Washington State Department of Transportation

I-5 Operations & Transportation Demand Management Analysis

Fairhaven (Exit 250) to Grandview Road (Exit 266)

Final Report
September 1, 2020

Prepared by:
Washington State Department of Transportation Northwest Region,
Mount Baker Area Multimodal Transportation Planning Office

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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.

COVID-19 implications for the results of this study are currently unknown. WSDOT and our partners conducted this study between July 2018 and January 2020. Modeling used historic data on regional population, job growth and travel behavior to project future demand. This did not account for potential impacts of major disruptions such as COVID-19. While the near- and long-term effects of the pandemic are unknown, it will likely be different from the assumptions used in this study.

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WSDOT Headquarters and Northwest Region Signatures

I-5 Operations & Transportation Demand Management Analysis

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Maintaining the Statewide Transportation System

WSDOT and its partners strive to meet the challenges to maintain and preserve the statewide transportation system in a state of good repair, knowing it is vital to the state's economy and quality of life. However, Washington State is currently substantially under-investing in WSDOT infrastructure, exacerbating decades of previous underfunding and additions of new infrastructure to the system without dedicated maintenance and preservation funds. In early 2020, WSDOT estimated an annual gap of $690 million to preserve and maintain WSDOT's transportation assets. This figure does not include the maintenance and preservation needs of transportation assets owned and operated by local jurisdictions. The funding gap is already forcing difficult decisions and tradeoffs to keep the transportation system open. As this funding gap continues, there will be additional widespread failures in the state system, resulting in deterioration and operational reductions such as speed limit reductions, weight limitations for bridges, bridge closures, longer routes for freight transports, more vehicle wear and tear and operational costs for travelers, reduction in ferry services, etc. WSDOT continues to work with the Governor's Office, the Office of Financial Management and the Legislature to communicate the results of this funding gap and suggested mitigation.

Stakeholder Acceptance

The I-5 Operations and Transportation Demand Management Analysis was prepared consistent with WSDOT policies and guidelines with the support and coordination from local and regional agency partners. The undersigned parties concur with the methods, findings and recommendations of this effort and will use its information to inform future multimodal transportation and land use planning decisions.

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Acknowledgements

This partnership was made possible because of the support and contributions of federal, state, regional and local agency representatives who helped guide this Analysis and develop our recommended actions. Our data-supported analysis stimulated informed policy discussions and evaluations that helped us better understand how to support our multimodal transportation network.

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Acronyms and Abbreviations

AADT. Average Annual Daily Traffic

ESO. WSDOT Environmental Services Office

FHWA. Federal Highway Administration

HCM. Highway Capacity Manual

LOS. Level of Service

MP. Mile Post

OFM. Office of Financial Management

SMTP. Washington State Multimodal Transportation Plan

SOV. Single Occupant Vehicle

SR. State Route

SWOT. Strengths Weaknesses Opportunities and Threats Analysis

TDM. Transportation Demand Management

TRAM. Bellingham 2020 Transportation Report on Annual Mobility

TSMO. Transportation System Management and Operations

WCOG. Whatcom Council of Governments

WSDOT. Washington State Department of Transportation

WTA. Whatcom Transportation Authority

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I-5 Operations and Transportation Demand Management Analysis

Executive Summary

Interstate 5 (I-5) in Whatcom County is part of a 48,000-lane mile system of interconnected controlled or limited access highways that form part of the National Highway System. The original intended purpose authorized by the Federal Aid Highway Act of 1956 was "to provide for safe, efficient, speedy transcontinental travel and serve a strategic National Defense purpose". The Federal Highway Administration, along with the Washington State Department of Transportation (WSDOT), is responsible for this system and recognizes that the Interstate System is not only a part of the National Highway System, but is also a part of regional and local transportation systems.[1]

I-5 looking south from the Railroad Trail Bridge.

In 2017, WSDOT began a statewide planning process with our partners (Corridor Sketch Initiative) to evaluate the entire state-owned system and determine where things are working well and where changes may be needed. Within Whatcom County, the evaluation revealed that mobility and fish passage barriers posed the greatest challenges on I-5 from Fairhaven (SR 11) to Grandview (SR 548).

I-5 looking north between Lakeway and Iowa Street.

This I-5 Operations and Transportation Demand Management Analysis found that I-5 does have significant congestion during peak travel periods, but does not suffer from a capacity problem. I-5 does, however, suffer from an access problem. Over 50% of the traffic in the Analysis Area between Samish Way (exit 252) and Bakerview Road (exit 258) travel less than three interchanges in distance on I-5. This means that over half of the travel on I-5 is less than 3 miles in length, and all of that entering and exiting traffic creates significant disruption and friction on the system. Where feasible, metering the on-ramp traffic would create gaps making it easier to get onto and off of I-5, improving safety and regional traffic flow.[2]

> Addressing major barriers such as I-5 through improved connectivity is central to the goals and objectives of this plan.
>
> *Bellingham Bicycle Master Plan – Chapter 3: Bicycle Network Recommendations*

[1] U.S. Department of Transportation, Federal Highway Administration, Office of Infrastructure, Interstate System Access Informational Guide, August 2010.

[2] Regional Traffic flows refer to trips that either travel through, or have an origin or destination within the Analysis area – data analyzed using the INRIX data with StreetLight software.

Congestion caused by such a large percentage of short trips by itself poses a significant challenge to all drivers, but the correlation to crashes is the most serious problem that the Analysis discovered. Shifting this local traffic from I-5 onto local city streets, which also exhibit significant congestion, would be problematic without meaningful travel demand management actions and improvements to transit and the active transportation system (walking and rolling).

Lakeway Drive / I-5 underpass looking toward the east.

To address the identified mobility and safety needs on I-5, the significant barrier to walking and rolling that I-5 imposes on the local network, and to facilitate the City's attainment of mode shift and emission reduction goals; we are recommending three distinct yet interrelated strategies and alternatives.

- Focus Area #1: **Interchange Operation and Safety Enhancement Improvements** (low cost traffic management improvements);
- Focus Area #2: **Ramp Metering and Traveler Information Signs**, (primarily during peak periods of congestion);
- Focus Area #3: **Lincoln-Lakeway Multimodal Transportation Study** (currently underway led by the City of Bellingham).

These actions meet the Washington State Legislature's policy direction to WSDOT to plan for state-owned facilities which specifically require WSDOT to first assess strategies to enhance the operational efficiency of the existing system before recommending system expansion.[3]

Ramp meter on I-5 in Seattle.

Focus Areas #2 and #3 will involve significant community engagement as these strategies and solutions are considered for inclusion into regional and local plans, and ultimately for funding.

WTA service in Bellingham.

The overall results of this I-5 Operations and Transportation Demand Management Analysis found that transportation systems management and operations (TSMO), travel demand management (TDM), maintenance, preservation and environmental stewardship are all necessary to meet the policy direction found in the City of Bellingham's mode shift goals[4] and the Climate Protection Action plan[5], Washington State goals for emissions reduction[6], and WSDOT's Sustainability Executive Order[7].

[3] Washington State Revised Code of Washington, Chapter 47.06.050 (1) (c) State-owned facilities component, capacity and operational improvement element, [2007 c 516 § 10; 2002 c 5 § 413; 1993 c 446 § 5.].

[4] City of Bellingham's Transportation Mode Shift Goals, 2020 Transportation Report on Annual Mobility.

[5] City of Bellingham Climate Protection Action Plan, 2018 Update.

[6] Governor Jay Inslee - Executive Order 14-04 - Washington carbon pollution reduction and clean energy action - Clean Transportation.

[7] WSDOT Secretary's Executive Order Number: E 1113.00, Sustainability, April 29, 2020.

What are our Next Steps?

- Brief decision makers and stakeholders on the final results of the I-5 Traffic Operations and Transportation Demand Management Analysis.
- Initiate Stakeholder Outreach to gather additional comments on proposed recommendations.
- Forward recommendations to partner agencies for inclusion in their plans.
- Recommend incorporation of strategies and alternatives within state, regional and local plans and other work in alignment with the Washington State Transportation Plan, Public Transportation Plan, Active Transportation Plan and Highway System Plan.
- Evaluate alternatives, and determine feasibility/ costs to implement recommended Focus Areas through the Practical Solutions Framework.

How is the Report Organized?

This Report presents key assumptions, performance measures, engagement practices, and alternatives developed in coordination with the Washington State Department of Transportation (WSDOT), Whatcom Council of Governments (WCOG), Whatcom County, City of Bellingham, City of Ferndale, Port of Bellingham, Whatcom Transportation Authority (WTA), and Lummi Nation to develop the integrated I-5 Operations and Transportation Demand Management Analysis.

The organization of the report is as follows:

Chapter 1: Introduction provides an overview of the I-5 Traffic Operations and Transportation Demand Management Analysis.

Chapter 2: Analysis Area Characteristics presents a discussion of the demographics, land use, and coordination with existing state, regional, local agencies plans considered in the Analysis Area.

Chapter 3: Multimodal Transportation Characteristics provides an overview of the Regional Transportation System, transportation modes and associated I-5 corridor characteristics.

Chapter 4: Traffic Operations and System Performance provides an overview of the traffic operations, system performance and safety features in the Analysis Area.

Chapter 5: Strategies and Alternatives Evaluation presents information on the selection of transportation strategies, solutions and alternatives to address the problem and needs in the Analysis Area.

Chapter 6: Recommended Alternatives and Actions documents Analysis findings, summarizes recommended actions and identifies next steps to prepare pre-design and scoping documents necessary to program projects for implementation.

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Chapter 1: Introduction

Background and History

Exhibit 1-1: Bellingham Washington, I-5 Corridor.

The I-5 Operations and Transportation Demand Management Analysis was initiated in coordination with local jurisdictions and agencies to identify practical, cost effective, multimodal transportation strategies and solutions to address issues raised in the 2017 Corridor Sketch Initiative (CSI). This effort is a component of a larger initiative by WSDOT to maintain, preserve, and improve the regional transportation system using performance-based measures to guide multimodal transportation investments and maintain highways in a state of good repair. Technical information and analysis generated during the Analysis will help inform and support important state, regional and local community decisions regarding multimodal transportation operations in the Analysis Area. The timing of the Analysis will provide key findings and recommendations on the regional transportation system that can be integrated into the Whatcom Council of Governments' (WCOG) Metropolitan/Regional Transportation Plan update, Whatcom Transportation Authority's Long-range Public Transit Plan, City of Bellingham's Comprehensive Plan and the WSDOT's Highway System Plan.

What is the purpose and need for the Analysis?

The 2017 Corridor Sketch Initiative (CSI) identified mobility challenges and fish passage barriers on several segments of a 16-mile segment of I-5 within the urban areas of Bellingham and Ferndale. Additionally, several planning studies conducted over the last 10 years by the City of Bellingham, City of Ferndale, Port of Bellingham, Whatcom Council of Governments and WSDOT show that traffic will significantly increase on I-5 over the next 20 years. These forecasts show growth from cross-border demand, as well as residential, commercial and industrial growth within cities of Bellingham and Ferndale. I-5 is the main travel corridor through Whatcom County, and is the primary regional freight corridor extending from Canada to Mexico. Regional growth on I-5 is also expected to correspondingly increase with growth in the State of Washington.

A majority of the growth in the county is expected to occur in the Analysis Area. Over the next twenty years, the area's population is expected to increase by 34% along with employment growth of over 43%. Currently, significant congestion is occurring on several segments and interchanges on I-5 during peak travel periods in the vicinity of interchanges where traffic merges on and off of I-5. This occurs most often where there are many closely spaced interchanges connecting to regional arterial streets. In those locations, traffic volumes have increased 14% to 18% over the last five years. Increases in traffic volumes are creating merge issues on the I-5 mainline and interchange ramps. Long queues on I-5 off-ramps are occurring in some locations. Additionally, many of the regional arterial connections at I-5 interchanges

are heavily congested during peak travel periods affecting the local street network and transit operations as well as impeding nonmotorized / active[8] transportation movement east and west across I-5. As traffic volumes grow in the I-5 corridor, associated interchanges and the local street network will experience significant increases in congestion and travel delays will impede the multimodal functionality of the transportation network.

Where is the Analysis Area?

During the problem identification phase, the initial CSI Analysis Area was a 16-mile corridor of I-5 in Whatcom County within the Bellingham and Ferndale urban growth areas. This Analysis Area extended from SR 11/Old Fairhaven Parkway in Bellingham at Mile Post (MP) 250, north to Grandview Road in Ferndale at MP 266 as shown on *Exhibit 1-2*. The final Analysis Area was revised to an 8-mile corridor after our analysis showed that congestion and crashes were occurring much more often within an 8-mile section of I-5 within Bellingham.

Exhibit 1-2: Initial CSI Analysis Area.

Exhibit 1-3: Revised Analysis Area.

The revised Analysis Area, as shown in *Exhibit 1-3,* is located within the urban area of the City of Bellingham, beginning at Samish Way MP 251, and north to Bakerview Road MP 259. This segment includes seven interchanges and associated northbound/southbound on and off ramps at:

- Exit 252 at Samish Way
- Exit 253 at Lakeway Drive
- Exit 254 at Ohio Street & Iowa Street
- Exit 255 at Sunset Drive / SR 542
- Exit 256A & 256B at Guide Meridian Street / SR 539
- Exit 257 at Northwest Avenue
- Exit 258 at Bakerview Road

Who are the partners and what are their roles?

Stakeholder involvement was a significant component of our approach during this Analysis. We collaborated with key stakeholders representing different technical and policy perspectives from our local and regional partners, FHWA and other WSDOT departments and disciplines. The Analysis also included briefings to the WCOG Transportation Policy Board and Transportation Technical Advisory Group (TTAC) as well as WSDOT support teams and the WSDOT Secretary's Practical Solutions Round Table.

[8] Refers to Washington State Department of Transportation Active Transportation Division policies towards "walking and rolling"

An Advisory Committee guided the development of the Analysis together with an Agency Support Team made up of state, regional and local agency staff. Both the Advisory Committee and Agency Support Team members proactively reached out to affected and interested community members, business organizations and special interests to increase awareness of the Analysis as well as ensure that strategies and potential alternatives addressed their priorities and interests. Community interests were reflected by participating agencies during Advisory Committee and Agency Support Team meeting discussions.

Representatives on the Advisory Committee included:

- City of Bellingham
- City of Ferndale
- Lummi Nation
- Port of Bellingham
- Whatcom Transportation Authority (WTA)
- Whatcom Council of Governments (WCOG)
- Whatcom County
- WSDOT Active Transportation
- WSDOT HQ Public Transportation
- WSDOT HQ Design Engineer
- WSDOT NW Region Mount Baker Area
- WSDOT NW Region Program Management & Administrative Services
- WSDOT NW Region Traffic and Safety
- FHWA

Exhibit 1-4: January 11, 2019 Advisory Committee.

The Advisory Committee had two workshops during the course of the Analysis. Workshops were held on January 11 and June 25 of 2019. During the first workshop WSDOT shared information on the Analysis background, traffic operations and crash data, environmental, and pavement/bridge preservation findings. Advisory Committee member staff also shared information on their studies, agency policies and implementation strategies associated with I-5 and the surrounding regional transportation network. Following this exchange of information, the Advisory Committee developed a project Charter to align the committee and staff with the Analysis objectives. The Charter identified transportation Analysis Area characteristics, performance measures, and multimodal transportation analysis tools as well as communication and stakeholder engagement expectations. See *Appendix G*. Additionally, the Advisory Committee adopted the following vision statement, objectives, and analysis outcomes:

Vision Statement

"I-5 performs at an optimum level through operational and demand management strategies."

Analysis Objectives

- **Safety:** Improve safety for all users by effectively managing the interstate and the regional transportation network to reduce the severity and frequency of crashes.
- **Mobility:** Improve the mobility on I-5 by effectively managing interstate operations and identifying opportunities for all modes to accommodate demand on the transportation network.
- **Regional Trips:** Provide safe and reliable regional and international travel on the interstate system and increasing connectivity between and within modes of travel.

- **Freight**: Maintain the safe, efficient, and reliable movement of freight on I-5.
- **Mode Shift:** Work to achieve mode-shift goals by identifying and implementing mode-shift opportunities to accommodate demand on the regional transportation network; addressing barriers across I-5; and reducing peak-hour demand on the regional transportation network arterials and I-5.
- **Programing Decision:** Work collaboratively to identify operations and demand management solutions or solution packages to promote multimodal travel options on the regional transportation network. Identify opportunities to leverage funding opportunities with our partners across jurisdictional boundaries.

Analysis Outcomes

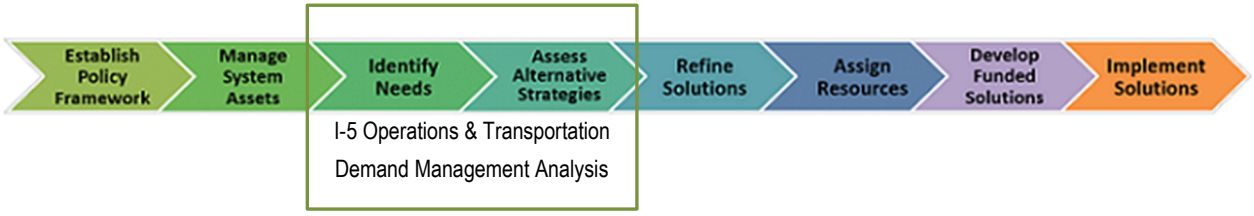
- Increase multi-agency awareness of WSDOT's Practical Solutions process.
- Identify problems, needs and opportunities on the multimodal transportation network.
- Develop strategies and identify alternatives in the Analysis Area to address mobility, safety and environmental needs for the I-5 corridor.
- Increase multimodal awareness of the potential for both benefits and impacts on the community from recommended solutions.

How was the Analysis prepared?

State government, metropolitan planning organizations (MPOs), transit agencies, and local governments have the primary responsibilities for transportation planning in Washington State. Accordingly, WSDOT with these participating organizations and agencies analyzed the transportation system in the Analysis Area and developed multimodal planning-level strategies and solutions to address identified needs and develop alternatives. Ten- and twenty-year growth scenarios were considered.

We managed the Analysis to align with WSDOT's Practical Solutions approach, Moving Washington Foreword Strategy, and the six transportation policy goals set forth in RCW 47.04.280, as well as regional and local agency plans. These policies and plans guided and informed the Analysis. Additionally, the Analysis has been prepared in accordance with WSDOT's Transportation Planning Studies Guidelines, WSDOT Practical Solutions Framework and Procedures, Safety Guidance for Corridor Planning Studies, Environmental Planning Handbook and best planning principles and practices.

Exhibit 1-5: Practical Solutions Framework



What was our approach and the process undertaken?

Our approach included the evaluation of the I-5 mainline and associated interchange ramp merge points to and from I-5. Additionally, other components of the multimodal transportation system were evaluated to address strategies, solutions and alternatives identified by the Advisory Committee.

The Analysis included three phases. The first phase used performance measures to identify problems and needs within the analysis area. The second phase identified strategies, solutions, and alternatives to address identified problems and needs. The third phase is currently unfunded but is intended to refine alternatives and determine the feasibility and cost of implementing recommended actions. *Exhibit 1-5*

identifies the approach and alignment with the Practical Solutions Performance Framework for transportation decision making and management of system assets.

In this approach the Advisory Committee adopted the Moving Washington Forward Strategy Principles:

- Operate efficiently to get the most out of the existing highway system
- Manage demand by offering more traveler options
- Adopt policy measures to extend the useful life of the system
- Add capacity strategically to best use limited resources

Our Analysis focused on issues identified during the Corridor Sketch Initiative (CSI), for corridor 287. This process highlighted segments of this corridor that were not meeting identified performance expectations, based on the transportation policy goals set forth in RCW 47.04.280.

Based on the initial statewide performance measures, the CSI work identified two areas; mobility and fish passage barriers, as potential problems on corridor 287. Based on available data during CSI, other performance measures met objectives established by WSDOT at the time of the study. However, all measures were re-evaluated during the corridor analysis consistent with planning guidance and best practices.

RCW 47.04.280
Transportation Policy Goals

Preservation: To maintain, preserve and extend the life and utility of prior investments in transportation systems and services.

Safety: To provide for and improve the safety and security of transportation customers and the transportation system.

Mobility (congestion relief): To improve the predictable movement of goods and people throughout Washington state, including congestion relief and improved freight mobility.

Environment: To enhance Washington's quality of life through transportation investments that promote energy conservation, enhance healthy communities and protect the environment.

Stewardship: To continuously improve the quality, effectiveness and efficiency of the transportation system.

Economic Vitality: To promote and develop transportation systems that stimulate, support, and enhance the movement of people and goods to ensure a prosperous economy.

This Analysis was initiated with technical input from subject matter experts for traffic operations, crash analysis, environmental, preservation and maintenance, together with local knowledge of the transportation network. The technical analysis was preceded by the identification of performance measures and targets. Performance measures and targets allowed the team to quickly analyze what was working well on the corridor as well as what was not. The performance-based Analysis assumes that WSDOT and its partners will continue to maintain and preserve the transportation system in a state of good repair so that roadway operations and capacity will be maintained in a state of good repair. This practice allowed the Agency Support Team and subject matter experts to focus limited resources on areas that were experiencing the most problems. Performance measures, metrics, and targets used can be found in *Appendix B*. The measures and metrics are included as each element of this Analysis is summarized. Data analysis, findings, strategies, and the identification and evaluation of alternatives are presented for the transportation network within the Analysis Area.

This analysis was done in accordance with RCW 47.04.280, the Results Washington Strategy, supporting the Washington Multimodal Transportation Plan, and the good work included in local and regional plans.

Major work elements included:

- Stakeholder Communication & Outreach
- Traffic Operations Analysis
- Safety Analysis
- Environmental Assessments
- Preservation and Maintenance Assessments
- Strategy and Solution Identification
- Alternatives Identification, Evaluation and Selection

Additional evaluation and analysis are located in the following chapters:

- Chapter 2: Analysis Area Characteristics
- Chapter 3: Multimodal Transportation Characteristics
- Chapter 4: Traffic Operations and System Performance
- Chapter 5: Strategies and Solutions Evaluation
- Chapter 6: Recommended Alternatives and Actions

Chapter 2: Analysis Area Characteristics

Introduction

This chapter provides an overview of the demographics, land uses, and transportation characteristics, as well as areas that influence or affect the transportation network in the Analysis Area. The broader multimodal transportation system supports a wide variety of urban land uses and modes of transportation on all associated transportation facilities; including state highways, airports, rail, freight, transit, pedestrian, and bicycle networks. These networks are owned and operated by governments—from counties and cities, to ports, transit agencies and tribal nations.

It is important to note, that population, employment and economic characteristics have a broad influence on the operations of I-5 within the Analysis Area.

Exhibit 2-1: Analysis Area, I-5 Samish Way.

What Factors were considered in our Analysis?

