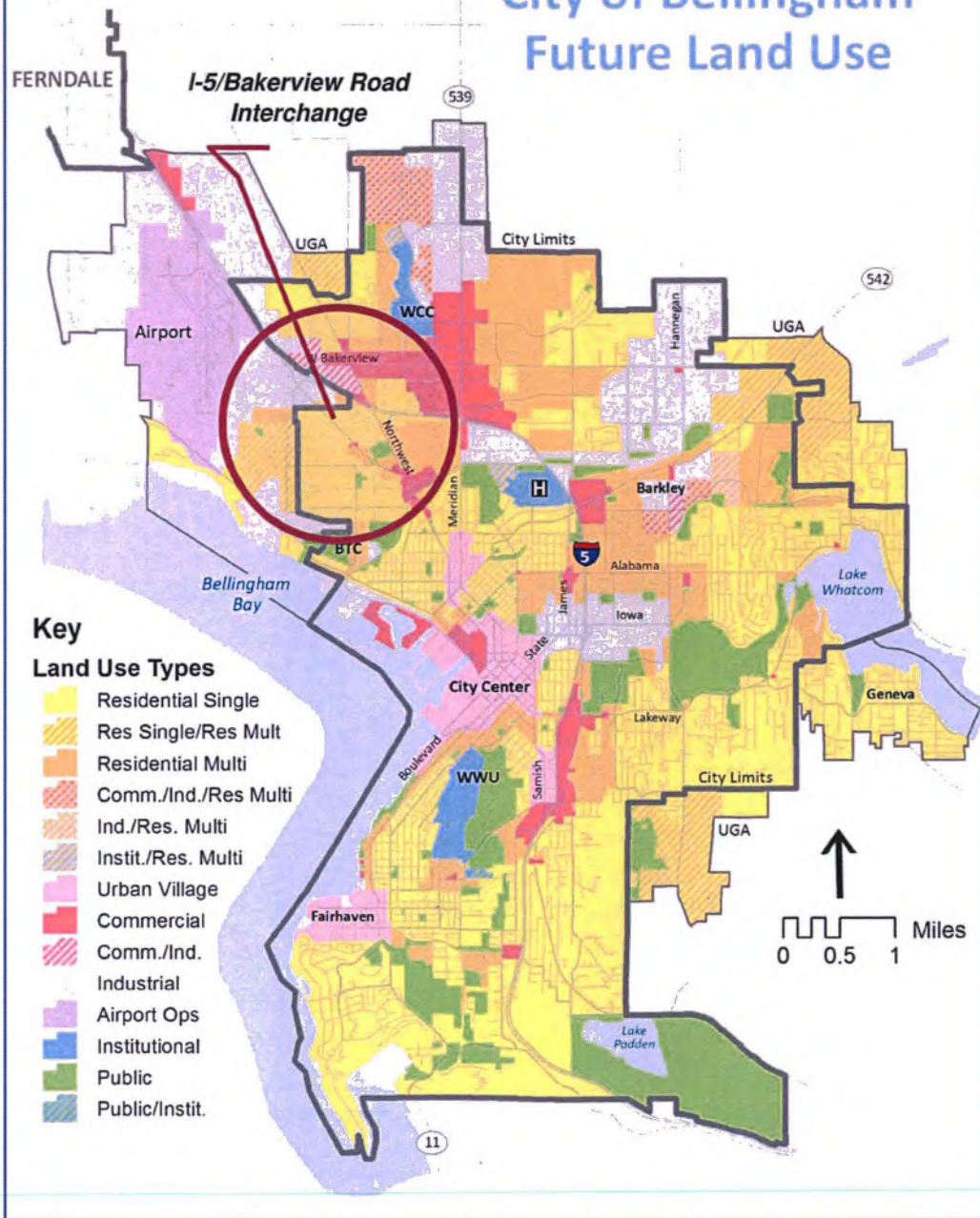
**Other Studies and Plans:** In addition to the land use and transportation plans identified above, numerous other plans have influence over land use and regional transportation growth within the study area. Each of these plans were reviewed for consistency and impact on the regional transportation network. These plans were also included in the local agencies' 2016 growth management plan update and in regional transportation travel demand mode forecasts. These plans and studies include:

- 2016 Whatcom County Comprehensive Plan
- 2016 City of Ferndale Comprehensive Plan





# City of Bellingham Future Land Use



## Policy Point 6: Future Interchanges

### Is the proposed improvement compatible with other known new access points or access revisions?

#### *Other New Access Points*

There currently are no other known or planned new access points to I-5 within the study area out to the design year 2040 and beyond.

#### *Other Known Access Revisions*

At the I-5/Slater Road interchange there are funded improvements focused on the ramp terminal intersections and adjacent local street intersections for completion during the 2023-25 State biennium. Specific intersection improvements are unknown at this time, but they may result in minor access revisions for some of the on- and off-ramp connections as a result of revised intersection designs and the need to ensure ramps meet minimum design standards. The proposed improvement at the Bakerview interchange is compatible with the funded improvements at the Slater interchange for the following reasons:

- Interchange spacing remains the same as existing conditions
- If there are minor ramp revisions at the Slater interchange, minimum ramp spacing between the Slater and Bakerview interchanges will far exceed the minimum ramp spacing requirement.
- The forecasted traffic volumes used for the Bakerview IJR analysis reflect local agency land use and employment plans including development trips forecasted for a large proposed development at the southeast quadrant of the I-5/Slater interchange.

#### *Comprehensive Network Plan*

The Fairhaven to Slater Interstate 5 Master Plan (IMP) was a long-range comprehensive freeway network plan completed in 2008 for a ten-mile section of I-5 through the urban area of Bellingham. The plan provided context for the review and approval of several funded on- and off-ramp access revisions on I-5 through Bellingham between Exit 252 and Exit 255. There were no funded new or revised access points in the Bakerview IJR study area at the time, but the IMP did set forth the following long-term recommendations pertaining to the Bakerview IJR study area as listed below.

- Rebuild the Northwest Avenue interchange as a single point urban interchange (SPUI) or as a diamond with roundabouts or signals at the ramp terminals.
- Rebuild the Bakerview Road interchange as a SPUI.
- Build roundabouts or signals at the Slater Road interchange ramp terminal intersections
- Construct collector-distributor lanes connecting to the Bakerview Road, Northwest Avenue and Guide Meridian interchanges to address substandard interchange spacing.
- Construct auxiliary weave lanes between the Bakerview Road and Slater Road interchanges.
- Preserve the right-of-way to create space in the median of I-5 for managed lanes (one lane in each direction) to provide flexibility for Transit, HOV or HOT lanes when needed in the future.
- Implement Active Traffic Management improvements; adaptive ramp metering, lane use control signs, variable speed limits, adaptive signal systems and more.

- Improvements to nonmotorized connectivity crossing I-5
- Local street improvements that remove trips from I-5
- Cost estimated at \$575 million in 2008 dollars

The IMP provided a financially unconstrained set of improvement alternatives to accommodate forecasted demand. With this information in hand, and the knowledge that funding the IMP strategies was unlikely, the development and evaluation of alternatives, including the proposed improvement for the Bakerview IJR, placed a greater emphasis on lower cost alternatives to address the need. This is consistent with WSDOT's Practical Solutions emphasis.

## Policy Point 7: Coordination

### Coordination of projects and actions that are programmed and funded

The proposed improvement to the I-5/Bakerview Interchange was identified and funded by the Washington State Legislature in 2015 as a Connecting Washington Project. (Project No. L2000119 I-5/Northbound on-ramp at Bakerview, \$10 million). The proposed improvement will support future land use and transportation growth and is scheduled for design and construction in the 2017-19 and 2019-21 biennium. The design of the proposed improvement will not preclude future additions for transit and other demand management facilities to ensure optimization of the I-5 mainline. Preliminary cost estimates for the proposed improvement have been estimated to cost between \$9.6 million and \$11.7 million. Final determination of costs will be identified during the design phase for the proposed improvement at which time additional funding sources will be identified, if needed, to support the proposal.