Demographics, economic activity and land uses are inextricably linked and provide important context on how the transportation system is used today. Whatcom County, City of Bellingham, and other local jurisdictions, agencies and Tribes within Whatcom County and around the state develop policies, designate land uses, permit development activity and develop investment strategies to serve regional and local population growth. In many cases, these activities dictate how the interstate is operating today and can assist in supporting strategies for future utilization. This chapter provides a summary of the key issues and context as we address performance issues identified in the Analysis Area.

Analysis Area Profile

The City of Bellingham is a major urban destination on the I-5 corridor near the U.S. / Canadian Border and significant economic hub to residents in Northwestern Washington, and Canada. I-5 provides a link to major employment and recreation centers in Bellingham, the cities of Ferndale, Lynden, and Blaine, and British Columbia Canada, as well as the Cherry Point industrial area located to the north. To the south, you will find the cities of Seattle, Everett, as well as major technology, manufacturing and industrial centers, i.e. Amazon, Microsoft and Boeing. All areas are experiencing significant growth. While these areas are outside the Analysis Area, travel demand generated and attracted from these adjacent areas also significantly influence the transportation system. For example, much of the recent retail development in the Analysis Area is a response to several years of strong growth in Canadian customers. While not reflected in the employment or population demographics for the area, these international consumers significantly impact travel demand. Analysis of recent regional cross-border vehicle crossings estimates that during the day, the addition of Canadian visitors increases the Bellingham population by 9%. On average 33,000 cars, and 3,000 trucks cross the Cascade Gateway border crossings

every day, carrying almost $53 million, (USD) in daily trade. (Source: International Mobility and Trade Corridor Program, IMTC, 2017 Data).

Demographics

Population

According to the Washington State Office of Financial Management (OFM) Whatcom County grew by 57% between 1990 and 2010. On average it was estimated that the County grew 1.2 % per year between 2010 and 2019. It is estimated that the population and employment will continue to increase by 43% and 34%, respectively from 2010 to 2040. Bellingham accounts for 40% of the population of Whatcom County.

Table 2-1: OFM Population estimates for Whatcom County. Source: 2010 U.S. Census.

Community	2005	*2010	2015 estimate	2018 estimate	2019 estimate
Whatcom	180,800	201,140	209,790	220,350	225,950
Whatcom Unincorp	79,848	87,065	89,788	92,915	94,986
Whatcom Incorp	100,952	114,075	120,002	127,435	130,314
Bellingham	72,320	80,885	83,580	88,500	90,110
Blaine	4,240	4,684	4,905	5,315	5,425
Everson	2,080	2,483	2,580	2,730	2,800
Ferndale	9,750	11,415	12,920	13,640	14,300
Lynden	10,480	11,951	13,090	14,160	14,470
Nooksack	970	1,338	1,460	1,500	1,605
Sumas	1,112	1,319	1,467	1,590	1,604

Table 2-2: Largest employers within 30-miles of Bellingham, 2017. Source: WWU

No	Company	Employment
1	Saint Joseph Hospital	2,126
2	Lummi Nation	1,780
3	Western Washington Univ.	1,499
4	Bellingham Public Schools	987
5	Whatcom County	881
6	BP Cherry Point	820
7	Alcoa Intalco	580

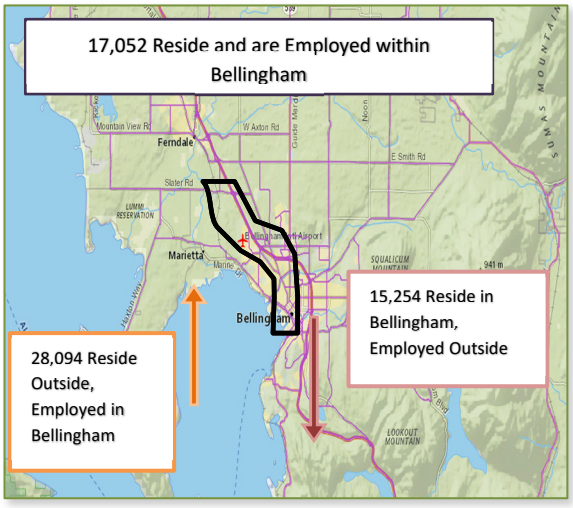
In 2016, over half of the workforce are within a 30 miles radius from Bellingham. Approximately 43,348 people travel to or from Bellingham to work compared to 17,052 who live and work in Bellingham. That means that 2.5 times as many people are commuting in or out of Bellingham for employment as there are people who live and work in Bellingham. Most of these people are using I-5 for work trips.

Due to the size of the Analysis Area specific demographic and social economic data for minority, low income, and other affected populations will be developed during prescoping and design of each of the alternatives at the project level using agency studies and plans as well as the latest US Census and OFM data.

All regional vehicular travel

The region is expected to see an increase of 45% in overall vehicle trips by 2040, and as would be expected, the majority of those trips will be made in the larger urban areas. Although rural areas (unincorporated) Whatcom County currently produce a substantial number of trips, its population growth and land-development rates are projected to be less than those of the urbanized areas. In 2013, 169,487 vehicle trips were within Bellingham. According to WCOG, by 2040, this figure is forecast to increase by 63%. Refer to *Appendix C* for additional information on Vehicle Trips by Jurisdiction.

Exhibit 2-2: 2015 Employment Inflow/ Outflow Whatcom County. Source WSDOT Sugar Data.



Whatcom Regional Plan Forecasts for Growth in Employment and Housing

Exhibit 2.3: New Employment Forecast. Source: WCOG.

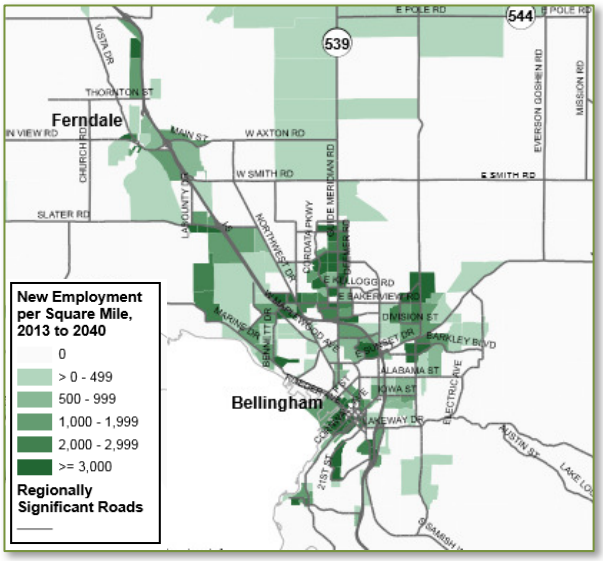
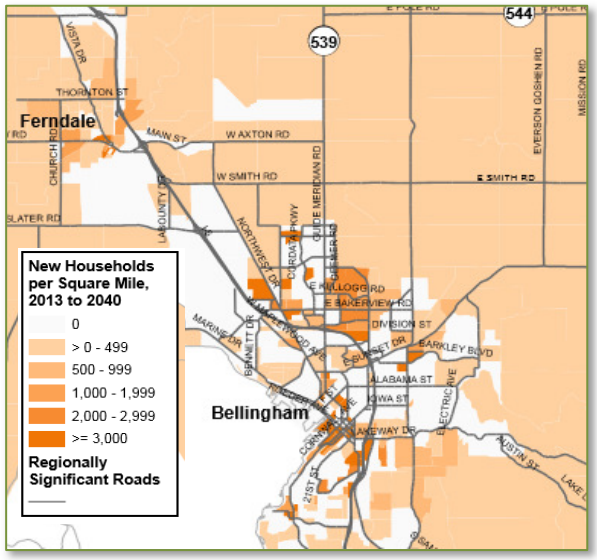


Exhibit 2.4: New Household Forecast. Source: WCOG.



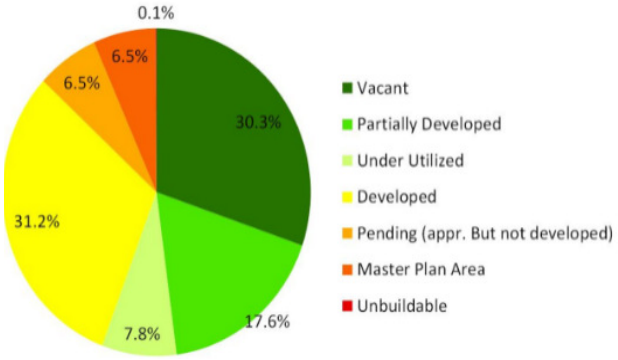
Local Land Use Profile

The information below shows that approximately 31% of the Bellingham UGA is currently developed, with a remaining 30% undeveloped, and 25% partially developed or underutilized. Of the land currently undeveloped in the UGA almost 5% of the area is designated for commercial use, 8% as industrial use, 6.5% is designated as mixed-use master planning areas and about 1% is identified as unbuildable. The remaining 14% of the UGA has pending or approved development proposed. Most areas of more intense development are in close proximity to the I-5 corridor.

Exhibit 2-5: Existing land use development within the UGA in 2017. Source: City of Bellingham.

Development Level (UGA):

Development Level	Acreage	Percentage
Vacant	2,945.11 ac	30.3%
Partially Developed	1,713.47 ac	17.6%
Under Utilized	761.69 ac	7.8%
Developed	3,030.13 ac	31.2%
Pending (Not developed)	630.96 ac	6.5%
Master Plan Area	635.75 ac	6.5%
Unbuildable	8.85 ac	0.1%



State, Regional, and Local Jurisdictions Planning and Policy Approach

I-5 provides for the movement of people and goods for the regional and interstate connections along the west coast from the U.S. / Canadian border to the U.S. / Mexico border. Within Whatcom County, the I-5 corridor also supports regional travel and local access. Locally significant development is anticipated over the next 20 years in residential, recreation, commercial and industrial growth. As anticipated growth increases so will transportation demand, impacting the transportation system locally, regionally and statewide.

As part of our Analysis several agencies and stakeholders have shared their transportation and land use plans for this region. These agencies, included the WCOG, Whatcom County, Whatcom Transportation Authority, Port of Bellingham and the cities of Bellingham and Ferndale, and the Lummi Nation. These plans and studies were used in conjunction with WSDOT plans, studies and policy initiatives during our Analysis and are summarized in *Table 2-3*.

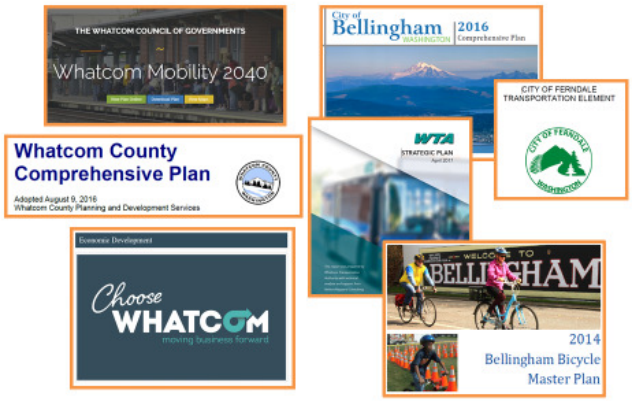


Table 2-3: Collaborative Planning and Policy Documents.

Comprehensive Plans, Studies and Policy Documents				
Date	**Title**	**Author**	**Description**	**Relevance to I-5 Analysis**
2007	Lummi Nation Tribal Transportation Plan	Lummi Nation	Forecast growth and identifies needs to support the tribal community. The plan provides for short and long-term development of their transportation system.	The Lummi Nation has been working on economic opportunities to support their community, including development near the I-5/Slater Rd interchange just north of the Analysis Area. This development may increase trips on I-5 through the Analysis Area.
2008	Fairhaven to Slater Interstate 5 Master Plan	WSDOT	Identifies safety and mobility needs on I-5 and connected local roads. Recommended improvements to maintain efficient operations and safety.	The Plan's primary recommendations were significant and costly I-5 widening and interchange reconstruction to address expected growth. Large capital projects were considered with some demand management network improvements.
2011 / 2014	City of Ferndale Master Planned Action	Ferndale	Guiding document that identifies transportation facility needs to support future high residential/commercial development.	Residential/commercial growth may increase the number of I-5 trips between Ferndale and the Bellingham Analysis Area.
2012	Pedestrian Master Plan	Bellingham	Defines priority pedestrian networks and improvements.	Identifies connectivity gaps on the local transportation network. I-5 identified as a major constraint.
2014	Bicycle Master Plan		Defines priority bicycle networks and improvements.	Connectivity gaps due to infrastructure and/or congestion identify I-5 as a major constraint & barrier.

Date	Title	Author	Description	Relevance to I-5 Analysis
2016	City of Ferndale Comprehensive Plan	Ferndale	Identifies transportation improvements to support planned growth. Fosters a multimodal transportation system.	Identifies improvements to improve automobile and freight travel, access to public transit, and implements policies to elevate pedestrian and bicycle travel by creating a network of transportation-related improvements to increase mode shift.
2016	City of Ferndale Annexation Blueprint	Ferndale	This annexation study identifies the capital facilities needed to support anticipated growth.	The City's Urban Growth Area is adjacent to I-5. The Main Street, Grandview, Portal Way and Slater Road interchanges may require additional improvements to support growth.
2017	Bakerview /I-5 Interchange Justification Report	WSDOT	Interchange Justification Report to support access modification at I-5/Bakerview Rd. Exit 258. Bellingham mode-shift goals used to forecast growth for all modes.	The I-5 interchange at Bakerview Road is within the Analysis Area. Current and planned development in the area will continue to increase traffic volumes at this interchange.
2017	Whatcom Mobility 2040	WCOG	Comprehensive land use / regional transportation plan to address projected growth to 2040.	The region is expected to see an increase of 45% in vehicle trips by 2040 with the majority of those trips occurring in the larger urban areas. Currently 80% of the County employment is in Bellingham. The increase in trips is expected to further congest I-5.
2017	IMTC Resource Manual and Performance Review	IMTC	IMTC identifies and promotes mobility and security improvements at the U.S. / Canada border crossings.	Cross-border traffic from British Columbia Canada and the U.S. uses I-5 through the Analysis Area and is expected to increase in the future.
2017	Bellingham Comprehensive Plan	Bellingham	Identifies transportation improvements needed to support planned growth. Fosters a sustainable multimodal transportation system for community connectivity, economic vitality and livability.	The City focuses on mode shift modification factors to support future growth, and included these in their performance measures. - Identifies I-5 as a barrier to connectivity their multimodal transportation system. - Local network improvements identified as possible alternatives to capacity improvements on I-5. - Land use/urban villages are planned near I-5 that will provide compact growth hubs to address mode shift goals and enhance land use efficiency - Thirteen neighborhood plans, adjacent to I-5, have identified specific circulation and development strategies that have been adopted by the City.

Date	Title	Author	Description	Relevance to I-5 Analysis
2017	Whatcom Transportation Authority Strategic Plan for 2018-2023	WTA	Documents WTA's near-term transit investments, ridership data and forecasted emerging needs based on regional land use changes, demographics and advancing technologies.	WTA provides transit, ride-share and other critical transportation services in the I-5 Analysis Area. I-5 interchanges and other major street intersection can become barriers for moving buses effectively within adopted performance measures.
2017	WSDOT Mobility Performance Framework	WSDOT	A Practical Design approach, identifies mobility performance measures that can be used to evaluate strategies.	Provides potential performance measures that could increase performance and reduce costs.
2018	Whatcom County Comprehensive Plan	Whatcom County	Identifies near- and long-term land use, infrastructure needs, strategies and investments for unincorporated areas of Whatcom County including Bellingham's UGA.	Whatcom County's planned growth will significantly increase travel into and out of Bellingham for jobs, shopping, and services. Much of that travel may use I-5 through the Analysis Area.
2015	Corridor Sketch Initiative (CSI) #287	WSDOT	Collaborative planning process provided an initial assessment of needs and strategies for the I-5 corridor, encompassing Bellingham's and Ferndale's urban areas.	This I-5 Analysis more clearly defines the needs and strategies identified in CSI's initial assessment of the I-5 corridor, using a Practical Solutions approach.
2019	Bellingham International Airport Master Plan	Port of Bellingham	The plan identifies needs and investments to support expected growth and development at the airport.	The Port's economic initiatives are focused on serving more freight and increased enplanements at Bellingham International Airport which is accessed primarily via I-5.

Chapter 3: Multimodal Transportation System Characteristics

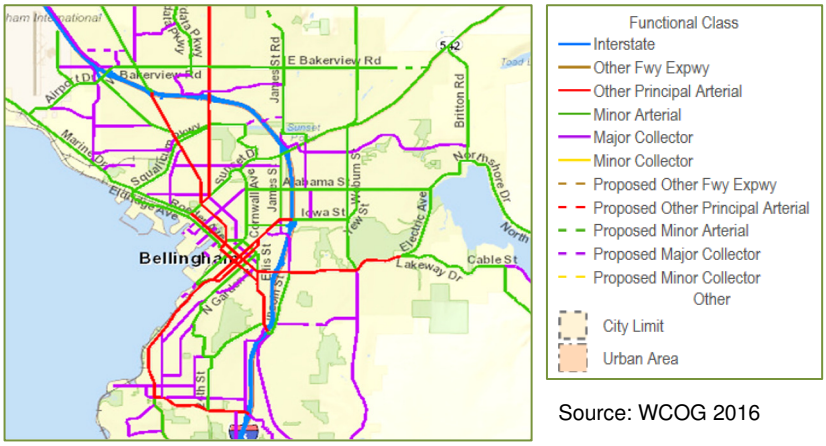
Introduction

I-5 looking south, Bellingham Washington.

This chapter profiles the current transportation network; transit, rail, air, pedestrian, bicycle and motor vehicles, that combine to serve local and regional populations as well as the movement of people, goods, and services to and from work, shopping, recreation and home. The transportation network is owned and operated by multiple agencies and supports numerous economic, social, and cultural benefits. A well-connected transportation network helps promote mobility, access and modal options for a variety of users including disadvantaged populations and older adults. In order to address the movement of people, goods and services on I-5, information on transportation facilities and modes was compiled and assessed. Performance measures were also identified for each mode and used to evaluate strategies and solutions for our Analysis. Performance measures, metrics and targets used are provided in this chapter and additional details can be found in *Appendix B*.

What is the Regionally Significant Transportation Network?

Regional Transportation Network.



Source: WCOG 2016

The Whatcom Council of Governments (WCOG) is the region's Metropolitan Planning Organization (MPO). MPO's are formed to address the regional transportation system as part of its federally mandated transportation planning functions. They work with local member jurisdictions to identify a regionally significant transportation network. The network serves many different modes that include air, rail, freight, automobiles, transit, pedestrians, bicyclists, and other public/private means. The roadway is a significant part of the system that serves all users. In this Analysis we looked specifically at the operations of the mainline of I-5 and ramp merge points. Other facilities and services such as transit connection points and routes adjacent to or connecting to the interstate, as well as pedestrians and bicycles connections were also investigated. We evaluated their effectiveness for addressing problems and needs identified during solutions evaluation and development of alternatives to address I-5 mainline operations.

Additionally, WCOG, beyond its typical MPO responsibilities, supports and facilitates the integration of the Smart Trips program in regional transportation planning. This program addresses specific needs that people have for information and/or motivation to take trips by means other than driving alone.

The Smart Trips Program is composed of multiple strategies:

- Provide more mobility and access for less cost
- To make room for a growing population
- Promote regional employer partners
- To keep dollars circulating locally, supporting local businesses
- To increase safety on streets and sidewalks
- To provide health benefits to individuals through active transportation
- To strengthen social connections

What are the Transportation Modes and Service Characteristics?

Early in our Analysis, the Advisory Committee identified several objectives for managing interstate operations. These included accommodating all modes of transportation demand on the transportation network and working towards achieving mode-shift goals identified by the City of Bellingham. To accommodate these principles, we worked with service providers to better understand the linkages between the different modes of transportation as well as identified existing gaps in the network. This information formed the bases for many of the strategies and solutions evaluated in our Analysis.

Freight

The multimodal freight transportation system in Washington is vital to the local, regional, state, national and international economy. It supports national defense, directly sustains hundreds of thousands of jobs, and delivers the daily necessities of life to residents. Goods are shipped into, out of, within, and through Washington on highways and roadways, railroads, waterways, pipelines, and intermodal facilities. Our Analysis also focused on the importance of international trade between the U.S. and Canada.

Exhibit 3-2: Cascade Gateway, Whatcom County border crossings, Source: IMTC.

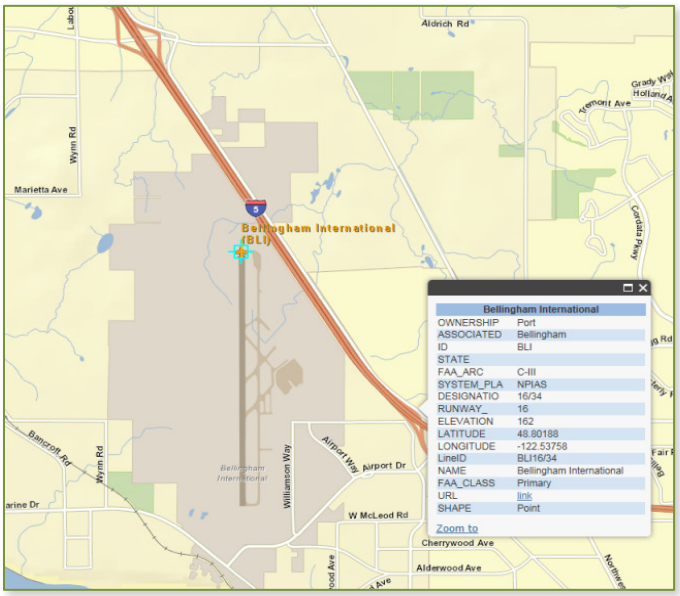
Washington is one of the most trade-dependent states in the nation, and our flow of freight to/from the Canadian border relies on I-5 as an important freight corridor. Our Analysis Area is located only 20 miles from the second busiest passenger vehicle crossing on the U.S. / Canadian border and the fourth busiest commercial crossing. Almost 36,000 cars and 2,800 trucks access the Cascade Gateway border crossings every day, carrying almost $40 million (USD) in daily trade. The Cascade Gateway is a prominent

international trade and travel connection. The movement of commercial goods is a critical component of the regional transportation network in the Analysis Area, and a critical part of economy. Roughly, 75% of all trade and travel through British Columbia and Washington State passes through Whatcom County.

Air Transportation

The Bellingham International Airport is an important part of the transportation network in this region. The airport is located within Bellingham's urban growth area at the north edge of the Analysis Area. The airport is the fourth largest commercial airport in the state, serving three commercial service airlines Alaska, Allegiant Air and San Juan Airlines. It supports both commercial and a general aviation uses. In 2017, 737,000 scheduled passenger enplanements occurred. It is also a major draw to Canadian travelers.

Exhibit 3-3: Bellingham International Airport.



Air Freight

The airport also has significant freight operations including freight airlines, freight forwarders, and trucking firms involved in air movement of freight. Cargoes consist of airfreight and mail transported by dedicated aircraft and in the cargo compartments of passenger aircraft. This is an important freight linkage.

Rail

Freight and passenger rail service operates on the Burlington Northern Santa Fe Railroad (BNSF) mainline through Whatcom County, parallel north-south at a distance west of I-5, but does not cross I-5 in the Analysis Area. Frequency of freight and passenger trains vary throughout the year. The amount of freight and passenger service is not expected to make a noticeable change of vehicular trips on I-5.

Transit Service Providers

Transit service helps increase capacity of the roadway without the need for costly new road facilities. Investing in transit service that supports connections to major destinations is a key strategy used to reduce peak hour travel impacts on the interstate as well as the local street network. In this Analysis Area, several service providers offer options other than driving a single occupancy vehicle. *Exhibit 3-0* provides a summary of public and private transit options available in the Analysis Area. Several of the private options provide service to out of areas destinations.

Table 3-1: Public/Private Transit Options.

Public/Private Transit Options	Services
Whatcom Transit Authority	• WTA bus routes traverse the Analysis Area and use regionally significant roads. • WTA provides paratransit service • WTA provides vanpool services • Park and Ride Facilities

Public/Private Transit Options	Services
Bellair Airporter Shuttle	Airporter Shuttle/Bellair Charters has daily scheduled bus service connecting to SeaTac Airport and intermediate points. The shuttle serves Blaine (by reservation only); Birch Bay, Lynden, Ferndale and Bellingham, providing 11 roundtrips each day. Charter and contracted services are also provided by special arrangement. Within Whatcom County, the Bellair Baker Shuttle offers service to the Ski area on a seasonal basis. It offers 11 south bound and 11 north bound trips a day.
Greyhound	The Greyhound Company provides scheduled regional bus service connecting to cities along the I-5 corridor.
Quick Shuttle	Quick Shuttle is a Canadian based provider of mostly scheduled service between Vancouver, British Columbia and Seattle-Tacoma International Airport. In addition to transiting the Analysis Area along I-5, Quick Shuttle stops at the Bellingham International Airport.
Bolt Bus	Bolt Bus scheduled bus service travels on I-5 through the Analysis Area five times per day in each direction between Portland, Oregon and Vancouver, British Columbia. The only two stops in between are in Seattle and Bellingham. The Bellingham stop is in the Analysis Area, at WTA'S Cordata Station.
VFW – VA Shuttle	The local Veterans' group offers a week-day shuttle service for Seattle-area hospital appointments for veterans. The van is purchased through fundraising by VFW volunteers, and is not wheel-chair accessible. Insurance and maintenance are paid for by the Veterans Administration, the drivers are unpaid volunteers. Veterans' medical care and access was identified as a priority statewide in 2009.

WTA Transit Service

Whatcom Transportation Authority (WTA) is responsible for public transit in Whatcom County and offers 27 fixed bus routes in Bellingham. Four of these routes are high-frequency corridor known as "Go-Lines". The goal of these routes is to provide service at 15-minute headways from 8 am to 6 pm. Service is provided seven days a week. WTA also provides numerous transportation services to meet the objectives of their strategic plan developed in 2017. Their mission includes an effort to reduce drive-alone trips.. WTA monitors and revises its fixed route system to provide more direct and frequent service along corridors with high ridership potential to maximize use. In general, WTA weekday service begins between 6 a.m. and 7 a.m. and ends between 5 p.m. and 11 p.m. Most routes operate on Saturday from approximately 8 a.m. or 9 a.m. to between 5 p.m. and 11 p.m. Only eight routes operate on Sunday, operating between approximately 9 a.m. to 8 p.m.

To meet demand, WTA works in consultation with Bellingham to respond to changing land uses and demographics. In the Analysis Area there are two

Table 3-2: WTA Transit Routes with boardings.

Route No.	Routes in the Analysis Area	2019 Boardings
3	Airport/Cordata	96,472
4	Hospital/Downtown	47,345
15	Cordata/WCC	172,934
24	Cordata	78,292
48	Bakerview Spur	1,677
49	Bakerview Spur	8,586
50	Gooseberry Pt	73,194
72X	Kendall	53,270
75	Birch Bay/Blaine	55,080
80X	Mt Vernon	33,956
190	Lincoln St	625,966
196	WWU/Lincoln	57,758
197	Lincoln/WWU	58,867
232	Cordata/WCC	495,663
331	Cordata/WCC	687,966
512	Sudden Valley	113,997
525	Electric	65,651
533	Yew St	50,097
540	Sunset	83,604
	Total	2,860,375

major bus stations, one at Cordata station and the other in downtown Bellingham.

In 2017, WTA provided 16,000 to 20,000 fixed route boardings per weekday and 570 to 590 paratransit rides. WTA's ridership and productivity are also among the highest in the nation, when compared to other small urban transit systems.

- WTA has 61 full-sized buses with 27 fixed routes, including four high-frequency corridors. They will have two electric buses before the end of 2020.
- Approximately 86 % of their transit trips originate in Bellingham. About 80% of their riders walk to bus stops.
- WTA provides 43 paratransit minibuses, and 21 vanpool vans.

Transit Routes within the Analysis Area

The WCOG regional travel demand model provides current and forecasted flows of transit trips (individuals taking the bus). These flows are for mid-day (MD) and evening (PM) time periods. Bellingham has the highest volumes of transit trips, concentrated around Western Washington University during the MD period and downtown in the PM period.

Regional Routes

In cooperation with Skagit Transit, regional transit service is provided from Bellingham to neighboring Skagit County for service access to Island County and the Puget Sound region, via Island Transit and Skagit Transit providing vital intercountry linkages as shown in Exhibit 3-5.

Transit Service Timing

Most WTA Fixed-Route services operate approximately 13 hours per day Monday through Friday with service every 30 or 60 minutes in Bellingham, Blaine, Ferndale and Lynden (less in very rural areas, more around WWU). Service is reduced on all Saturday routes to 9 hours per day. Sunday and Evening service is offered on fifteen routes. Sunday service spans approximately 10 hours per route per day.

WTA Route Service Crossings with I-5

WTA operates fixed route and paratransit services crossing I-5 at all of the I-5 interchanges in Bellingham. WTA estimates that 25% of their new transit service hours in recent years have been used simply to keep existing routes on schedule due to congestion, not to add new service. This trend continues to worsen, and some of it is due to the increasing severity and duration of congestion on I-5 and at the I-5 ramp terminal intersections in Bellingham.

Exhibit 3-4: Local and Regional Arterials Crossing I-5.

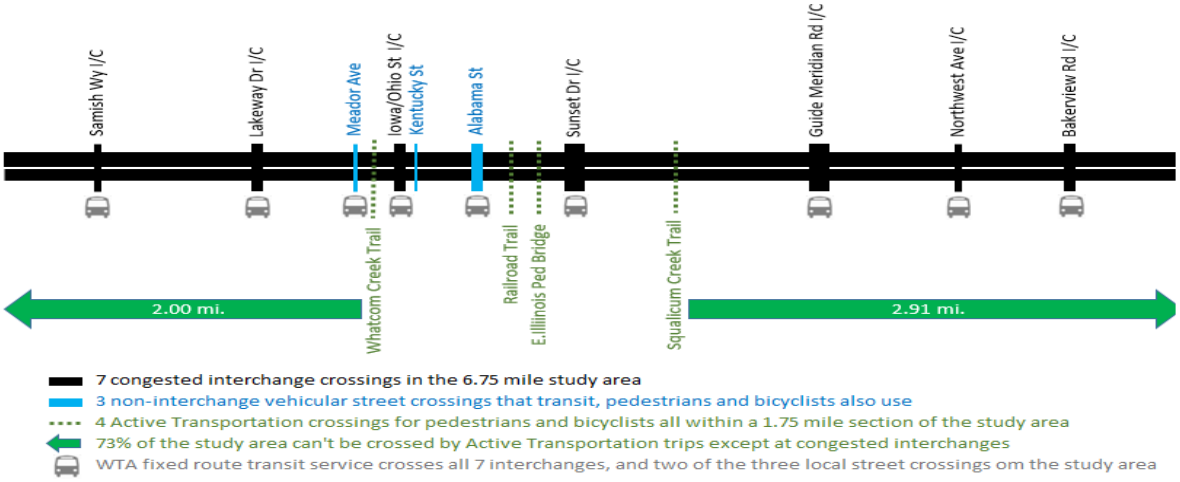
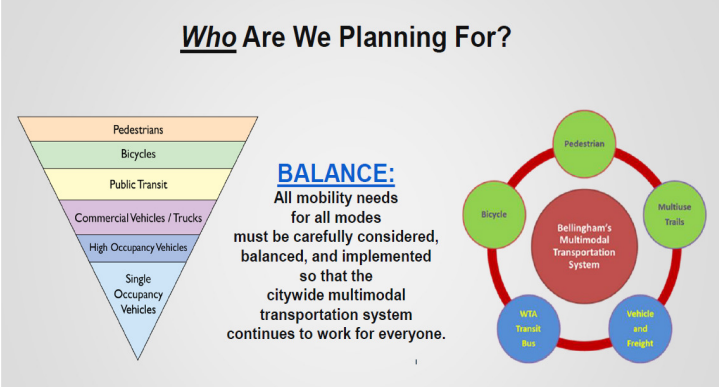


Exhibit 3-5: Source Whatcom Transportation Authority (WTA) Route Map. (2019)

Bellingham Active/Nonmotorized Transportation Network

Bicycling and walking travel modes play an important role within the local Bellingham transportation network. Infrastructure that supports bicycling and walking expands transportation options and complement transit and other forms of transportation by supplementing trip segments. In Bellingham public and private agencies have taken steps to promote pedestrian and bicycle travel in Whatcom County. These efforts are reflected in local agency plans and capital infrastructure decisions made throughout the community.

Exhibit 3-6: Source City of Bellingham Comprehensive Plan.



Pedestrian and bicycle plans have been developed that identify and designate planned improvements for pedestrian and bicycle facilities and corridors that address and encourage enhanced community access and promote healthy lifestyles. The City of Bellingham has policies and development regulations in place that support the development of an interconnected network of bicycle and pedestrian facilities that connect residential and employment areas with community and regional destinations, recreation schools, and public transportation services.

Bicycling

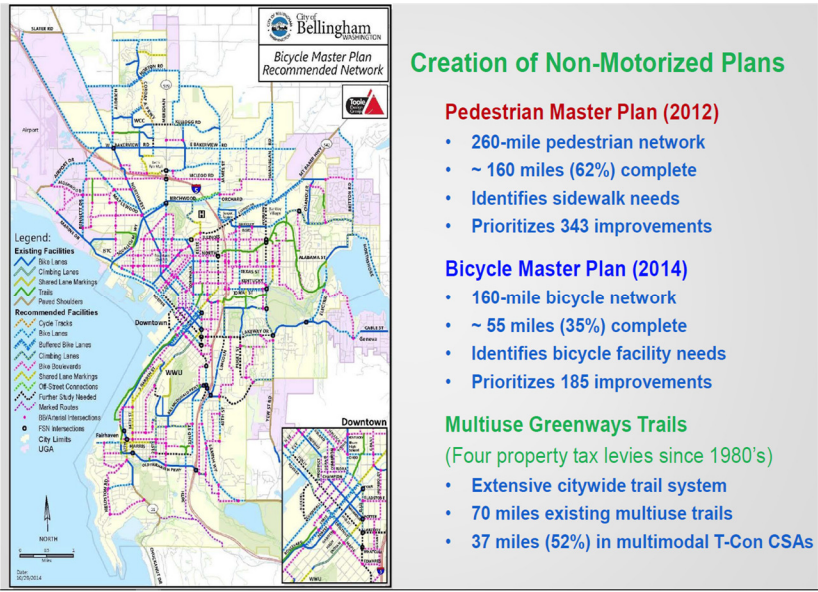
Bellingham and other local jurisdictions and agencies have made significant efforts to increase bicycling within the region to address their mode shift goals. According to 2019 data from the American Community Survey 5-year average (2014-2018). 3.6% of commute trips in Bellingham were made by bicycle, (See Bellingham 2020 Transportation Report on Annual Mobility, Chapter 2).

Bellingham has completed over half (52% of the 215 recommended bicycle link and crossing improvements adopted in their 2014 Bicycle Master Plan. This is a direct result of having dedicated local funding for both street resurfacing and non-motorized transportation improvements from the Bellingham Transportation Benefit District (TBD). Bellingham's rapid implementation of the Bicycle Master Plan from 2015 – 2020 garnered positive attention and recognition both statewide and nationally with the following:

In 2019, WSDOT initiated the development of an Active Transportation Plan in accordance with RCW 47.06.100 to include a statewide strategy to integrate bicycle and pedestrian pathways with other transportation system modes and users. The draft plan outlines policies and criteria to work towards improved network connectivity and quality on the regional transportation network. The plan is scheduled to be completed in late 2020.

- 2019 Washington Governor's Smart Communities Award;
- 2019 American Planning Association Washington Award for Transportation Plan Implementation;
- 2020 Association of Pedestrian & Bicycle Professionals national webinar (March 18, 2020);
- 2020 APA national Transportation Planning Division featured article in "State of Transportation Planning."

Exhibit 3-7: Source City of Bellingham's Nonmotorized Network.



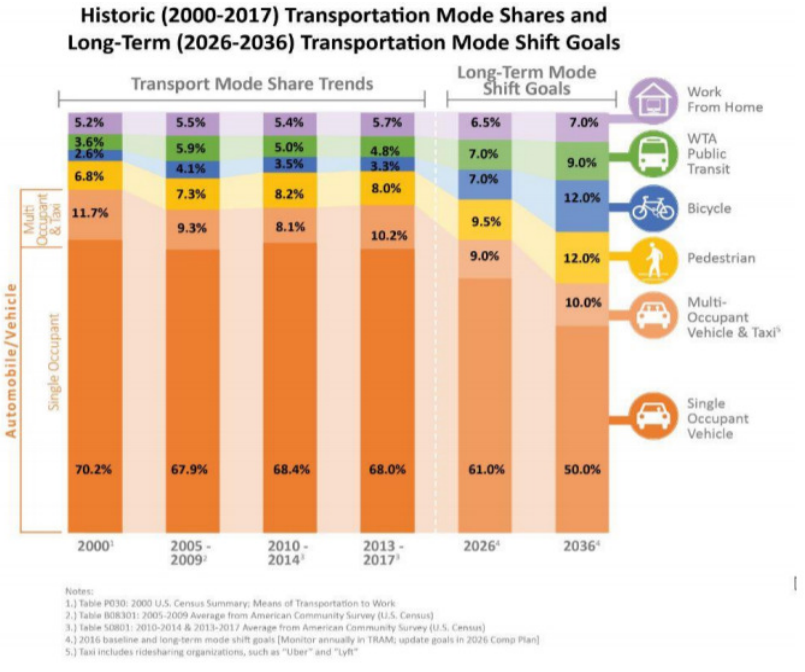
In Bellingham, 24% of trips are one mile or less, and 12% of all trips are made by walking. For people with disabilities, those with lower incomes, and seniors and children, walking accounts for about 30% of all trips. Walking trips are also among the shortest in travel time, averaging about 14 minutes per trip. (WCOG 2017 Transportation Activity and TRAM).

Bellingham Transportation Mode Shares 2014-2018

Up until mid-March 2020, the national and regional economies were very strong and had been for many years. Historically, individuals with more disposable income purchase more automobiles, which translates to higher vehicle miles traveled. This has been the trend for many years now and, coupled with historically low gasoline prices, has translated into more reliance on automobiles. Figures 2.5 and 2.6 below provide a closer look at all rolling 5-year averages and illustrate that compared to 2013-2017, the 2014-2018 5-year averages show that:

- Single Occupant Vehicle (SOV) mode share increased (+2.1%) to 70.1%
- Multi-Occupant Vehicle (MOV) mode share decreased (-1.2%) to 8.9%
- WTA Public Transit mode share held steady at 4.8%
  • Bicycle mode share increased (+0.3%) to 3.6%
- Pedestrian mode share decreased significantly (-0.9%) to 7.1%, and
- Work at home mode shares decreased (-0.2%) to 5.5%.

Exhibit 3-8: Source City of Bellingham Mode Shift Goals.



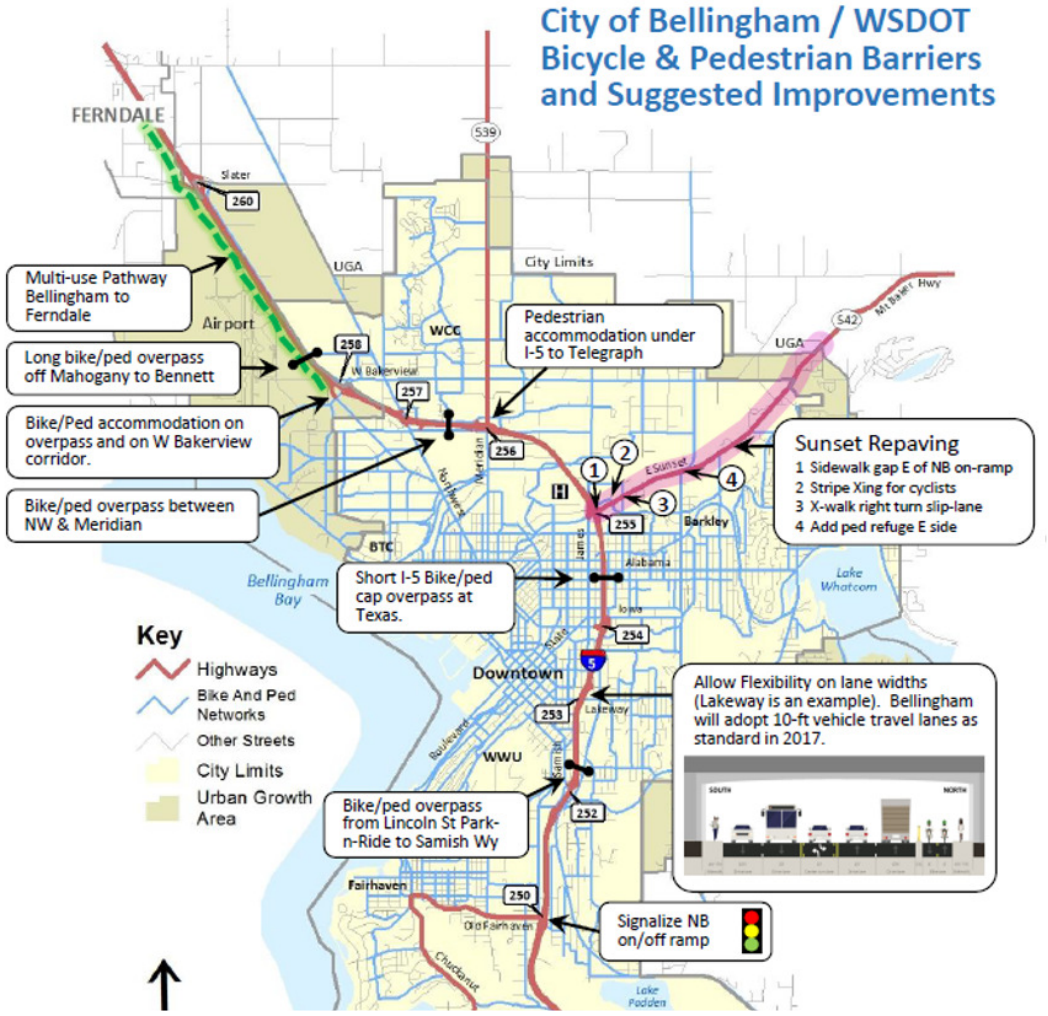
Decreases in mode shares for walking and carpooling are consistent with the national trend of increased vehicle miles traveled and are the result of factors that are out of Bellingham's local control, including, but not limited to:

- The increased availability of rideshare services, such as Uber and Lyft;
- A strong market economy allowing more disposable income;
- Low interest rates for automobile loans; and
- Historically cheap fuel prices (locally $2.50/gallon).

Nonmotorized Constraints in the Analysis Area

The I-5 corridor poses a significant barrier to east / west mobility for transit, bicycle and pedestrian activity. To address nonmotorized constraints Bellingham and WSDOT worked together to identify bicycle and pedestrian improvement location in the Analysis Area across I-5 to improve connectivity on the transportation network. Exhibit 3-9 shows four potential crossing location across I-5 and five areas to improve existing interchange locations.

Exhibit 3-9: City of Bellingham / WSDOT Potential Partnership Opportunities.



I-5 Facility Characteristics

I-5 is a part of the regionally significant roadway network. The Analysis Area is located between Samish Way MP 251, north to Bakerview Road MP 259. I-5, is the major north-south corridor in Washington State. The facility through Bellingham is improved with two paved lanes with shoulder in both direction through the Analysis Area. This segment of I-5 includes 7 interchanges, 30 associated on and off ramps, and 21 bridges. Environmental assets and needs are also located in the Analysis Area and are addressed in this chapter and *Appendix D*.

Exhibit 3-10: I-5 near SR 539/Guide Meridian.

Exhibit 3-11: Analysis Area between Samish Way Exit 252 and Bakerview Exit 258.

I-5 Interchanges in the Analysis Area

Seven major local arterials cross the interstate in the Analysis Area and two highways connect to I-5 within the Analysis Area at the following interchange locations:

- Exit 252 at Samish Way
- Exit 253 at Lakeway Drive
- Exit 254 at Ohio Street & Iowa Street
- Exit 255 at Sunset Drive / SR 542
- Exit 256A and 256B Guide Meridian /SR539
- Exit 257 at Northwest Avenue
- Exit 258 at Bakerview Road

Preservation, Pavement Condition

Another primary consideration in planning for the regional transportation system is the need to preserve the existing system and protect investments that have already been made to the system. Preservation is critical to keep the economy operating, and prolong the life of the existing transportation system through such projects as repaving roads, and rehabilitating bridges. WSDOT prioritizes preservation and safety projects when targeting investments on the transportation system to ensure that that the quality, effectiveness and efficiency of the system is maintained and in a state of good repair. To ensure a state of good repair, preservation needs are identified and monitored in the WSDOT Pavement Management System (PMS)

and Bridge Management System for I-5 and other state highways. Based on available data in 2018 the average pavement condition in the Analysis Area is rated as Good, however, some areas on the corridor may be rated poorly or not rated at all. In addition, the condition of these facilities can change dramatically from year-to-year and conditions should be reviewed and updated consistent with WSDOT and FHWA criteria when addressing corridor for improvements. Pavement condition is identified as *Contextual Needs* and additional investigation is needed to determine protection and management of resources when addressing corridor maintenance needs or improvements. More information on pavement preservation is located in *Appendix E*, however, for the most up-to-date information consult the WSDOT Pavement Management System.

Bridge Structures

When looking at future options, it will be important to know the constraints that existing infrastructure presents. Several prominent structures pose significant constraints on the ability for transit, pedestrian and bicycles to effectively operate on the local transportation network on either side of I-5.