Exhibit PP7-E1 State Transportation Improvement Program (STIP) Project locations



Several regional and local transportation improvements were analyzed together with the proposed improvement. Although these projects are unable to support the full future-year transportation needs in the study area, they will provide significant benefit to local and regional traffic operations. Most projects are programmed and funded to occur within the 2017 – 2022 time-period. The following transportation improvements have been approved and adopted in the State Transportation Improvement Program (STIP). STIP project locations are shown in Exhibit PP7-E1 and listed in Table PP7-T1.

Table PP7-T1: State Transportation Improvement Program (STIP) Projects

ID	Project Name	Description	Time
5	Mahogany Avenue	New east/west street between Northwest Avenue and Pacific Highway with full arterial street standards	2017
15	Northwest Avenue/Bakerview Intersection	Intersection Safety and Feasibility Study	2017
16	W Horton Road	New east/west multimodal arterial street construction. Joint City/County project	2018
12	I-5/Northbound Onramp from Bakerview	Connecting Washington Project, new northbound on-ramp from Bakerview Road to I-5	2017 - 2021

\*WCOG 2017 TIP

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# Policy Point 8: Environmental Processes

## Environmental process status

This policy point highlights the initial environmental process reviewed for the proposed improvement. This initial effort is intended to result in a “finding of engineering and operational acceptability”. The final environmental review and completion of NEPA and or SEPA will occur during the design phase of the proposed improvement.

A preliminary review of available information compiled during the environmental review did not identify any significant environmental issues. The review was conducted at a high level and considered the following constraints/resources: demographics, fish and wildlife, groundwater resources, hydrologic attributes, natural hazards, surface water resources (including wetlands), topography, tribal consultation areas, and Whatcom County Critical Areas. Based on the study area and existing conditions at the time of review in 2015/2016, it was determined that the proposed improvements would meet the conditions stipulated (23 CFR 771.117(d) to receive a Documented Categorical Exclusion (DCE) determination. As indicated above, this information will be confirmed during the design phase as the appropriate NEPA documentation is completed.

General information and direction to the planning team focused on products that could inform NEPA and or SEPA during the design phase and final environmental review thus avoiding rework during the environmental documentation phase. Consistency and proper documentation was stressed for both the results and consultative processes behind the planning decisions.

Documentation included:

- a) Purpose and need statement;
- b) Definition of the planning area;
- c) Preliminary screening of alternatives and elimination of unreasonable alternatives;
- d) Basic description of the environmental setting; and,
- e) Preliminary identification of environmental impacts and mitigation.

A total of five alternatives were selected by the IJR Support Team for the Tier II evaluation. During the evaluation, some noteworthy factors were revealed and included additional right-of-way needs, potential impacts to wetlands, and storm water retention/control facilities. Detailed information on the review can be found in Appendix F, Memorandum’s dated November 25, 2015 and November 29, 2016. The proposed improvement together with other selected alternatives are highlighted in Policy Point 2 Reasonable Alternatives” beginning on page PP2-1.

The proposed improvement was assessed based on available information. The environmental review included:

- Collection, review, and analysis of background information and studies
- Completion of Environmental Review Summaries by Specialty Groups (Air & Noise, Biology, Cultural Resources, Hazardous Materials, and Hydraulics).
- Geographic Information Systems (GIS) data review.
- Field reconnaissance (windshield survey) of wetlands, habitat.

- An approach to evaluate components of the physical environmental for comparing design alternatives.
- Potential wetland impacts and mitigation needs identified.