Of the 21-bridge structures located on I-5 in the Analysis Area most structures carry local traffic over I-5, and 6-stuctures provide local access under I-5. None of the structures are classified as functionally obsolete. Bridge structures are identified as *Contextual Needs* and additional investigation is needed to determine protection and management of resources. More information on bridge structures is located in *Appendix E,* however, for the most up-to-date information consult the WSDOT Bridge Management System.

Environmental Resources & Assets

In coordination with the Environmental Services Office (ESO), environmental issues were documented early on in the Problem Identification phase of the Analysis between MP 251.00 to MP 259.00. The planning-level environmental review focused on human and natural environmental features and assets in the corridor that had the potential to influence the scope of future investments, or existing assets in the corridor that needed to be protected. Additionally, the evaluation included identified performance measures, performance metrics and performance targets to help determine environmental baseline and contextual needs in the corridor. A brief summary of the performance measures, metrics and targets are summarized in *Appendix B*. This evaluation did not examine the full range of environmental and social-economic issues that are normally addressed during site specific project development actions.

Environmental issues covered in the Analysis include:

- Chronic environmental deficiencies (CED)
- Stormwater retrofits
- Cultural resources, Historic Bridges
- Climate vulnerability impacts
- Wetland mitigation sites
- Fish passage barriers
- Habitat connectivity priorities
- Noise reduction

Chronic Environmental Deficiencies (CED)

There were no CED priorities within the Analysis Area. However, conditions may change for the most up-to-date information consult the WSDOT Bridge Management System.

Stormwater Retrofit & BMP Priorities

WSDOT manages stormwater that comes from state transportation facilities. Stormwater priorities and BMPs are identified as *Contextual Needs* in CSI. The database of prioritized stormwater retrofit locations shows there are no medium or high priorities in the corridor. However, there are 10 Stormwater BMPs between MP 252 – 260: four ponds, two ditches, and four roadside slope types. Details on these BMPs are available on WSDOT's Environmental Workbench. There is one TMDL included in WSDOT's NPDES Municipal Stormwater Permit in the Analysis Area

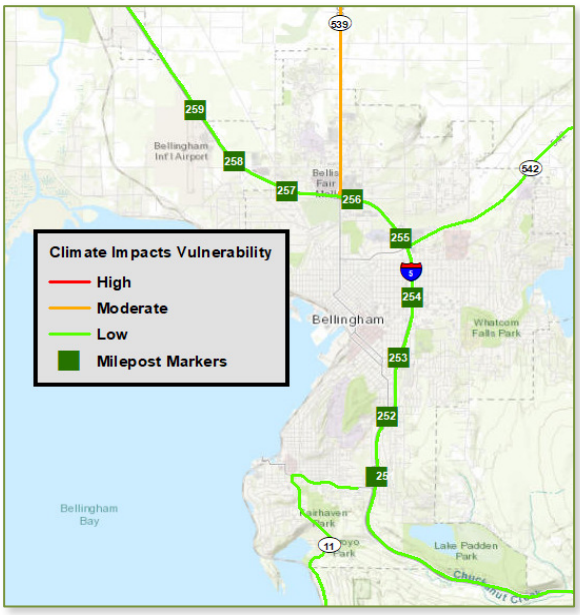
Cultural Resource, Historic Bridges

There are no interstate highway bridges of national significance identified in the Analysis Area that are subject to Section 106 review. Other cultural resources and archaeological sites are within close proximity (less than 5 miles or adjacent) to corridor, including some historic rail related features. Other unidentified historic properties (built environment) may also be located in close proximity to the highway or within the 5 to10-mile buffered area. Cultural resources in the Analysis Area are identified as *Contextual Needs* and additional investigation is needed to determine protection and management of resources.

Climate Vulnerability Impacts

Climate Vulnerability Impacts on I-5 were found to be low based on the qualitative assessment conducted by the Department in the 2011 Climate Impacts Vulnerability Assessment Report. However, the vulnerability assessment did not take into account extreme weather events, which can occur at any time on the corridor. After further dialog with ESO climate vulnerability impacts were identified as a *Contextual Need* and as maintenance and improvements occur in the Analysis Area consideration should be given to the vulnerability of the system to extreme weather events to help facilitate resiliency of the corridor.

Exhibit 3-12: State Routes Climate Vulnerability.



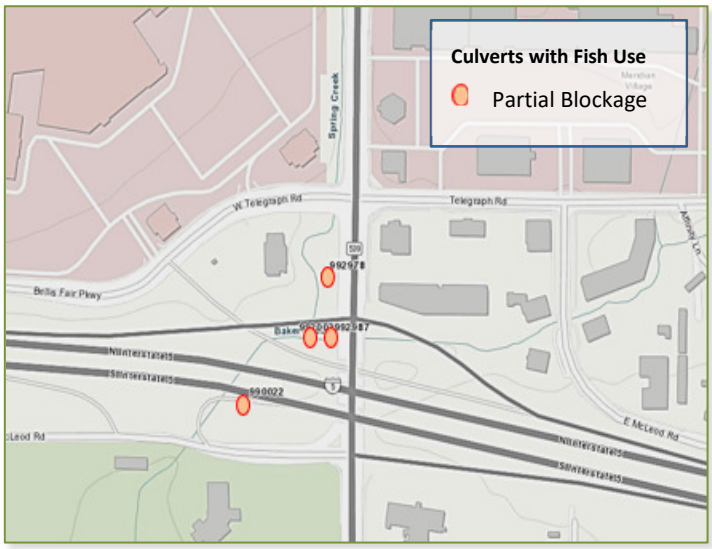
Wetland Mitigation Sites

There are a number of wetlands along I-5 within the Analysis Area and WSDOT manages wetland mitigation sites as environmental assets when impacts to wetlands require the agency to mitigate Clean Water Act regulations. Wetlands are identified as *Contextual Needs* and any development proposal may require additional mitigation if wetlands are impacted. Impacts to managed wetland mitigation sites require further negotiation with regulating agencies.

Fish Passage Barriers

The WSDOT Fish Passage Barrier Removal Program coordinates with WDFW and Tribal governments to inventory culverts on fish bearing streams within the jurisdiction of WSDOT and assess how well those structures are allowing fish passage. As of May 17, 2019, six fish bearing road crossings have been documented within the I-5 Corridor. Three of the six culverts are documented fish passage barriers. Two culvert crossings have unknown barrier status and one crossing is fish passable. Fish passage barriers identified under the federal court injunction (U.S. v. WA NO C70-9213) were identified as *Baseline Needs* in the corridor. Fish passage barriers not identified under the injunction are considered as *Contextual Needs*.

Exhibit 3-13: Spring and Baker Creek crossing I-5 / SR 539.



In March of 2019, WSDOT began preliminary design on several fish passage barrier projects crossing I-5 and associated I-5 interchange ramps in the vicinity of I-5 and SR539. Barriers are located on Spring Creek at MP 256 and Baker Creek at MP 256.28. Preliminary design work is also being done nearby on Spring Creek on SR 539 in the vicinity of MP 0.03.

Habitat Connectivity Priorities

In 2010 The Washington Wildlife Connectivity Working Group, which is co-led by WSDOT and the Washington State Department of Fish and Wildlife, published a statewide analysis of habitat connectivity. The Habitat Connectivity Investment Priorities is based on analysis of areas that are important for wildlife movements - the Analysis Area has high to medium priorities to invest in improvements for habitat connectivity. Table 3-3 shows data collected over a five-year period of deer carcass removal and deer-vehicle collision data. Highway improvements such as barrier fencing or improved deer crossing opportunities may increase habitat connectivity. Habitat Connectivity was identified as a *Contextual Need* in the corridor as maintenance and as other improvements are considered in the corridor, additional investigation to determine if specific improvements are warranted to increase habitat connectivity.

Table 3-3: Deer Carcass and Deer-Vehicle Collision. Source: WSDOT.

Begin ARM	End ARM	# of deer carcass removals	# of deer-vehicle collisions	Safety Rank
250.6	251.5	3	12	High
251.6	252.5	7	4	Medium
252.6	253.5	6	6	High
253.6	254.5	3	6	High
254.6	255.5	8	7	High
255.6	256.5	3	5	Medium
256.6	257.5	1	6	High
257.6	258.5	8	8	High
258.6	259.5	3	5	Medium

Noise Wall Retrofit Priorities

This corridor includes one retrofit noise wall location in the vicinity of McLeod Road east of Meridian Street and one existing noise wall on the west side of I-5 at the York neighborhood. Based on

information from ESO the likelihood of new noise walls within this corridor is moderate to high due to anticipated noise levels and housing density at the following locations:

- Both sides of I-5 between Connelly Avenue/Old Fairhaven Pkwy and Ridgemont Way vicinity
- Both sides of I-5 between Virginia Street and E. Sunset Drive
- South of I-5 and west of Northwest Avenue

In addition, noise is identified as a *Contextual Need when* proposed improvements are contemplated and should be evaluated during pre-scoping and design to determine affected areas and impacts.

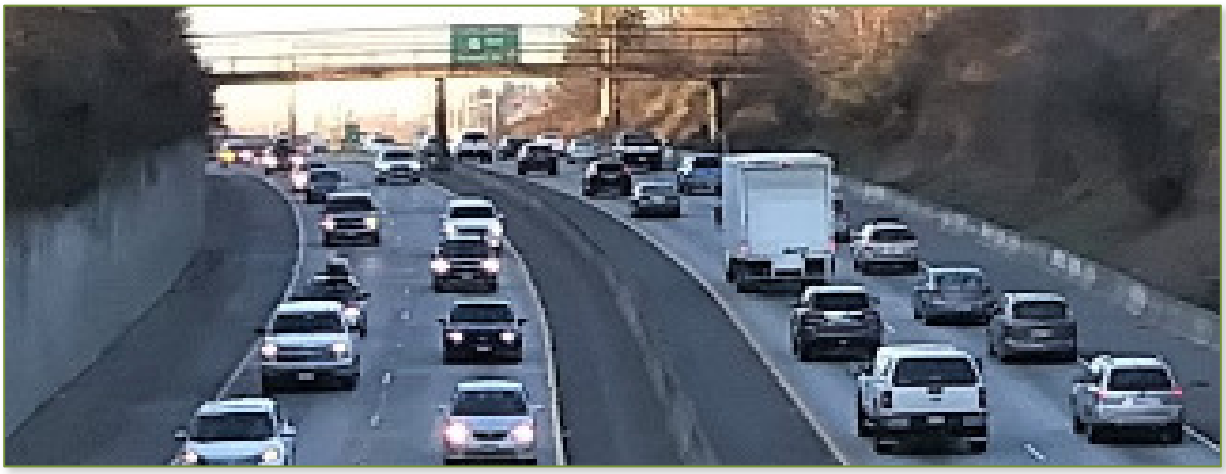
What did we learn?

- The transportation network is owned and operated by multiple public agencies and private the sector.
- The City of Bellingham prioritizes multimodal transportation through policy and capital projects in the City to support their mode shift goals.
- The regional transportation system serves many users through a variety of different modes that include air, rail, freight, automobiles, transit, pedestrians, bicyclists, and other means of transportation.
- There are three documented fish passage barriers on the I-5 corridor in the Analysis Area.

Chapter 4 Traffic Operations & System Performance

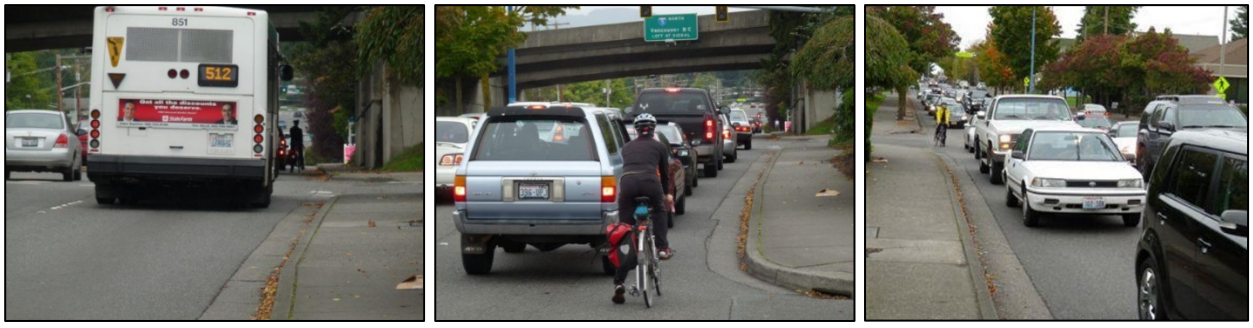
Over the past 15 years WSDOT has authored or been involved in a number of studies documenting existing and forecasted conditions on I-5 through the urban area of Bellingham. A common theme in those studies has been increasing volumes of traffic, congestion, and crashes on a geometrically challenging 8-mile section of I-5 that has 7 interchanges, 30 ramps and four travel lanes. In the busiest sections through Bellingham, I-5 traffic volumes have increased to 85,000 ADT mid-week in 2018 rising to 100,000 ADT on Fridays in summer months, with more growth in Bellingham and the region expected in the future.

Exhibit 4-1 Thursday mid-afternoon congestion near the I-5 / Sunset Drive *interchange, February 2020.*



We have also heard from our local agency partners about the growing impact I-5 has had on the local and regional transportation network. They tell us that I-5 is a physical barrier and bottleneck to local system connectivity and mobility within Bellingham, having the effect of funneling active transportation trips, transit routes, freight movements, and automobile trips through highly congested I-5 interchanges to cross I-5 in many parts of Bellingham.

Exhibit 4-2: *Lakeway Drive PM peak hour congestion at the I-5 interchange. Photos provided City of Bellingham.*



In 2015 WSDOT and its local agency partners completed a Corridor Sketch Initiative (CSI) assessment of I-5. CSI summarized findings from previous studies, completed a high-level screen to identify current and emerging conditions, and recommended further actions to better understand identified needs. This Analysis took a closer look at the needs and strategies identified in CSI.

In this chapter we are providing a summary of our analysis and findings for I-5 traffic operations, crashes, trip characteristics in order to gain a better understanding of:

- I-5 traffic operations and efficiency
- What I-5 traffic operations look like if vehicle traffic volumes grow in the future
- The relationship between I-5 crashes and congestion
- I-5 trip characteristics

I-5 Traffic Operations

To evaluate I-5 mainline traffic conditions we used the following analysis tools and measures of performance:

- ✓ Highway Capacity Manual analysis to gauge the performance of the I-5 mainline. WSDOT's performance standard in the I-5 Analysis Area is LOS D. When the level of service exceeds LOS D (i.e., LOS E) it indicates that I-5 is at or nearing capacity. I-5 begins to lose some of its capacity to move traffic safely and efficiently, and it continues to degrade as traffic densities reach LOS F conditions.
- ✓ Merge Lane Volume Threshold analysis to show where there is a need to manage the flow of on-ramp traffic. WSDOT has an established volume threshold of 1700 vehicles/lane/hour. When merge lane volumes reach or exceed the threshold, it indicates a need to manage the flow of on-ramp traffic volumes in order to get the most out of existing I-5 capacity and improve safety.
- ✓ I-5 Geometrics is a focus area whenever we evaluate I-5 traffic operations and safety in Bellingham. Prior studies have reviewed I-5 geometrics extensively, and have been included in the report appendix. We included relevant geometric information in our analysis and discussions throughout this Analysis.

Highway Capacity Manual Analysis (HCM)

We evaluated existing I-5 mainline level of service (LOS) for basic freeway segments (before, after and in-between ramps) and freeway merge/diverge segments (on- and off-ramp connections). The existing conditions analysis period is 3 pm to 7 pm for the average mid-week day in April 2018, using I-5 traffic volumes queried from WSDOT's vehicle detection loops. We did not conduct an analysis using future forecasted volumes due to time and resource constraints, but we did evaluate I-5 conditions by applying 10% and 20% traffic volume growth scenarios to the April 2018 volumes to get a sense of what future I-5 operations will look like with continued growth in traffic volumes.

We looked for locations and times where I-5 mainline segments have traffic densities equal to or greater than 35 passenger cars/mile/lane which correlates to LOS E or LOS F conditions. Starting at the lower density range for LOS E we begin to see a degradation in I-5 throughput due to the volume of traffic and associated congestion. As densities increase to the higher range of LOS E and into LOS F the traffic throughput capacity of I-5 continues to decline. Table *4-1* describes traffic densities and traffic flow characteristics for HCM level of service.

Table 4-1: HCM Level of Service (LOS) Criteria and Characteristics.

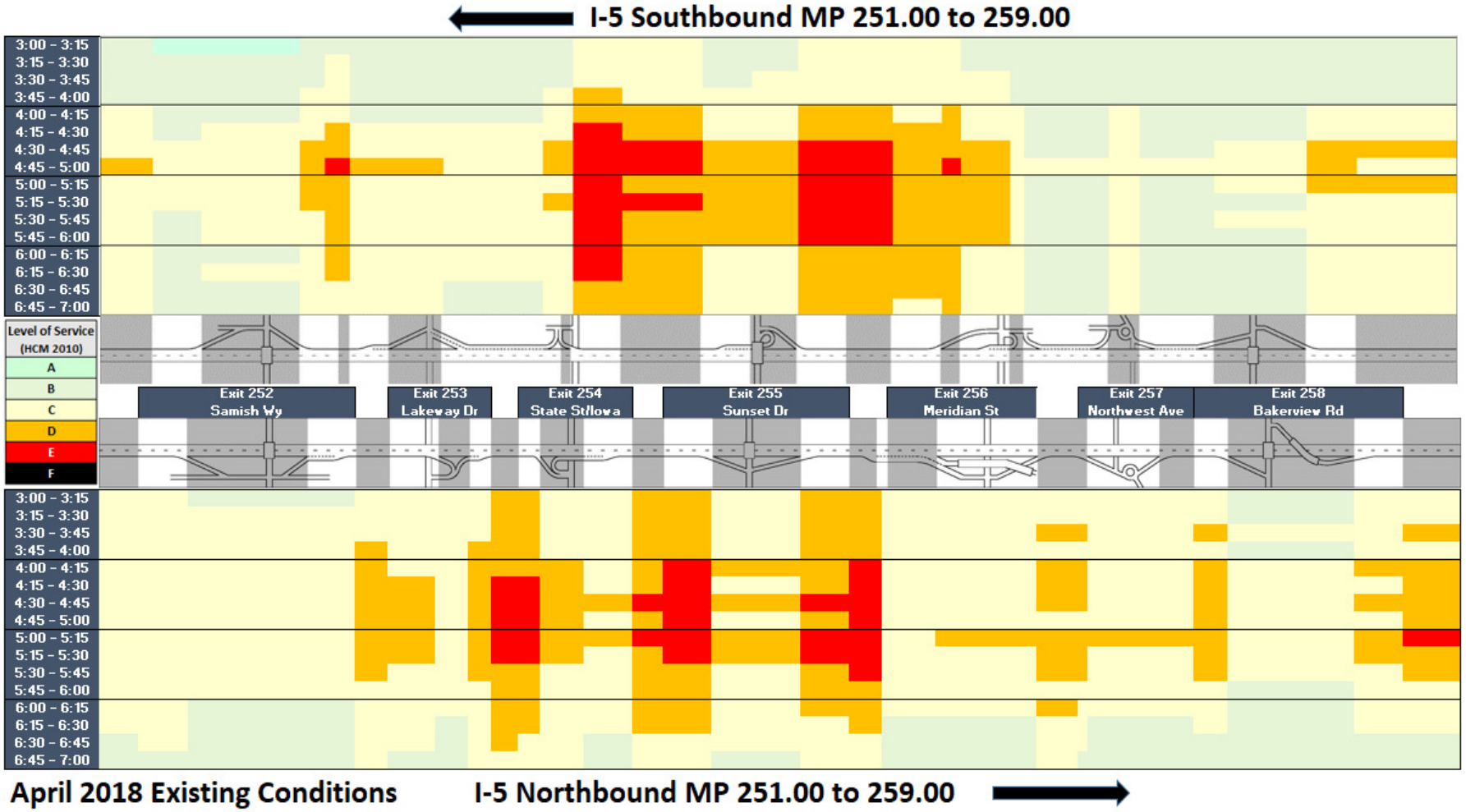
HCM Level of service (LOS) criteria and Characteristics

LOS	Density* for basic freeway segments	Density* for merge /diverge segments	Traffic Flow Characteristics
A	≤ 11	≤ 10	Vehicles are almost completely unimpeded in their ability to maneuver within the traffic stream. The effects of incidents or point breakdowns are easily absorbed.
B	> 11 - ≤ 18	> 10 - ≤ 20	Vehicles maneuvering within the traffic stream are only slightly restricted. The effects of minor incidents are still easiliy absorbed.
C	> 18 - ≤ 26	> 20 - ≤ 28	Freedom to maneuver within the traffic stream is noticeably restricted and lane changes require more care and vigilance by drivers. Minor incidents may still be absorbed but localized deterioration in service quality will be significant. Queues may be expected to form behind any significant blockages.
D	> 26 - ≤ 35	> 28 - ≤ 35	Speeds begin to decline with increasing flows, with density increasing more quickly. Freedom to maneuver within the traffic stream is seriously limited. Drivers experience reduced physical and psychological comfort levels. Even minor incidents can be expected to create queuing because the traffic stream has little space to absorb disruptions.
E	> 35 - ≤ 45	> 35	I-5 operation is at or near capacity. Freeway operations are highly volatile as there is virtually no usable gaps within the traffic stream, leaving little room to maneuver within the traffic stream. Any disruptions, such as vehicles entering from a ramp or an access point or a vehicle changing lanes, can establish a disruption wave that propagates throughout the upstream traffic stream. Toward the upper boundary of LOS E the traffic stream has no ability to dissipate even the most minor disruption, and any incident can be expected to produce a serious breakdown and substancial queueing.
F	Demand exceeds capacity, or Density > 45	Demand exceeds capacity	The flow of traffic breaks down forming queues behind bottlenecks. Points of recurring congestion, such as merge or weaving segments and lane drops, experience very high demand in which the number of vehicles arriving is greater than the number of vehicles that can be discharged. Traffic incidents can temporarily reduce the capacity of a short segment, so that the number of vehicles arriving at a point is greater than the number of vehicles that can move through it. Queues have the potential to extend upstream for considerable distances.

** Density is the number of passenger cars/mile/lane (pc/mi/ln)*

Exhibits 4-3, 4-4 and *4-5* on the following pages chart the results of the HCM traffic analysis for the I-5 the Analysis Area for existing conditions, and the existing conditions plus 10% and 20% volume growth scenarios. I-5 segments that are operating worse than LOS D are shown graphically as red or black in the charts with red being LOS E and black being LOS F.

Exhibit *4-3: I-5 Samish Way to Bakerview Existing Conditions HCM Level of Service Results.*



As shown in *Exhibit 4-3*, current traffic densities equate to inefficient LOS E conditions on several I-5 segments and times of the day. Some segments of I-5 are operating inefficiently for 1.5 to 2 hours a day due to the volume of traffic.