Preliminary review of the natural and build environmental issues included:

- a. Fish and Wildlife – limited to only fish passage assessments at road crossings. Although fish passage is not an issue within the project area, a more comprehensive assessment of fish, wildlife and vegetation resources will be required for the proposed improvement.
  - Endangered Species – The project is located in the City of Bellingham with noise and human movement typical of an urban environment. Due to its location along I-5 within the city limits, none of the Alternatives will impact terrestrial species on the federal list of Endangered Species Act (ESA). Several aquatic species on the ESA list are documented within a 1-mile radius of the project site in receiving water bodies for the drainage associated with the project area including Silver Creek and Bellingham Bay.
  - Golden and Bald Eagle Protection Act - The nearest bald eagle nest is located three quarters of a mile southwest of the proposed improvement; therefore, no concerns are raised to impact an eagle nest or communal roost.
- b. Groundwater Resources – The study area falls within a critical aquifer recharge area. Drainage and stormwater management requirements have been identified for the proposed improvement. This constraint will be further assessed during design.
- c. Natural Hazards – The project area is identified as being low to moderately susceptible to liquefaction. This constraint is addressed during design.
- d. Surface Water Resources – Wetlands are present in the project area and are illustrated in Appendix B, page B-4. Preliminary review of the proposed improvement revealed that about one acre of Category II wetlands would be impacted. This constraint and mitigation will be addressed during design.
- e. Air Quality – Whatcom County is not in a limited air quality maintenance area.
- f. Tribal Consultation Areas – identifies tribal ownership areas. The project area does not fall within any of the consultation areas.
- g. Demographics – the project area was mapped as 15+% in poverty and 30-50% minorities. These values, if confirmed upon more detailed analyses, will necessitate an environmental justice component for the NEPA process. ‘Limited English Proficiency’ (LEP) and Title VI of the Civil Rights Act will need to be addressed and will also need to be considered during impact assessments.
- h. Property Impacts/Right of Way – There are five commercially zoned land parcels totaling 3.24 acres that would be impacted by the proposed improvement. No residential properties would be displaced by the proposed improvement.
- i. Land Use/Recreation – the proposed improvements would not impact existing recreational opportunities
- j. Historical/Cultural Resources – none were identified during the initial review. A more in-depth assessment will be completed during the design phase.



Public outreach associated with the proposed improvement was conducted on two different occasions. The first event was held on October 11, 2016 before the Bellingham Transportation Commission. The second event included a public open house, held near the project location at the Alderwood Elementary School. Over 100 hundred people attended this event. Staff received comments from 21 individuals. Most comments received recognized the need for roadway improvements with most people commenting favorably on alternatives R-B and R-C. Additional public engagement will be determined once project design is initiated in July 2017.

The following permits and approvals are anticipated and will be addressed during design:

- NEPA Documented Categorical Exclusion
- SEPA Mitigated Determination of Non-significance
- Army Corp of Engineers – Section 404 Permit
- Section 7 (Endangered Species Act) compliance
- Section 106 (Cultural and Archeological Resources) compliance
- Department of Ecology – Section 401 Water Quality Certification
- Department of Ecology – NPDES Construction Permit

According to WSDOT Design Manual Chapter 210 and WSDOT Environmental Procedures Manual, there are no required public involvement activities for a NEPA Documented Categorical Exclusion and/or SEPA Mitigated Determination of Non-significance. However, public outreach and public involvement is encouraged.

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## **Appendix**

**Appendix A Methods and Assumptions Document**

**Appendix B Conceptual Design**

**Appendix C Traffic Analysis**

**Appendix D Safety Analysis**

**Appendix E Alternatives Evaluation**

**Appendix F Environmental**

**Appendix G IJR Support Team Meetings and Key Activities**

**Appendix H Bellingham Technical Memorandums**

**Appendix I Stakeholder Outreach**

**Appendix J Glossary**