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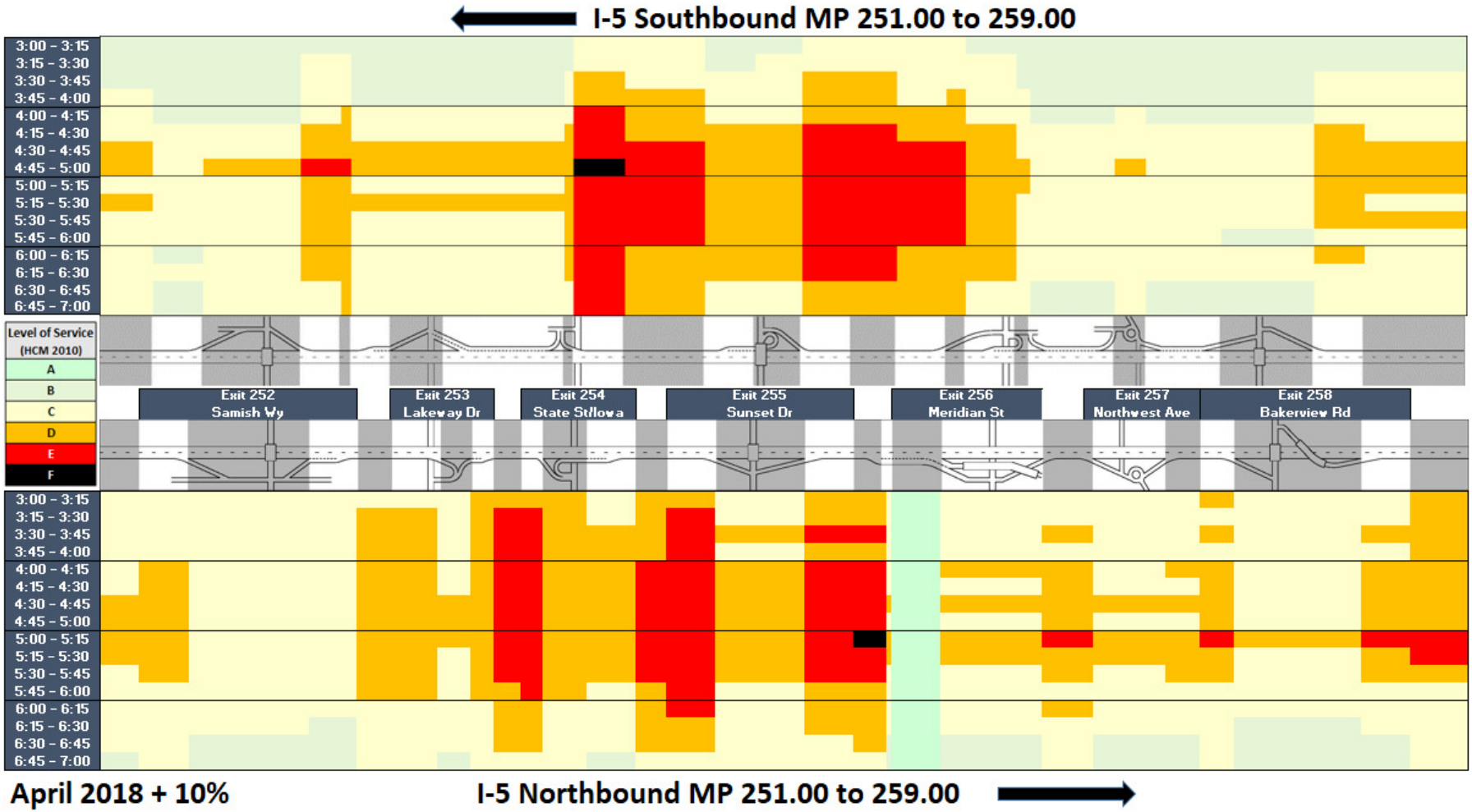
Exhibit *4-4: I-5 Samish Way to Bakerview, HCM Level of Service/Traffic density results for the 10% volume growth scenario.*



As shown in *Exhibit 4-4*, as traffic volumes grow by 10% the number of time periods/locations operating inefficiently doubles, and we begin to see traffic densities that equate to LOS F conditions.

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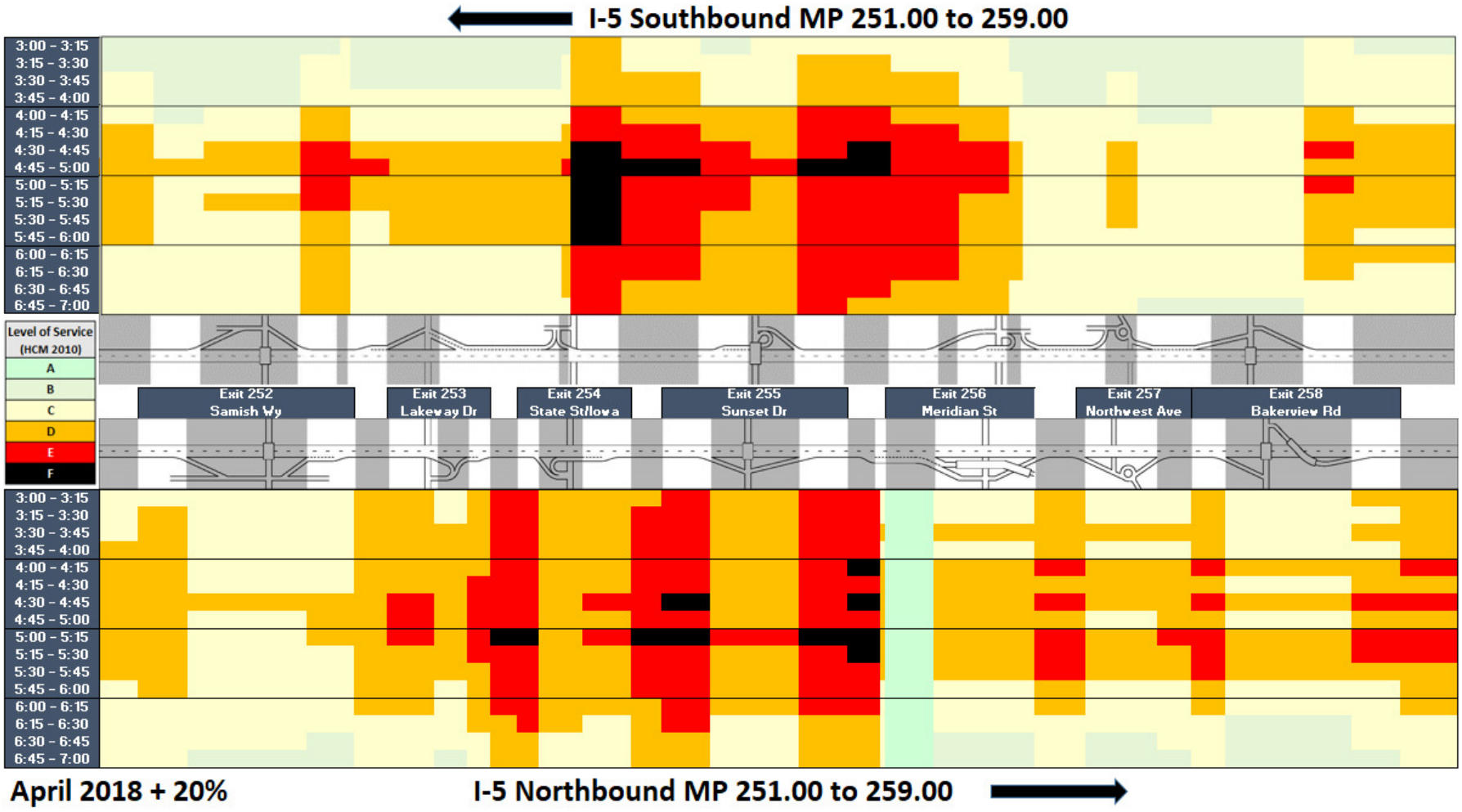
Exhibit 4-5: I-5 Samish Way to Bakerview, HCM Level of Service/Traffic density results for the 20% volume growth scenario.



As shown in *Exhibit 4-5*, as traffic volumes grow by 20% the number of time periods/locations operating inefficiently at LOS E or LOS F quadruples versus existing conditions volumes. At these volumes there are many more locations and times where traffic densities equate to LOS F conditions.

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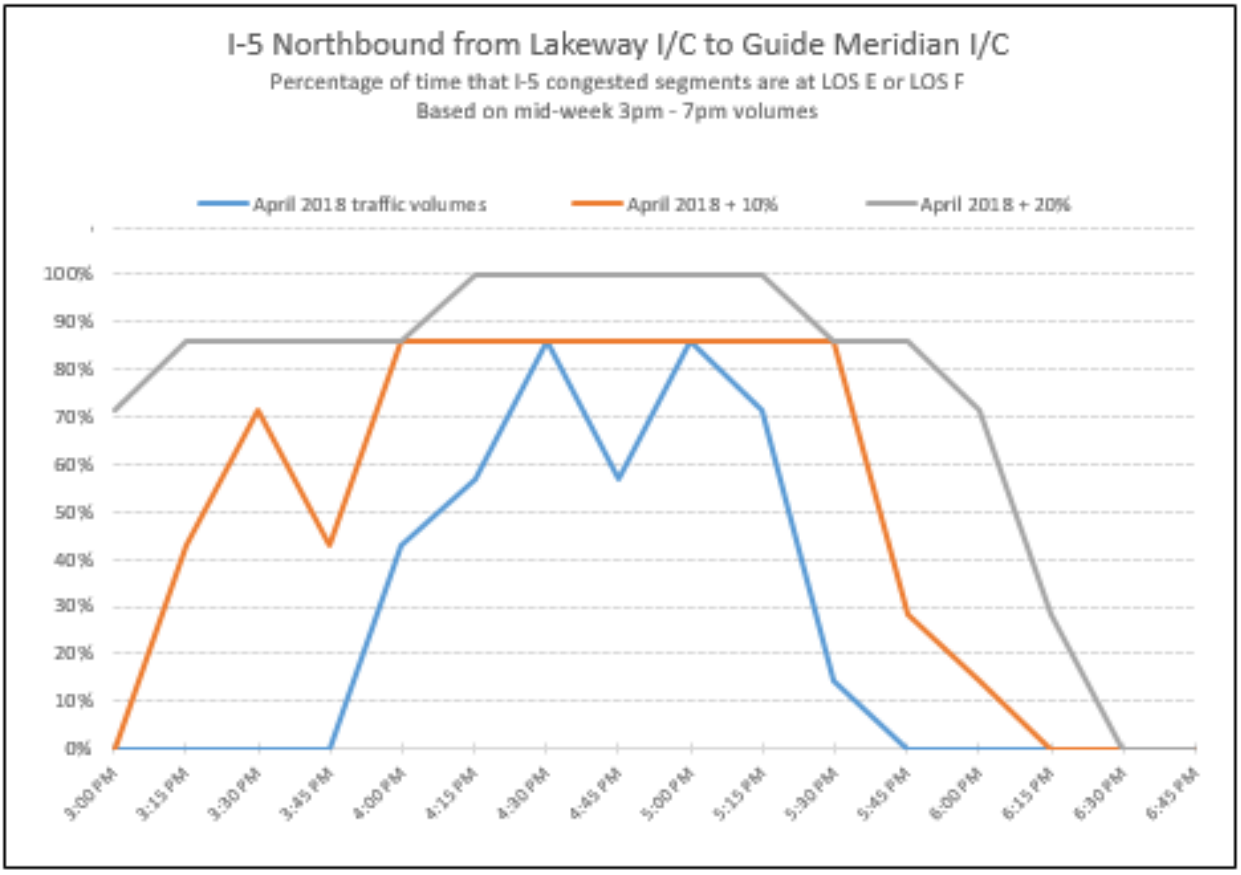
I-5 Northbound Congested Segments Summary

In the northbound direction there are seven segments of I-5, between the Lakeway Dr. (Exit 253) interchange on-ramp through to the Guide Meridian (Exit 256) interchange off-ramp, that have the highest densities of traffic and congestion.

Currently, those congested and inefficient segments are operating at LOS E or LOS F for a significant percentage of the time, particularly between 4:00 pm and 5:30 pm as represented by the blue line in the chart in *Exhibit 4-5*.

When volumes grow, the percent of the time that I-5 is highly congested and inefficient increases, spreading to most of the 3:00 pm to 7:00 pm time period as shown in the chart by the orange line (10% volume growth) and gray line (20% volume growth). At 20% volume growth densities reach LOS F conditions frequently in some I-5 segments. We get a taste of what I-5 traffic conditions with these higher volumes look like now on the busiest travel days of the year on many Fridays between May and September, and on Canadian Holidays as Canadians travel to and from British Columbia via I-5.

Exhibit 4-6: I-5 Northbound from Lakeway Interchange to the Guide Meridian /SR 539 Interchange.



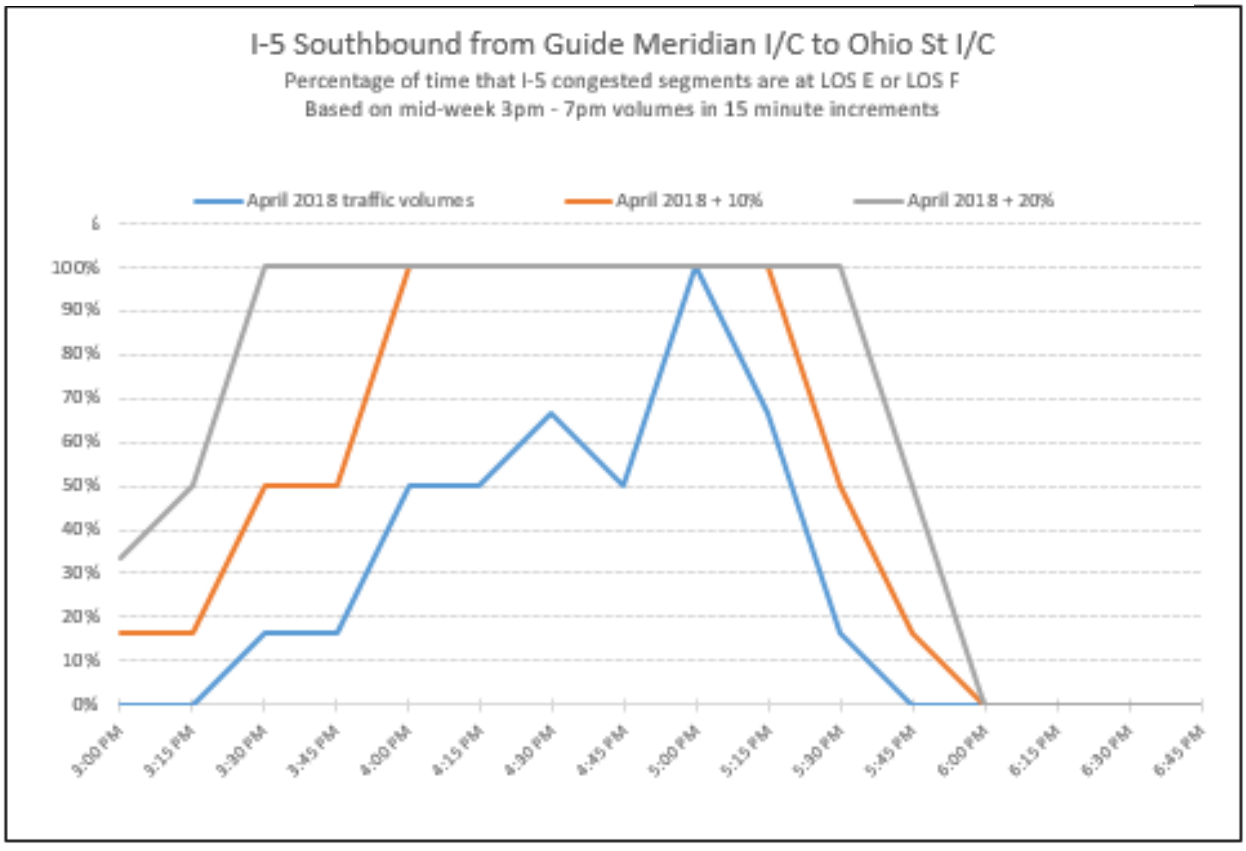
I-5 Southbound Congested Segments Summary

In the southbound direction there are six segments of I-5, between the Guide Meridian (Exit 256) interchange on-ramp through to the Ohio St (Exit 254) interchange off-ramp, that have the highest densities of traffic and congestion.

Currently those congested segments are operating at LOS E or LOS F for a significant percentage of the time, particularly between 4:00 pm and 5:15 pm as represented by the blue line in the chart in Figure 4-7.

When I-5 volumes grow, the percent of the time that is highly congested and inefficient increases, spreading to most of the 3:00 pm to 7:00 pm time period as shown in the chart by the orange line (10% volume growth) and gray line (20% volume growth). At 20% volume growth densities reach LOS F conditions frequently in some I-5 segments. And, as mentioned for the northbound summary, we also see southbound traffic volumes at, or close to, these higher levels on Fridays between May and September and on many Canadian Holidays.

Exhibit 4-7: I-5 Southbound from Lakeway Interchange to the Guide Meridian /SR 539 Interchange.

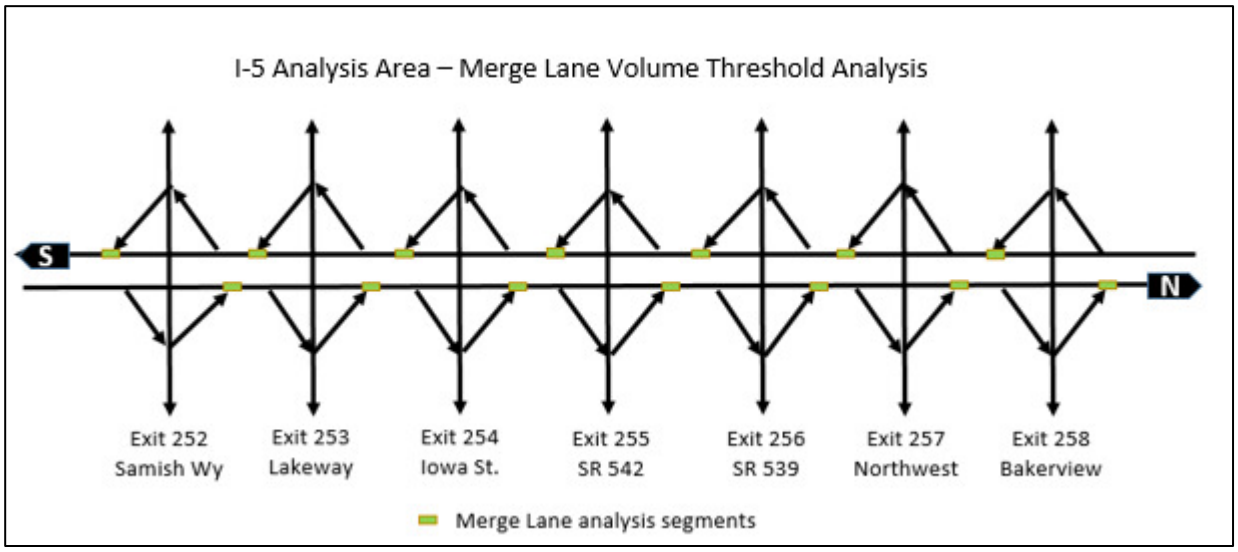


I-5 Traffic Operations: Merge Lane Volume Threshold Analysis

WSDOT Merge Lane Volume Threshold analysis was used to determine if existing traffic volumes show a need to manage the flow of traffic where on-ramps merge onto the I-5 mainline. Our existing conditions analysis was based on I-5 mainline and ramp traffic volumes for an average mid-week day in May 2017, queried from WSDOT's vehicle detection loops for the hours between 6:00 am and 8:00 pm.

For each analysis segment shown in *Exhibit 4-8* below, we added the on-ramp volume to the right lane volume on I-5 at all of the Analysis Area on-ramp merge points for every 15-minute period. When the combined volume meets or exceeds a Merge Lane Volume Threshold of 1700 vehicle/lane/hour this indicates a need to manage flow in the merge lane at one or more locations on I-5.

Exhibit 4-8: I-5 Merge Lane segments evaluated.



We also evaluated I-5 traffic conditions for two future volume growth scenarios, adding 10% and 20% to the May 2017 volumes.

Exhibit 4-9 and 4-10 provide summary charts of the Merge Lane Volume Threshold analysis for existing conditions as well as for the volume growth scenarios for I-5 northbound and southbound. The locations and times that are at or above the 1700 vehicle/lane/hour threshold are shown as colored sections in the charts. The darker the colors, the higher the merge lane volumes, and the greater the need to manage traffic flow in the merge lane. The need is amplified by the high concentration of interchanges and ramps on I-5 over a relatively short distance in the Analysis Area through Bellingham, which makes ramp merge areas challenging for drivers.

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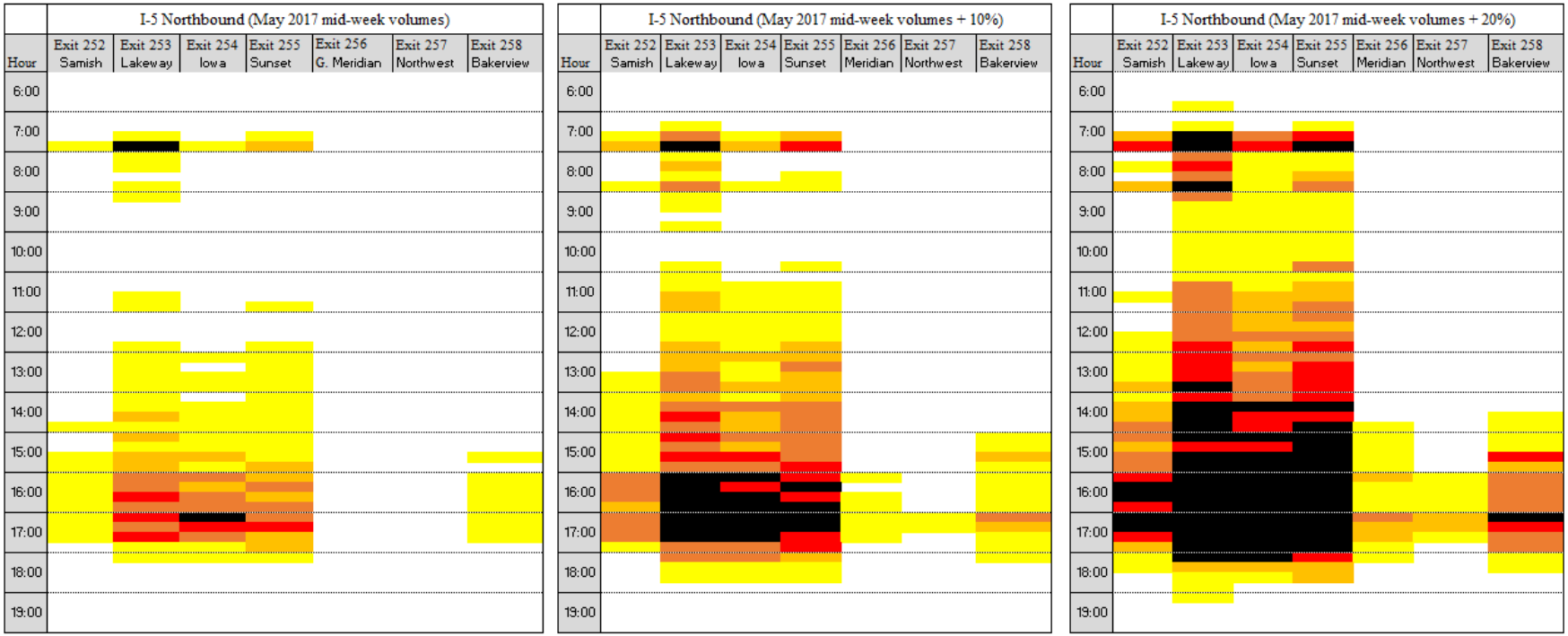
Exhibit 4-9: I-5 Northbound Merge Lane Volume Threshold Analysis Results.



The I-5 Northbound charts tell us:

- In the base year the times of the day where the volume threshold is met is primarily between 1 and 6 pm where 54% of the time periods have volumes at or over the threshold. Narrowing it further to the 4 - 6 pm time period and the percentage increases to 68%.
- Adding 10% and 20% to base year volumes results in more locations and times where volumes are at or greater than the threshold
- Currently there are many Spring and Summer Fridays that have traffic volumes greater than the May 2017 + 10% volumes shown in the chart.

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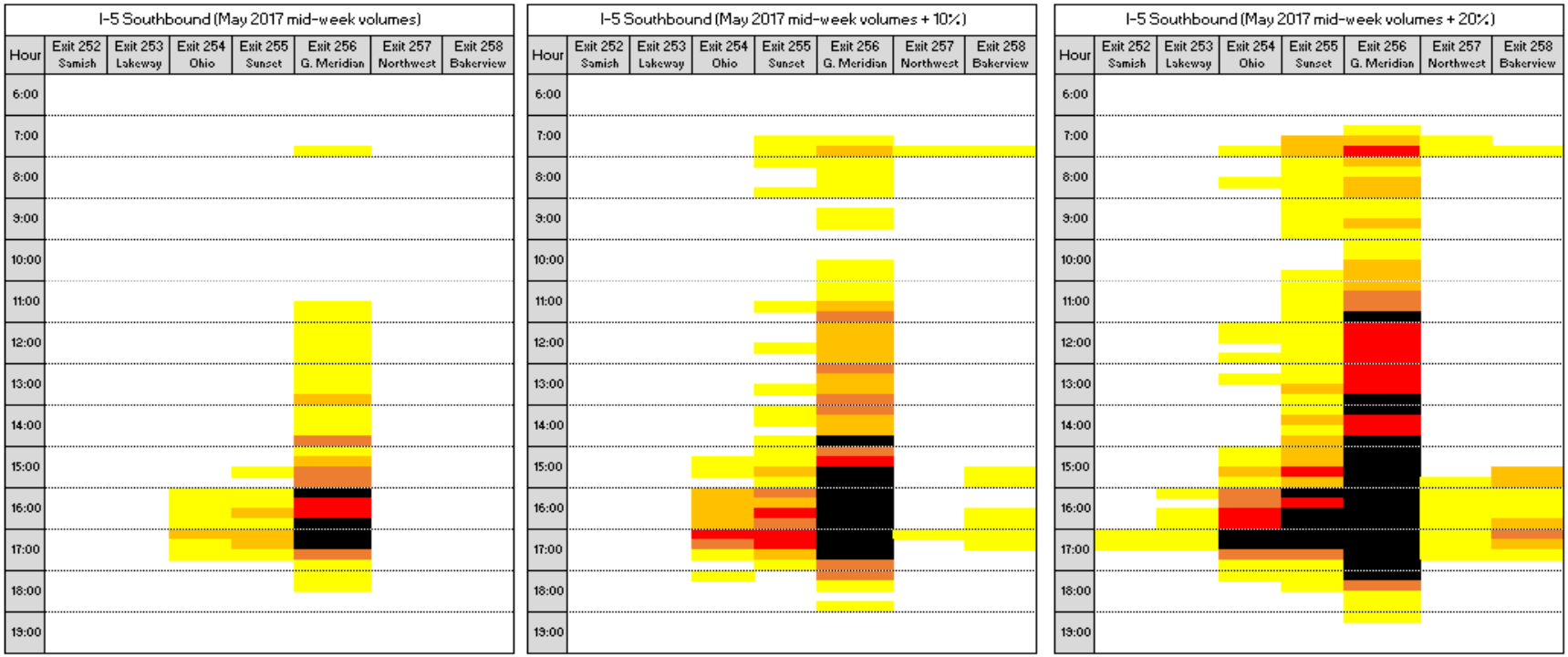
Exhibit 4-10: I-5 Southbound Merge Lane Volume Threshold Analysis Results.



The I-5 Southbound charts tell us:

- In the base year, the times of the day where the volume threshold is met is primarily between 1 - 6 pm where 25% of the time periods have volumes at or over the threshold. Narrow it further to the 4 - 6 pm time period and the percentage increases to 39%.
- Adding 10% and 20% to base year volumes results in more locations and times where volumes are at or greater than the threshold.
- Currently there are many Spring and Summer Fridays that have traffic volumes greater than the May 2017 + 10% volumes shown in the chart.

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Congestion and Crashes

Our traffic analysis has shown us the locations and times where I-5 is congested and inefficient due to high travel demand. These are also the locations and times where crashes occur more frequently, as shown in *Exhibit 4-11* and *4-12* which list I-5 mainline crashes for a five-year period, 2013 – 2017.

Exhibit 4-11: I-5 Northbound Crashes by Milepost.

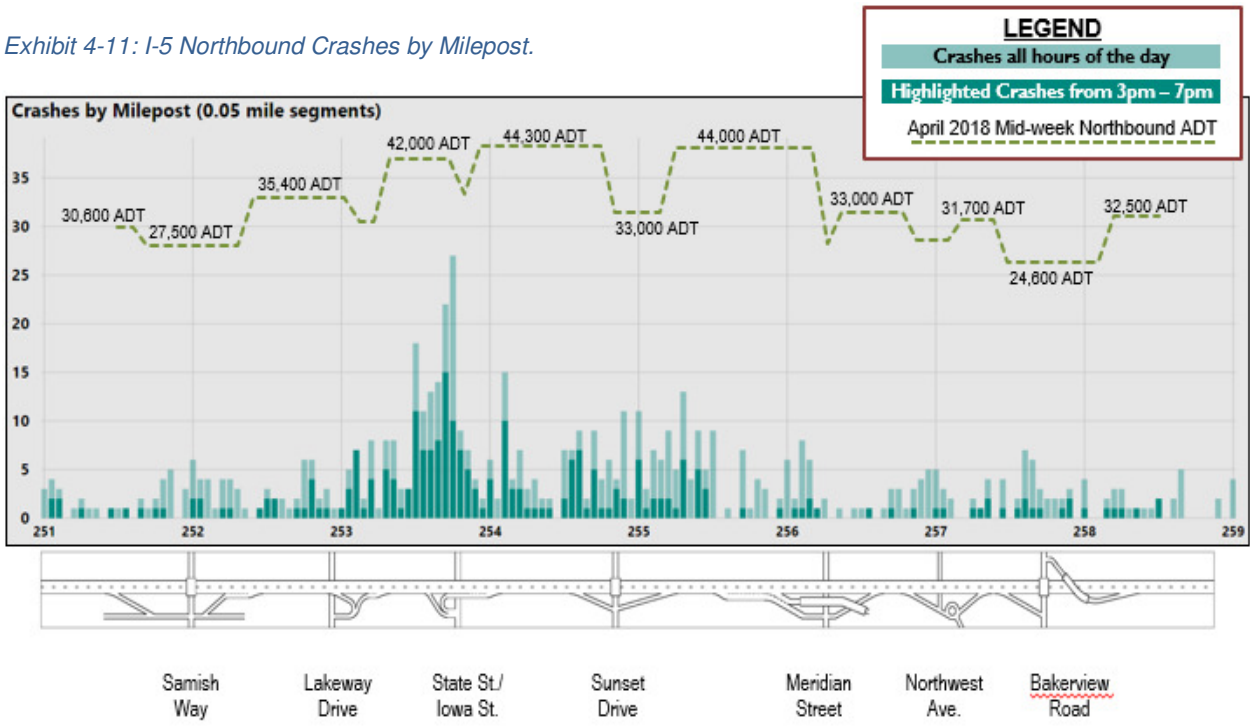
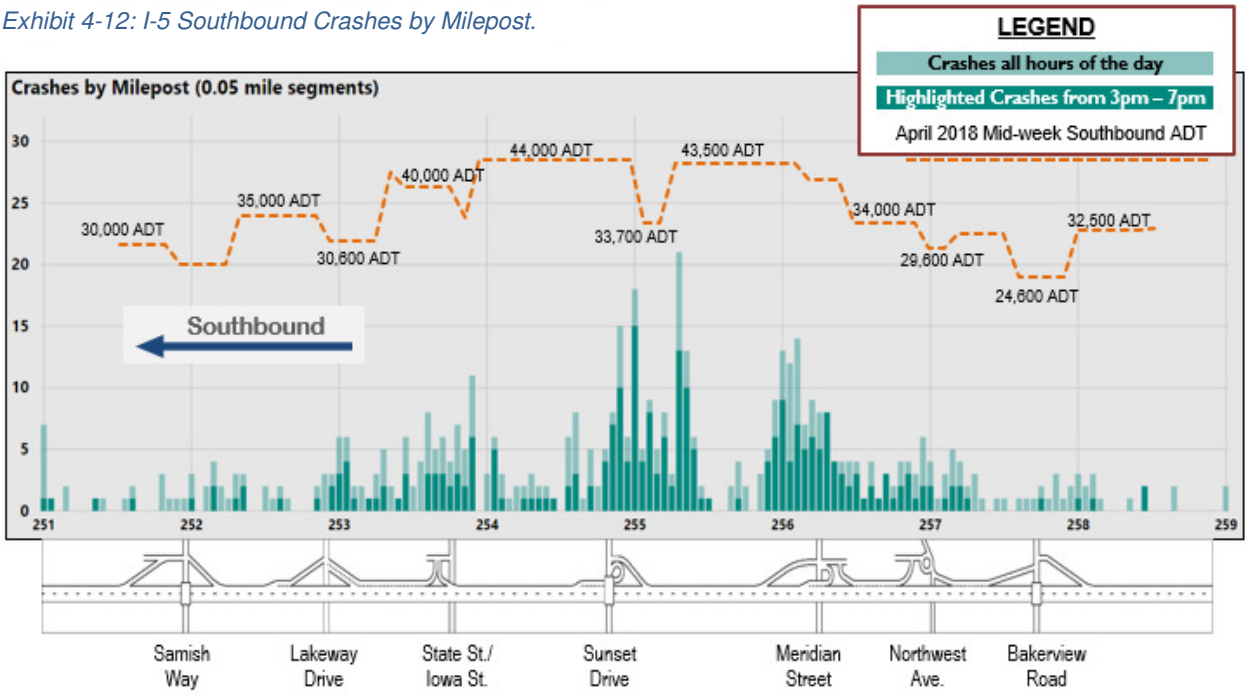


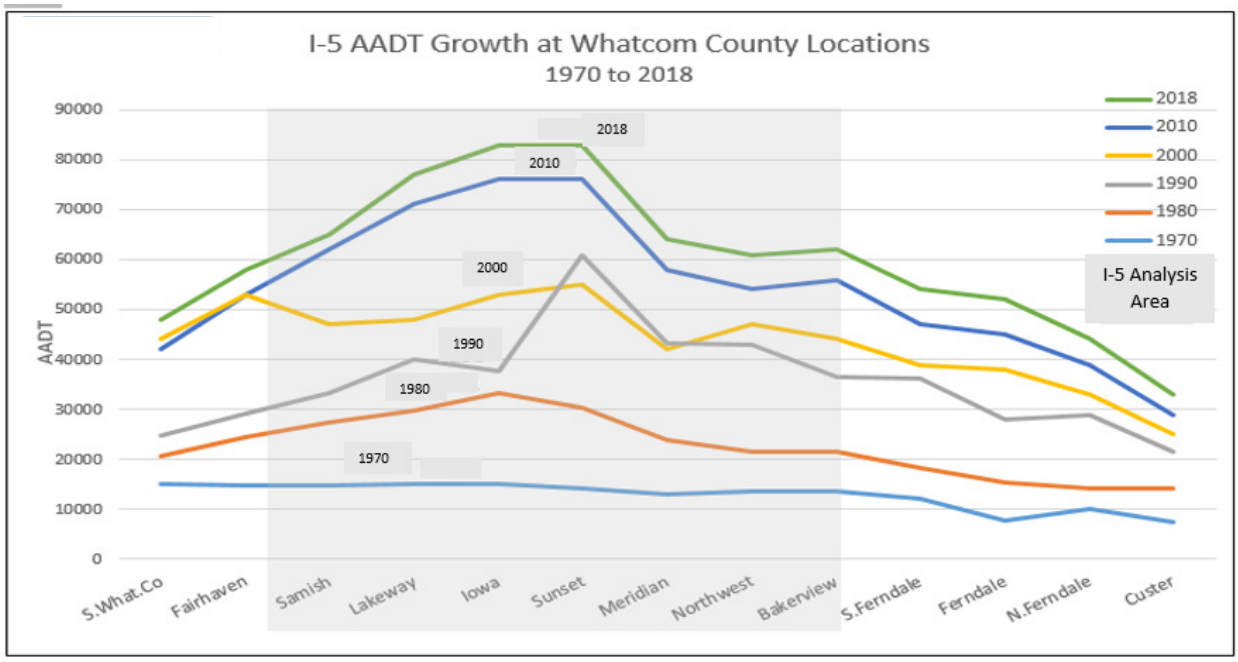
Exhibit 4-12: I-5 Southbound Crashes by Milepost.



I-5 Trip Characteristics – Origin/Destination Analysis

It has long been suspected that much of the growth in traffic volumes on I-5 through Bellingham is due to the high number of short vehicular trips entering and exiting I-5 within the City. One indication of this are the traffic counts at various locations on I-5 dating back to 1970 showing that AADT volumes have grown at a much higher rate within the Bellingham compared to locations north of south of it, particularly since 2000 as shown in *Exhibit 4-13*.

Exhibit 4-13: I-5 AADT Growth at Whatcom County Locations.



In the past we did not have the analytical tools nor data to evaluate short trips on I-5 during peak demand periods. But with the installation of traffic loop counters on I-5 ramps and the mainline, and the rapid refinement and quality of "big data" services that collect and aggregate the trip movements of vehicles and devices (primarily cell phones) through the transportation network we now have access to quick and affordable origin/destination information and traffic volumes for I-5 trips.

That information tells us that a high percentage of trips entering I-5 on-ramps in Bellingham make a short trip to exit at an off-ramp in Bellingham. The number of short-trips is a contributor to traffic congestion on I-5 in Bellingham. As those local trips grow, it reduces the capacity of I-5 for the safe and efficient movement of people and goods regionally, nationally and internationally.

See *Exhibit 4-15* for average trip lengths in the Analysis Area.

Exhibit 4-14: Traffic queues on the I-5 northbound off-ramp at the Guide Meridian.

Exhibit 4-15: I-5 Northbound On-ramp Trip Lengths for Average Mid-week Day in 2017, 5 to 6 pm

I-5 Northbound

- Over 50% of on-ramp trips travel three interchanges or less.
- The Guide Meridian off-ramps are the most frequent destination.
- 36% of the Iowa St. on-ramp trips travel 2.4 miles to exit at the Guide Meridian off-ramps.
- 41% of the Sunset Dr. on-ramp trips travel 1.4 miles to exit at the Guide Meridian off-ramps.

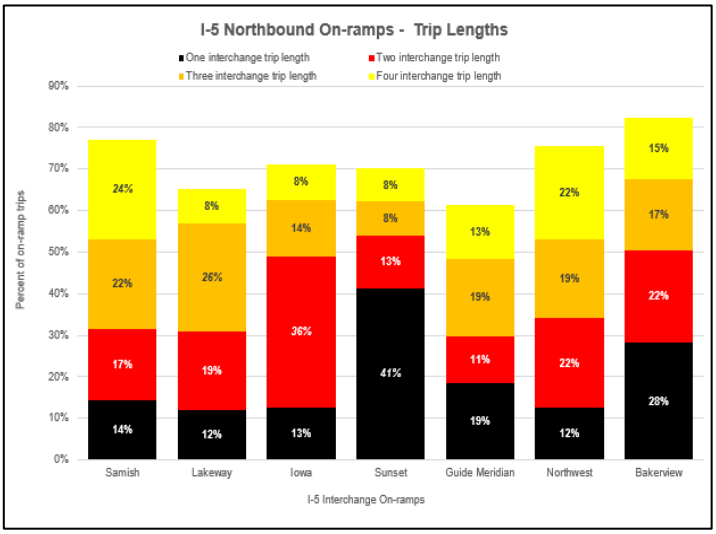
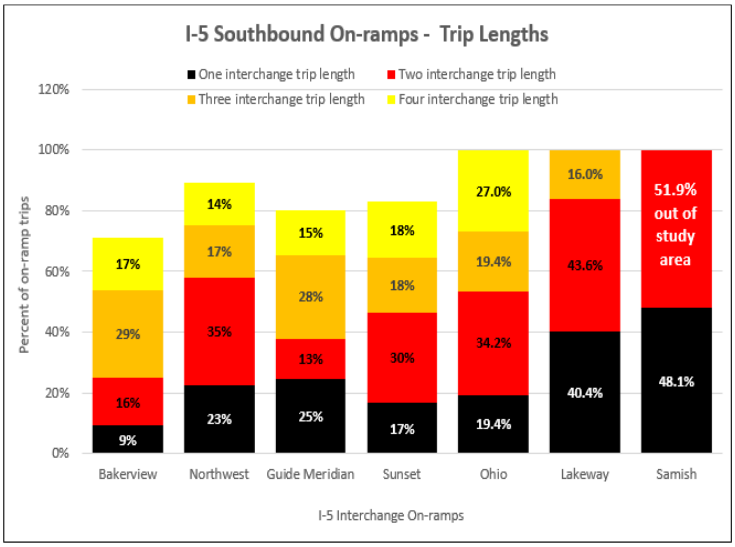


Exhibit 4-16 I-5 Southbound On-ramp Trip Lengths for Average Mid-week Day in 2017, 5 to 6 pm

I-5 Southbound

- Over 60% of the on-ramp trips travel three interchanges or less
- 65% of Sunset Drive on-ramp trips travel 2.7 miles or less to exit at the Ohio St, Lakeway Drive and Samish Way off-ramps
- 84% of Lakeway Drive on-ramp trips travel 2.2 miles or less to exit at the Samish Way and Fairhaven Pkwy off-ramps.



What did we learn?

- Historical I-5 traffic volume growth exceeds population growth.
- Congestion is degrading I-5 efficiency and reliability.
- A high percentage of I-5 automobile trip distances in the Analysis Area are short trips between one or two interchanges.
- Crashes are occurring more frequently where there is congestion at the merge points to I-5.
- Crash rates are slightly higher in the I-5 Analysis Area when compared to similar highways and traffic volumes.
- Insufficient local network connections crossing I-5 impact all travel modes and may hinder attainment of multimodal goals and may increase dependence on I-5 for short local automobile trips.

- Local arterials are extremely congested at and near all I-5 interchanges, impacting all travel modes.
- I-5 interchange spacing is very tight between six of the seven interchanges in the Analysis Area.
- I-5 does have significant congestion during peak travel periods, but does not suffer from a capacity problem now and into the future. Over 50% of the trips on the interstate are short trips and a reduction in vehicular trips by encouraging mode shift to other modes of transportation such as bike, ped and transit may reduce demand on the state and local transportation network.

Chapter 5: Strategies and Alternatives Evaluation

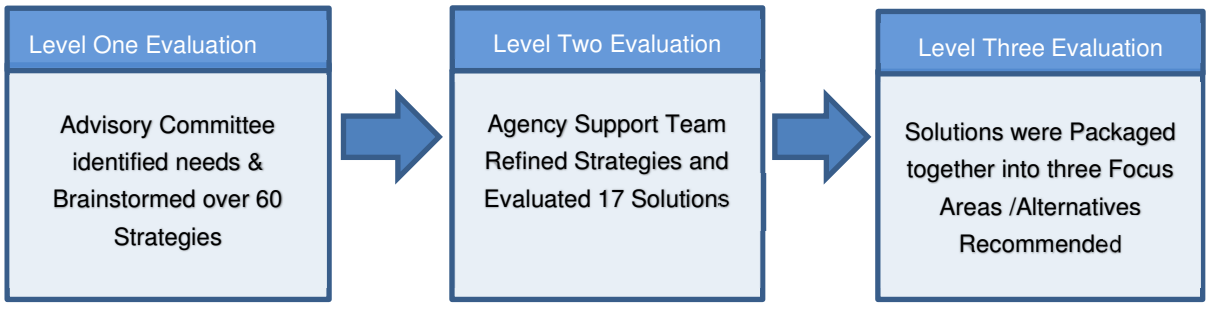
This Analysis identified a broad range of traffic operational and Transportation Demand Management (TDM) strategies and solutions to address identified needs in the Analysis Area. Under the Practical Solutions approach all modes of travel were considered and were included as part of the evaluation and screening process. Many strategies and solutions reflected the policies and implementation policy plans from regional and local transportation plans, public transit service plans and supporting agency. All of these plans identified potential investments that help support the I-5 mainline and local street system interface. Additionally, other components of the multimodal transportation system were evaluated to address strategies and solutions identified by the Advisory Committee. Maintenance, safety and preservation were emphasized in all transportation decisions.

> **"It's not only about fixing a state highway problem, we also look at how that affects the regional transportation system in order to provide an integrated and sustainable transportation network."**
>
> Practical Solutions Roundtable Presentation 10/2019

Collaborating with our partners and stakeholders we worked to develop cost-effective, multimodal transportation strategies to address mobility, safety and other needs identified during the Analysis. Together we developed recommendations on a full range of solutions to improve transportation network functions, linkages and modal connections. It has been a performance-based approach, where multimodal performance outcomes guided the decision processes that lead to investment choices in the right location, at the right time. In addition, this process was about how to address identified needs in the Analysis Area through the improvement of traffic operations, managing demand by improving modal integration into the transportation network and limiting large capital expenditures by better utilizing existing capacity on the interstate and non-WSDOT owned systems.

The following sections identify the Analysis findings and outcomes, selection of strategies, solutions, alternatives and screening evaluation to address identified baseline and contextual needs. The Analysis process, summarized in *Exhibit 5-1,* began with the identification of performance measures. We then did an analysis of I-5 operations and crashes to better understand the current conditions along with community objectives. With that information we then established the purpose and need statement to address those conditions. This work helped the Advisory Committee and Agency Support Team identify and evaluate strategies and solutions to develop recommended Alternatives.

Exhibit 5-1: Three-Level Evaluation and Screening Approach.



What have we learned from this Analysis?

As described in previous chapters, this Analysis helped us better understand the traffic performance of the I-5 corridor and the extent of the need or problems on the corridor. Our initial review included an in-depth analysis of traffic operations and crashes on I-5 over the initial 16-mile corridor. This assessment was used to determine how the corridor was functioning and if there were areas that fell below performance expectations. After careful consideration of the data, the corridor was narrowed to address the most significant problems that were occurring in an 8-mile section through Bellingham from MP 251 to MP 259. The determination of need was based on the following findings and Observations:

Exhibit 5-2: Identified Findings and Observations.

Identified Findings and Observations

- Historically, I-5 traffic volume growth exceeds population growth.
- Congestion is degrading I-5 efficiency and reliability.
- In the Analysis Area, a high percentage of I-5 automobile trip distances are short between two and three interchanges.
- Crashes are occurring more frequently where there is congestion at the merge points to I-5.
- Crash rates are slightly higher in the I-5 Analysis Area when compared to similar highways and traffic volumes.
- Insufficient local network connections crossing I-5 impact all travel modes and may hinder attainment of multimodal goals and may increase current dependence on I-5 for short local automobile trips.
- Local arterials are extremely congested at and near all I-5 interchanges, impacting all travel modes.
- I-5 interchange spacing is very tight between six of the seven interchanges in the Analysis Area.
- I-5 has significant congestion during peak travel period, but does have plenty of capacity for its intended purpose of regional or statewide travel, now and into the future.
- A reduction in vehicular trips and improving traffic operations at ramp merge points may reduce travel demand and crashes.

Strategies and Solution Evaluation

Our Advisory Committee established, and cooperatively developed a Charter *(Appendix G)* that identified the vision statement, objectives and outcomes to guide the Analysis. Based on the purpose and need for the Analysis, a broad range of solutions were identified and progressively screened and refined to identify preferred strategies and solutions that would move forward for further investigation. At each of the three levels of evaluation and screening, strategies and solutions were either eliminated from further analysis or they were retained, modified and grouped together to improve potential performance. The evaluations built upon the findings and analysis, and information gathered from partners and subject matter experts. At each level, our stakeholder partners worked with us to refine a broad range of solutions to meet the identified needs.

Analysis and performance measures focused our attention on identifying strategies and solutions that addressed system performance issues either through improved operations, modal options or through strategic low-cost capital investments.

The Advisory Committee emphasized the importance of I-5 to the regional and local economy and maintaining performance at an "optimal level through operational and demand management strategies." Therefore, it was no surprise that many of the strategies and solutions identified in the Analysis highlighted the importance of having an integrated multimodal transportation system.

Successful integration of the system would mean factoring in all modes of transportation together with Bellingham's land use strategies, regionally forecasted data, as well as state, regional and local plans and studies as referenced in Chapters 1 - 3.

The evaluation screening approach considered multimodal strategies and WSDOT Practical Solutions framework. This review incorporated the consideration of cost-effective strategies and solutions that balance the goals of state and local needs, to increase performance that addressed identified needs in the Analysis Area.

How were Needs Identified Using the Analysis and local knowledge?

The first of two Advisory Committee Workshops were held on January 11, 2019. Based on the findings and observation identified in Exhibit 5-2, together with regional and local information on the transportation system and Analysis Area characteristics, the Advisory Committee members took part in several joint exercises to identify problems/needs and then potential strategies, solutions and alternatives. Prior to identifying needs, WSDOT provided a summary of their findings on I-5 traffic operations and crashes. Local agencies also presented briefings on their existing and planned regional transportation system needs, transit facilities/services, nonmotorized (active) transportation facilities, local street network, and land use plans. *Table 5-1* summarizes the 19 problems and needs identified by the Advisory Committee during the workshop.

Table 5-1: Advisory Committee January 11, 2019. Problems & Needs Identified.

Problems and needs identified by the Advisory Committee
Lots of people are making short trips on I-5 and there are opportunities to use other modes.
Crashes at our most congested interchanges and ramps in study area.
Interstate crashes effect the local system
Emergency response impacts the transportation system in the study area
Preserve the ability of I-5 to provide reliable interregional trips
Improve operations on I-5
Reduce carbon footprint
Lack of connectively is reducing operational effectiveness of WTA
Lack of intermodal connectivity
Congested interchanges are impacting all modes of transportation, ie bus, walk, bike, other
Lack of modal choice options
Trip predictability is unreliable
Social expectation are unrealistic
Lack of redundancy, lack of connectivity (resiliency) in the system for different modes
Community Health effects of congestion
Environmental justice – impacts
Impacts to commute time in the study area
Travel time reliability
Deer-vehicle impacts

*January 11, 2019 Advisory Committee Workshop

The Advisory Committee also identified over 60 potential strategies, many of these were noted as being oriented toward a predetermined solution. Over the course of the next 90 days the Agency Support Team reviewed the needs and strategies identified by the Advisory Committee and determined how they stacked up against the identified purpose and need statement, objectives and outcomes established for this Analysis. Baseline and contextual needs were refined using the performance measures, metrics and targets identified in *Appendix B*. A summary of identified baseline and contextual needs identified during

this analysis are highlighted in *Table 5.2*. Specific project baseline and contextual needs may be refined to reflect the purpose and need of the

How solutions were identified and evaluated?

The Agency Support Team prepared problem statements and developed issues papers for each identified problem. Issues papers were developed to assist decision makers in evaluating solutions through a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis, and to create scoring criteria. Papers reflected a purpose and needs statement, and objectives reflected in the project Charter, together with identified findings and observations. Each issue paper included a problem statement, description, and objective of the proposed solution. Each solution identified their strengths, weaknesses, opportunities and potential threats. Agency presented issues papers can be found in *Appendix F*. Information from each agency issue paper was transferred to an evaluation worksheet represented in *Table 5-3 beginning on page 60*. Agency issue papers represented a total of 17 solutions narrowed down from the potential 60 strategies identified in the January Advisory Committee workshop.

Table 5-2: Baseline and Contextual Summary.

Baseline and Contextual Needs Summary		
No	**Category**	**Assessment**
A.	**Mobility (motorized vehicles)**	Baseline
B.	**Bus/Transit Service**	*Contextual*
C.	**Safety**	*Baseline*
D.	**Preservation**	
	• Pavement	*Contextual*
	• Bridge	*Contextual*
	• Maintenance	*Contextual*
F.	**Active Transportation**	
	• Bike	*Contextual*
	• Pedestrian	*Contextual*
G.	**Environment**	
	• Fish Passage Barriers	Baseline/ *Contextual*
	• Wildlife Habitat Connectivity	*Contextual*
	• Wetland	*Contextual*
	• Climate Vulnerability Impacts	*Contextual*
	• Noise and Noise Wall Retrofit	*Contextual*
	• Stormwater BMP	*Contextual*
	• Cultural Resources	*Contextual*

Notes: 1. Baseline and contextual needs were identified during the development of the I-5 corridor analysis and may not reflect specific baseline or contextual needs necessary for project specific applications and will be identified using plans and studies relevant at the time of the project development phase.
2. Fish Passage Barriers identified under the federal court injunction (U.S. v. WA NO C70-9213) are considered baseline needs in accordance with the WSDOT Design Manual. Other fish passage barriers in the analysis area are contextual.

In addition, to the SWOT analysis Agency Support Team identified additional scoring criteria shown in *Exhibit 5-3* to evaluate potential solutions based on Analysis findings and observations.

Exhibit 5-3: Evaluation Scoring Criteria.

Evaluation Scoring Criteria	
1. Does the solution alternative address the identified study need? 2. Does the solution alternative address some or all of the study objectives? 3. Is the solution alternative practical and can it be implemented?	+ Yes 0 No - Has negative impacts

Evaluation Results

On June 6, 2019, the Agency Support Team conducted a preliminary assessment of the solutions. They evaluated those using jointly developed Evaluation Criteria, SWOT Analysis, and findings and objectives. The results of this review are captured in the Evaluation Worksheet, located in *Table 5-3,* and submitted to the second Advisory Committee Workshop on June 25, 2019 for discussion and determination of final actions. Summary results of the 17 solutions are as follows:

A. Eight solutions addressed I-5 mainline operations and safety
   - Ramp metering
   - Hard shoulder running

- Highway access management
- Tolling
- Auxiliary lanes
- Automated traveler information signs/Active traffic management
- Traffic incident management
- Enforcement

Of the eight listed above, five were deemed unfeasible and or required extensive capital resources to address. For example, hard-shoulder running and auxiliary lanes required significant capital expenditures to accommodate improvements. Additionally, access management of I-5 interchanges may be challenging politically to change or remove existing access ramps to I-5/Bellingham locations. Tolling required action from the legislature and/or other interests.

B. Six alternatives addressed Transportation Demand Management (TDM) enhancements
   - Active Transportation (bicycle and pedestrian) improvements
   - Mode Choice education and encouragement
   - Improve transit connection with other modes
   - Transit signal prioritization
   - Transit street design
   - Transit network efficiency improvements (transit hubs/upgrades)

   All TDM alternatives would help reduce or maintain trips on the interstate and local street system by improving connectivity between modes and encouraging mode shift from single occupancy vehicles to other alternatives.

C. One alternative addressed environmental
   - Wildlife connectivity

   Solutions under environment would not directly improve I-5 mainline operations, however, improvements may improve fish and wildlife connectivity across I-5 as well as address the Departments Stewardship policies.

D. The Agency Support Team added two additional solutions to improve traffic operations and safety on the state and local transportation system. These included:
   - Automated traveler information signs on I-5 to improve traffic management
   - Practical low-cost improvements on of the local network and ramps at key I-5 interchanges

   Automated traveler information signs were noted in interviews with WSDOT Maintenance to improve workman safety on I-5 as well as notify travelers of I-5 operating conditions.

Grouping of Recommended Solutions and Identification of Alternatives

The final Advisory Committee workshop was held on June 25, 2019 to discuss results from the June 6, 2019 Agency Support Team's evaluation of solutions. As indicated above, the recommended strategies and solution went through a three-tiered evaluation process and were analyzed on their effectiveness in addressing identified problems and needs. Based on the findings and observations, two general approaches were noted:

- ✓ Manage Operations on I-5 to address the severity and frequency of crashes.
- ✓ Remove vehicular trips from the transportation network by working with local partners to achieve mode-shift goals by identifying and implementing opportunities to change the existing vehicle commute culture to other modes of transportation, and improve transportation facilities and network connections to better accommodate mode shift.

During the June workshop the Advisory Committee discussed the solutions evaluation by the Agency Support Team. The Committee noted that many of the proposed solutions on their own may not address the needs or the overall objectives identified by the Advisory Committee. In addition, many of the solutions together may be more cost effective and address a wider community and transportation benefit when packaged together. The Committee discussed the idea of packaging solutions together which resulted in three Focus Areas or alternative recommendation. Packaged together the three Focus Areas would better address the complexity of the transportation system as well as meet the purpose and needs and objectives of the Analysis. Many transportation demand management strategies and solutions that were brought forward, were also identified for funding and implementation in local agency capital facility plans. However, it was noted by the Committee that further efforts were needed to determine feasibility, costs, and impacts of solutions identified in each of the Focus Areas or Alternative recommendations. The Advisory Committee noted that a feasibility and cost analysis would help further refine specific recommended actions and may improve overall performance with a reduction in potential impacts and increased benefits to the transportation network and community character. This effort was initially identified as Phase III in the Work Plan and was a significant issue in the project Charter as a desired outcome and objective for addressing programing decisions. *See Appendix G.*

Note: Solutions are represented in Table 5.3 Solution Alternatives Worksheet. Individual solutions are numbered. Number solutions were packaged together and may be represented in one or more of the three Focus Areas / Alternative recommendations.

Focus Areas /Alternative recommendations

Focus Area #1: Interchange Operation and Safety Enhancement Improvements

This alternative uses low-cost, Practical Solutions to solve mobility, safety and access issues on the local street network and access at several I-5 ramp locations. Please note that many of the potential fixes at the interchanges in the alternative also support implementation measures of Focus Area #2. Following a more detailed traffic assessment by WSDOT in coordination with Bellingham, many of the identified problems may be solved through the application of low-cost Practical Solutions, such as changes in signal timing, lane restriping, minor geometric changes, active transportation improvements, signage and others.

Solutions that make up Alternative 1 include:

- **(9)** - Active Transportation (bicycle and pedestrian) improvements
- **(11)** - Transit connection improvements to other modes
- **(12)** - Transit signal prioritization

Focus Area #2: Ramp Metering and Traveler Information Signs

This alternative proposes to place ramp meters and automated traveler information signage on I-5. The placement of ramp meters may improve traffic operations and safety by addressing congestion such as platooning of vehicles and merging traffic on I-5. Impacts to the local street network are also addressed. The placement of automated traveler information signs would provide advanced notification to help inform the traveling public of emergencies or other potential issues on the corridor. Both ramp metering and placement of traveler information signs would involve coordination with Bellingham to analyze the feasibility, impact and cost of improvements in the Analysis Area.

Solutions that make up Alternative 2 include:

- **(6)** - Automated Traveler Information/Active Traffic Management
- **(7)** - Traffic Incident Management

(8) - Enforcement
(9) - Active Transportation (bicycle and pedestrian) improvements
(11) - Transit connection improvements to other modes
(12) - Transit signal prioritization
(17) - I-5 interchange efficiency improvements on the local network and ramps

Focus Area #3: Lincoln-Lakeway Multimodal Transportation Study

This alternative proposes a multi-agency subarea planning study with participation from WCOG, City of Bellingham, Whatcom Transportation Authority and WSDOT. This Study seeks to identify comprehensive solutions that promote better utilization of the transportation network (local/highway) and encourages mode shift by emphasizing better connectivity and access to land uses between transit, bike, pedestrians and vehicles.

The Study Area includes three interchanges on I-5: Samish Way, Lakeway Drive, and Ohio/Iowa Street. Lakeway Drive at the I-5 interchange is one of Bellingham's central access points to the downtown area. Lakeway Drive provides access to I-5 and is a major east/west multimodal corridor for people walking, biking, riding transit, freight, and driving passenger and service vehicles from the central core of the City, to retail commercial locations, education and recreation facilities and residential areas. Additionally, WTA has plans to expand transit facilities in downtown and on the Lincoln Street corridor between the I-5 and Samish interchanges and is currently engaged in conducting a long-range plan to identify facilities and improvements. The City has designated an urban village west of I-5 north of Samish I-5 interchange and is also considering the designation of an urban village east of I-5 in the Lincoln-Lakeway area. Significant land use development in the study area is anticipated over the next few years.

Solutions that make up Alternative 3 include:

(9) - Active Transportation (bicycle and pedestrian) improvements
(10) - Mode choice education, encouragement, and behavior change
(11) - Transit connection improvements to other modes
(12) - Transit signal prioritization
(14) - Transit street design
(15) - Transit system investments
(17) - I-5 interchange efficiency improvements on the local network and ramps
(1) - Ramp metering impacts

The Final Solution Alternatives Evaluation Worksheet is located in Table 5-3. This worksheet includes the SWOT Analysis used by the Advisory Committee to evaluate and develop the three Focus Area / Alternative Recommendations.

Table 5-3: Final Solution Alternatives Evaluation Worksheet.

Final Solution Alternatives Evaluation Worksheet

	No.	Solution Alternative	Problem	Objective	Solution Description	Strength	Weakness	Opportunities	Threats	Rating
I-5 MAINLINE AND ASSOCIATED RAMPS	(1)	**Ramp Metering**	• I-5 through Bellingham is congested for multiple hours most days. • High frequency mainline vehicular collisions at the merge/diverge points at on-ramp locations on I-5. • Vehicle platoons (groups of closely spaced vehicles) on the on-ramps creates conflicts at the merge point locations.	Improve traffic flow and increase person throughput by controlling the frequency with which vehicles enter the flow of traffic on the interstate.	•Ramp meters installed on I-5 on-ramps to regulate the flow of traffic entering I-5 during peak demand.	•Reduces mainline congestion, breaks up platooning, reduces crash potential and increases mainline efficiency. •Controls the rate at which vehicles enter the mainline.	•Can increase on-ramp queues, creating spill over onto local arterials clogging up the city street network. •These queues can also affect the off-ramps on the opposite side of the interchange if the city street become significantly congested.	•Ramp metering may affect how people travel on the regional network, with some users choosing to use parallel corridors or other modes of transportation when trip reliability may be uncertain.	•On-ramp geometrics may not accommodate ramp meters, and the costs to bring them into compliance may be too high. Ramp meters may affect the local street network and the costs to address local impacts are too significant.	+
	(2)	**Hard Shoulder Running**	• I-5 experiences heavy congestion during peak periods.	Increase mobility and capacity on the corridor to relieve congestion and associated crashes. Adds new capacity for transit and/or general-purpose traffic to help relieve congestion by using the shoulder.	•A new peak-use shoulder lane on I-5 to reduce backups and improve traffic flow during peak travel.	•Takes advantage of existing highway right of way and pavement. •Reduces delay, congestion and GHG emissions and improves travel time reliability.	•If there is a collision or incident, the peak-use shoulder lane will be closed until the problem is cleared. •May require additional right of way and pavement to address gaps in pavement width.	•Requires minimal ITS infrastructure to develop, adds capacity, and may be used to enhance HOV or transit access. It can improve trip time predictability for all interstate travelers.	•Possibly not enough shoulder width to accommodate the traffic and the bridges in the corridor cannot be widened.	O
	(3)	**Highway Access Management**	• I-5 through Bellingham is congested for multiple hours most days. • Potential for crashes at the merge/diverge points at off-ramp locations on I-5. • Vehicle platoons (groups of closely spaced vehicles) on the I-5 mainline and on the on-ramps creates conflicts at the merge point locations.	Reduce congestion and delay caused by disruptive merging and turning behaviors so we have fewer conflicting movements and more uniform traffic flow.	•Access ramp modifications (creating a "split-diamond" interchange) or elimination to address interchanges with inadequate interchange spacing.	•Eliminates the northbound on ramp and southbound off-ramp at Lakeway and the northbound off- ramp to Iowa Street and southbound on-ramp from Ohio Street. •Significant traffic would "re-route" onto the local street system so there would be a need for new connections that do not exist today.	•These closures would re-route a significant amount of current traffic, disrupting travel patterns that drivers and businesses have come to rely on. •These closures would need to occur at the same time as the local network improvements and would likely be very costly.	•These new connections are feasible (albeit expensive due to the need for bridge to cross Whatcom Creek) and the intersection improvements would likely require right of way which could also be very costly. •Cost of expanding I-5 to include weave lanes and new bridges could be three or four times as costly.	•This change would be extremely difficult for the community to understand, but the benefits would easily oppose the impacts.	O
	(4)	**Tolling**	• I-5 is congested for multiple hours most days through Bellingham. • Potential for crashes at the merge/diverge points at on-ramp locations on I-5. • Vehicle platoons (groups of closely spaced vehicles) on the on-ramps creates conflicts at the merge point locations.	Reduce the use of I-5 as a local roadway, used for one, two, or three interchange distance of travel by initiating congestion pricing.	•Toll I-5 access in the Analysis Area. Tolls collected could reflect the trip length, with a disincentive for shorter trips. This pricing policy would discourage short distance I-5 trips by assessing a toll upon exit.	•This policy would improve I-5 operations, provide funding to make improvements to I-5 and the surrounding local multimodal system, and encourage I-5 use for regional trips.	• Toll revenues may not be enough to complete the local multimodal system improvements needed to accommodate the local route enhancements. • WSDOT does not have authority to collect tolls on I-5 in Bellingham. Toll revenue can only be spent with Legislative approval.		•Toll revenue may not be sufficient to pay for the local multimodal system improvements needed to accommodate trips taken off of I-5.	

	No.	Solution Alternative	Problem	Objective	Solution Description	Strength	Weakness	Opportunities	Threats	Rating
	(5)	Auxiliary Lanes	• Insufficient interchange spacing and difficult ramp merge and diverge conditions. • I-5 through Bellingham is currently congested for one or two hours a day with demand approaching the capacity of I-5. • Small increases in I-5 travel demand will result is severe congestion for many hours each day. • Congestion occurs where interchange spacing and ramp merge/diverge conditions are challenging. • The majority of trips entering I-5 in Bellingham make short trips traveling three or less interchanges in length.	Allow drivers to more comfortably merge into traffic while also preventing bottlenecks caused by drivers attempting to enter or exit the Interstate.	•Construct auxiliary weave lanes on I-5 in sections were interchange spacing and merge-diverge geometrics are challenging for drivers and where volumes, congestion and the type and number of crashes indicate merge-diverge challenges. •Prioritize implementation of this solution at the locations that provide the highest benefit for the lowest direct and indirect cost.	•Reduces potential for crashes and congestion at numerous locations on I-5, including three currently in place on southbound I-5 in Bellingham.	•Cost to construct auxiliary weave lanes. •Potential impacts to adjacent land use.	•Creates additional capacity that can improve, efficiency, reliability of travel, and emergency response and reduce crash potential.	•Continued land use development alongside I-5 and at the interchanges makes widening of I-5 for auxiliary lanes expensive and impactful.	+
I-5 MAINLINE AND ASSOCIATED RAMPS	(6)	Automated Traveler Information Signs/ Active Traffic Management	•I-5 through Bellingham is congested for multiple hours, most days. •High frequency mainline vehicular collisions at the merge/diverge points at off-ramp locations on I-5. •Automated Traveler Information Signs were introduced at the June 6th Agency Support Team meeting to improve system operations.	Increase mobility, ease congestion and reduce crash potential by informing drivers with real-time information of upcoming problems and/or challenges on the interstate, so they can appropriately alter their trips.	•Expand the existing ITS to inform travelers of upcoming conditions. For example, Variable Message Signs on I-5 to alert travelers of incidents or traffic conditions in Bellingham. •Add ATM Variable Speed Limits to impose alternative speeds on the interstate to address congestion •Provide traveler information signs on I-5 to inform the traveling public of crashes, congestion and other issues.	•Provide travelers information about delays caused by traffic, incidents, construction, weather, or border crossing congestion. •Information can be used to plan alternate routes, which can reduce roadway demand, backups and wait times. •This technology has proven effective at reducing crash potential and improving traffic flow.	•Requires infrastructure investments, operational management and ongoing maintenance.	• WSDOT is working to gain the most efficiency out of the existing roadway network. • This technology can reduce crash potential associated with congestion and blocked lanes. • About 25% of traffic congestion is due to events like collisions or disabled vehicles. • An ATM approach focuses on influencing travel behavior with respect to lane/ facility choices and operation.	None known.	+
	(7)	Traffic Incident Management	• Traffic incidents cause congestion resulting in travel delays, secondary collisions, increased fuel consumption, air pollution, and travel and shipping costs.	To clear traffic incidents from roads as safely and as quickly as possible.	•Rapid detection and clearance of minor incidents such as stalled and disabled vehicles.	•Incident management, reduces incident duration and improves traffic control, enhances motorist safety by reducing the length of lane blockages and road closures, which reduces exposure, and helps reduce secondary collisions. •Quick clearance also reduces the societal costs of congestion such as lost time and extra fuel costs incurred when motorists and truck drivers are caught in traffic congestion.	•Requires personnel and equipment to be ready at all times to clear blockage.	•Rapid clearance preserves highway capacity through prompt removal of disabled or abandoned vehicles that can distract or slow down drivers resulting in loss of throughput capacity, and additional incidents.	•Benefits of safe, quick incident clearance, although well documented, are not widely acknowledged as a capacity and safety benefit.	+

	No.	Solution Alternative	Problem	Objective	Solution Description	Strength	Weakness	Opportunities	Threats	Rating
TRANSPORTATION/ DEMAND MANAGEMENT	(8)	Enforcement	• Increase mobility and decrease congestion and crashes that are caused by illegal driver behavior.	Promote safety and mobility by obtaining public compliance with traffic laws through enforcement.	• Focus enforcement on specific problem areas or hot spots. • Work in partnership with Washington State Patrol to designate procedures, processes, location and frequency of designated enforcement.	• Enhances corridor management through the reduction in possible problems. • Decreases illegal behavior, which reduces crash potential. • Promotes and maintains public acceptance for corridor management. • Supports and enhances effectiveness of operational strategies such as ramp metering.	•Dedicated enforcement requires ongoing staffing and outreach.	•Some safety and operational problems are more easily and effectively solved through education and enforcement. •Enforcement can further reduce travelers' risky behaviors, so they understand the impact, make wiser choices, and reduce the likelihood of crashes and equipment failure that further congest the roadways.	•Hard to be inclusive of users that need this information the most.	+
	(9)	Active Transportation	I-5 bisects the City of Bellingham and is a physical and operational barrier for all modes of travel including people trying to walk and bike across it. Opportunities exist to reduce the mobility barrier of I-5 through Bellingham.	Improve Active Transportation connectivity crossing I-5.	•Fund improvements for people to walk and bike across I-5 through Bellingham. •There are eight (8) I-5 interchanges with challenging walking and biking conditions that could be addressed.	•Increasing opportunities for people to walk and bike safely and comfortably across I-5 will reduce the number of short local single-occupant vehicle trips. •Will increase the number of trips made by walking and biking, thus reducing pressure on I-5 for vehicle operations.	• Funding constraints.	•There are multiple opportunities for WSDOT and Bellingham to work together to plan, fund, and implement meaningful improvements for people trying to walk and bike across I-5 through Bellingham.	•The longer we wait to develop improvements the more costs increase.	+
	(10)	Mode Choice: education, encouragement, behavior change	• I-5 is congested with local drivers making short trips. • Local surface streets cannot absorb these vehicle trips without degrading WTA fixed route service and worsening conditions for people walking and bicycling. • Drivers on I-5 are dissatisfied with its poor functioning and believe that "no one is doing anything about it." • Short-trip drivers don't realize that there are attractive alternatives. • Short-trip drivers don't have enough knowledge or positive experience walking, bicycling and riding the bus to feel comfortable trying these alternatives. •The local street system may lack adequate network capacity.	Travelers are encouraged to walk, bike, share rides and ride the bus instead of making SOV trips.	•Neighborhood Smart Trips would be a multi-year Individualized Marketing campaign in Bellingham neighborhoods surrounding I-5.	• Smart Trips program has momentum, experience and strong community partnerships. • Staff have experience running a large-scale Individualized Marketing campaign in Bellingham. • Behavior change is a durable solution that persists even as the population increases. • Neighborhood Smart Trips would provide measurable outputs and outcomes. • Campaigns will communicate in word and deed that "something is being done." • Intervention will not induce more spillover traffic onto the local street network. • Behavior change is extremely cost-effective.	• Results won't be visible to the casual observer.	• Neighborhood Smart Trips could demonstrate the gold standard for responding to traffic congestion in Washington State. • This approach is an ideal method for promoting new City infrastructure and WTA service. • This approach is well-suited to target areas of increasing density.	• This approach and how it works can be difficult to explain to those who are unfamiliar with it.	+
	(11)	Transit Connection Improvements	• The sidewalk, trails, and bicycle network is not complete, or is perceived to be unsafe or in adequate. • Connectivity to other modes (transit, rail, ferry and airport) is lacking or incomplete. • Many bus stops do not have benches, shelters or lighting.	Increase transit ridership.	•Assess pedestrian environment within ¼ mile of WTA bus stops. •Inventory bus stop amenities. •Create a prioritized list of improvements for both the built environment and bus stop amenities. • Identify funding sources and make improvements.	• Improving the pedestrian environment will benefit all users, not just people accessing a bus stop. • Installing curb cuts, benches, lighting and painting crosswalks is relatively inexpensive.	•Bus routes and stops are not permanent. • There is no guarantee that a route or stop in existence today will be in service one, two or ten years from now.	• WWU Planning Students (to help with assessment). •Increase opportunities for mode shift.	None.	+

	No.	Solution Alternative	Problem	Objective	Solution Description	Strength	Weakness	Opportunities	Threats	Rating
TDM	(12)	**Transit Signal Prioritization**	• On-time performance of WTA bus routes is decreasing due to increased dwell time at traffic signals. • Adding time to bus routes inconveniences riders and makes transit less attractive to new riders. • Adding time to bus routes increases the cost of existing bus service.	Improve efficiency and reliability of transit by reducing dwell time at intersections.	•Implement transit signal priority for WTA buses at traffic signals in WSDOT's ROW. •Implement queue jump lanes at appropriate intersections.	•Transit signal priority and queue jump lanes creates less dwell time for buses at intersections and helps keep routes running on time. •There is a cost saving to WTA if we do not have to add additional time in order to keep buses running on time. • WTA buses are already equipped with transit signal priority technology.	•Transit signal priority may affect the traffic throughput at intersections with frequent transit service. • Old Interchange infrastructure makes widening for queue jumps lanes very expensive.	•Keeping bus routes on time and not increasing the length of travel time has the potential to attract new riders.	•Intersection geometrics may be insufficient to accommodate queue jump lanes or it might be cost prohibitive. •Lots of infrastructure and operational challenges at I-5 interchanges.	+
	(13)	**Origin/ Destination Survey**	•Lack of Information on travel patterns. • Most travel survey data is for commute trips only, which are only ~20% of all trips. • The WCOG's 2018 household travel survey is not likely to have a big enough sample size in individual Bellingham neighborhoods to draw conclusions from. • The 2008 Individualized Marketing Survey data is outdated. • The Streetlight data recently used by WSDOT is limited to I-5 on/off- ramps.	Improved knowledge of travel patterns to better inform WTA bus routes and/or service options improvements.	•Fund a comprehensive 24/7 Bellingham origin/destination travel survey.	• Origin/destination survey data would be useful for others besides WTA. • Even if bus routes weren't modified as a result the data could be used to justify pilot projects using more targeted types of service.	• Knowing people's travel patterns, and presenting a public transit option, doesn't necessarily translate into mode shift.	•Origin/Destination data may allow for improved WTA service using either existing or new service options.	None.	
	(14)	**Transit Street Design**	Introduced during the June 6th Agency Support Team meeting, this solution improves connectivity to transit stops and service quality by introducing street design concepts that facilitate access for riders and buses.	Increase connectivity of transit users to transit stops and other modes as well as providing attractive amenities to transit users.		Promotes better utilization of the transit system.	May not have adequate right-0f-way or may compromise mobility on the local system in support of transit use.	Partnerships between the Bellingham and WTA could improve healthy streetscapes.		+
	(15)	**Transit System Investments**	Introduced at the June 6th Agency Support Team meeting this concept would provide transit hubs at strategic locations in the transit network.	Increase efficiency of transit.	•New, improved, relocated transit hubs and an upgraded downtown bus station would improve the transit network efficiency. •New or improved roadway lanes improving ingress/egress and reducing delay for transit buses.	Increase transit efficiency.		Partnerships with Western Washington University at the Lincoln Street Park and ride.	Street congestion on the local system.	+
ENVIRONMENT	(16)	**Wildlife Connectivity**	• I-5 is a barrier for wildlife, providing very few opportunities for east/west habitat connectivity. • Animal-vehicle collisions have occurred. • Medium to high priority for investing in improvements to reduce wildlife collisions.	Reduce risk of wildlife/vehicle collisions, and facilitate wildlife movement.	• Variable messaging to alert travelers of potential wildlife crossings. • Wildlife fencing with crossing structures either over or under the interstate. • Consider wildlife underpasses in very specific locations. Analyze opportunities that are beneficial to the travelling public as well as wildlife as fish passage barrier removals are designed.	•Reduces vehicle collisions, delays and injuries and strengthens wildlife habitat connectivity.	•It is sometimes difficult to predict animal crossing locations.	•If specific locations associated with fish-bearing streams, also facilitate animal and possibly human nonmotorized movement, it could be considered as fish passage barrier removal is designed.	None identified at this time.	

	No.	Solution Alternative	Problem	Objective	Solution Description	Strength	Weakness	Opportunities	Threats	Rating
TRANSPORTATION NETWORK	(17)	**I-5 Interchange Efficiency Improvements**	Introduced at the June 6th Agency Support Team meeting. This concept improves connections to the interstate and local street system. Existing conditions on the local and state transportation system are congested and future growth forecasts will further compromise traffic conditions at I-5 interchanges.	Improve the efficiency and safety of traffic operations at I-5 interchanges in Bellingham with practical, low-cost ramp, and ramp terminal intersection improvements.	•Widen off-ramps to channelize turning movements at the intersection. (Examples: Iowa NB off-ramp, Sunset SB off-ramp) •Realign ramp terminal intersection •Improve the efficiency of the I-5 NB ramp terminal intersection and increase vehicle storage - Improve interchange ramp geometries where needed. - Optimized signal timing to take advantage of associated ramp and ramp terminal improvements.	•Using what we have more efficiently extends the life of previous transportation infrastructure investments. •Drivers are making already making their own channelization using the ramp shoulders and off-pavement areas at some I-5 off-ramps. Example of this are the NB off-ramps at the Lakeway and Iowa interchanges. •Better utilization of existing right-of-way and paved ramp areas. These improvements could benefit Transit and Active Transportation travelers in interchange areas as well.		•Joint partnership and cost sharing between the City and WSDOT. •Low-cost, Practical Solution improvements such as restriping, signal timing, providing dedicated lanes and minor geometric changes could increase the efficiency of the local system and accessibility to I-5 at many interchanges locations in the Analysis Area. Minor improvements may have high benefit and low cost as well as a shared funding benefit.	•There may be insufficient right of way. •Possible constraints or impacts related to environmentally sensitive areas or features. •May be constrained by other roadway features such as drainage systems and utilities.	+

Chapter 6: Recommended Alternatives and Actions

Introduction

As discussed in Chapter 5, the final Advisory Committee workshop was held on June 25, 2019. During this workshop the Committee considered the evaluation conducted by the Agency Support Team and identified three Focus Areas or Alternatives.

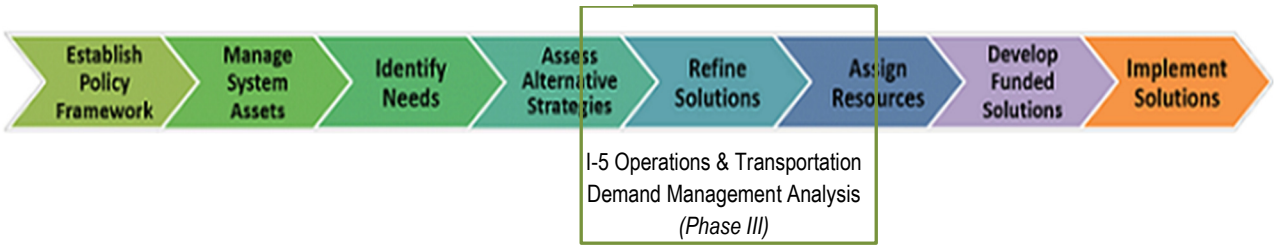
The three alternatives are recommended are as follows:

- Focus Area #1: Interchange Operation and Safety Enhancement Improvements
- Focus Area #2: I-5 Ramp Metering and Automated Traveler Information Signs
- Focus Area #3: I-5 Lincoln-Lakeway Multimodal Transportation Study

Approach

The following is a brief summary of the recommended alternatives in the Analysis. Each of the recommended actions were refined in coordination with the City and WSDOT's Traffic Team. The process and proposed improvements were developed to support the next element in the Practical Solutions Framework identified in Exhibit 6-1, a process for determining feasibility, benefit and costs that informs decision making for programing statewide future improvements. This information is also used to inform local planning efforts in comprehensive plan update, grants, developer contributions or other private and public actions. *Exhibit 6-1*, summarizes the phases and framework for transportation decision making and management of system assets during this Analysis.

Exhibit 6-1: Practical Solutions Framework.



Recommended Alternatives

Focus Area #1

This alternative focuses on low-cost, Practical Solutions to solve mobility, safety and access issues on the local street network and I-5 ramp locations. Following a more detailed traffic assessment by WSDOT, in coordination with the City of Bellingham staff, many identified problems may be solved through the application of low-cost Practical Solutions, such as changes in signal timing, lane restriping, minor geometric changes, signage, biking and walking improvements and others.

Interchange Operation and Safety Enhancement Improvements

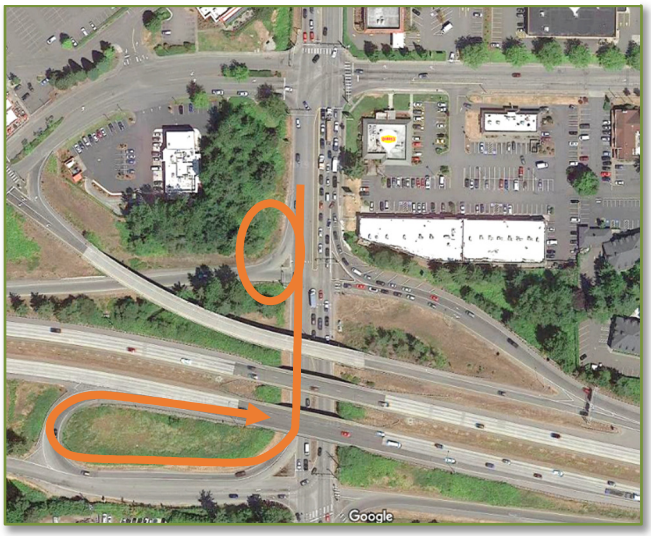
WSDOT NW Region Mount Baker Area and City representatives met on November 25, 2019 to discuss six I-5 interchanges and associated local streets that were experiencing traffic operations and safety issues. Each of the six locations were selected for their potential to address problems using low-cost Practical Solutions. Discussion during the workshop focused on identifying problems, needs, potential

solutions and benefits to the transportation network. Interchanges are presented from north to south along I-5.

1) North Bound (NB) on-ramp and South Bound (SB) on-ramp at SR 539 / Meridian Street

Problem: Congestion and delay are occurring on Meridian (SR 539) corridor. The current lane configuration on the NB onramp and SB on-ramp limit throughput on the local system as well as access to the I-5 SB on-ramp shown on *Exhibit 6-2*. This limits lane capacity on the local system causing traffic operation delays during peak traffic periods. Additionally, there is a history of rear-end and sideswipe collisions on Meridian as well as low-speed merges from the ramp to the I-5 mainline.

Exhibit 6-2: NB on-ramp and SB off-ramp at I-5 / SR 539/Meridian Street.



Solution: The City of Bellingham and WSDOT Traffic have already been working together on this area. A proposal is currently under consideration for minor ramp lane and radius revisions on I-5 ramp from Meridian together with dedicated right lane (adding curb separation) and access management through the intersection by merging both I-5 ramps into dedicated lane for the NB and SB on-ramps to I-5. Transit coordination is also necessary to ensure compatibility.

Benefits: The dedicated lane would separate traffic to the I-5 ramps from the local street network providing better throughput as well as adding more storage capacity to the I-5 ramps. This would, potentially reduce sideswipes and rear-end crashes. In addition, the current signal may do a better job of metering traffic entering the SB onramp to I-5.

2) SB on and off-ramp at E. Sunset Drive

Problem: Significant traffic congestion is present on the E. Sunset Drive corridor during most of the day, causing vehicular backups on the I-5 mainline during peak traffic periods in the location shown on *Exhibit 6-3*. The SB on-ramp has insufficient vehicle storage causing significant congestion and delay on E. Sunset Drive. This corridor is further compromised from vehicles entering the SB on-ramp from both Sunset Drive and James Street through an ineffective lane management design. Additionally, one of the two SB off-ramp lanes to James Street drops within a short distance of entering James Street causing a bottleneck and increasing congestion on E. Sunset Drive. There is also a history of rear-end collisions at the interchange ramp intersections as well as sideswipe crashes at the SB off-ramp to James Street.

Exhibit 6-3: SB on and off-ramp at I-5 / E. Sunset Drive.

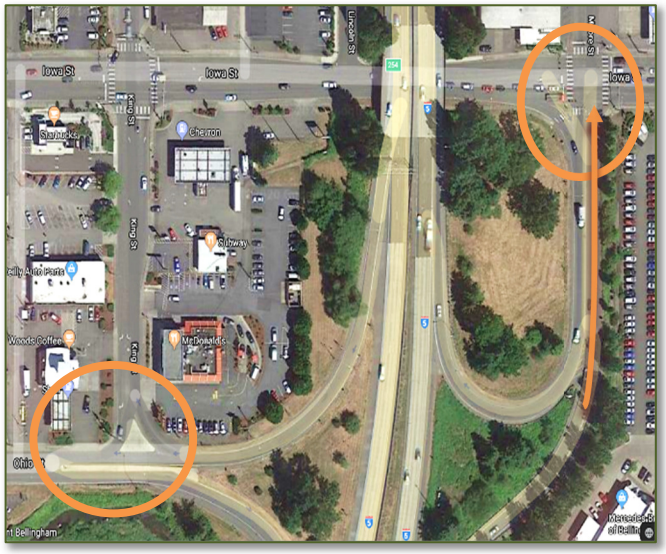
Solution: Reconfigure the SB off-ramp by changing the middle lane to a left only from a shared left and through. Re-channelize the westbound E. Sunset Drive approach lane across the bridge to a dedicated access lane to the SB on-ramp, and eliminate one of the northbound lanes on James Street to address merging issues across E. Sunset Drive to the SB on-ramp.

Benefits: Increases throughput from the SB off-ramp to the E. Sunset Bridge for vehicles reducing queuing on the off-ramp, and decreases merging issues on E. Sunset Drive and James Street. Frees up capacity for westbound vehicles on E. Sunset Drive from the SB on-ramp. May reduce rear-end and sideswipe crashes.

3) NB on-ramp and off-ramp at I-5 / Iowa St

Problem: There is a history of sideswipes and rear-end crashes at the Iowa Street intersection with the entrance to the NB on-ramp and NB off-ramp exit. Traffic and safety issues are created from vehicles blocking the intersection of the NB on-ramp at Iowa Street and vehicles indiscriminately using the ramp shoulder of the SB off-ramp to turn east onto Iowa Street to avoid the backup to westbound traffic movements onto Iowa Street during peak travel periods. Shown on *Exhibit 6-4*.

Exhibit 6-4 NB on-ramp and SB off-ramp at I-5 / Iowa Street.



Additionally, backups are occurring on the I-5 mainline at the SB off-ramp onto Ohio Street during peak periods of the day due to traffic volume and congestion on King Street and N State Street. King Street is located at the bottom of the SB off-ramp and feeds directly into Iowa Street to the north, which is a major east/west corridor. Additionally, during storm events there is significant storm water ponding at the intersection with Iowa and the NB on and off-ramp (significant flooding occurred again from February 3rd through 7th). Stormwater may be coming from the interstate.

Solution: On the NB off-ramp to Iowa Street, add an additional lane and stripping on the off-ramp to Iowa Street to improve east / west turning movements at the intersection with Iowa Street.

On Ohio Street, close the right-turn access to King Street to address backups on the SB off-ramp to Ohio and place additional curbing between James and King Street to manage crossover vehicle movements. Address access in coordination with the city and affected property owners. This will result in freed up capacity on the SB off-ramp as well as Ohio Street. It is noted that the King Street intersection was jointly improved by WSDOT and City 10 years ago that involved acquiring properties and relocating businesses to address safety concerns.

Request maintenance to analyze the storm water ponding at the intersection of Iowa and the NB on and off-ramp to determine if the interstate hydraulic drainage system is working properly

Benefits: Increase operational efficiencies at the local street and interchange ramps, and reduces crashes.

4) SB on and off-ramp at I-5 / Lakeway Dr

Exhibit 6-5: SB on and off-ramp at I-5 / Lakeway Drive.

Problem: Significant traffic congestion is present on the Lakeway Drive corridor during most of the day and can cause backups on the SB off-ramp to the I-5 mainline in the location shown on *Exhibit 6-5*. Large trucks headed eastbound on Lakeway are also using both eastbound lanes when turning right to the SB on-ramp due to the angle of the ramp to Lakeway Drive. Placement of the pedestrian crossing on the SB off-ramp is wide due to the right-turn radius design. Additionally, the Lakeway Drive corridor has significant bicycle and pedestrian activity passing under I-5, which has limited sidewalk and bicycle facilities.

Solution: Long-term and short-term interchange strategies were discussed. Short term includes moving two crosswalk locations and addressing the turn-radius at both ramp locations.

The first crosswalk is located at the SB off-ramp to Lakeway Drive. The SB off-ramp and Lakeway Drive could be rechannelized by using the existing physical space at the intersection to improve pedestrian and bicycle movement as well as accommodate freight, transit and other vehicle movements. Other options may include investigating the potential to reduce the turn radius at the northwest corner at Lakeway Drive.

The second crosswalk crosses Lakeway Drive adjacent to the SB off and on-ramp and there may be opportunities to review the current crosswalk to create a center refuge island to accommodate pedestrian movement away from the freight traffic turning movements from the SB off and on-ramps.

Other options for freight movement may include increasing the right-turn radius to the SB on-ramp from eastbound traffic on Lakeway Drive to better accommodate freight movement so that trucks are not infringing on the secondary lane to make the turn.

Benefits: Addressing crosswalks at the ramp and across Lakeway Drive would reduce the exposure a pedestrian has when crossing the ramps and Lakeway Drive. Modifying lane designations and changing the radius to the SB off-ramp for left turn movement would increase vehicular storage on the ramp and decrease the potential for backups on the SB off-ramp of I-5. Changing the radius at the SB on-ramp would improve truck turning movements and address vehicle sideswipe conflicts. There will be an opportunity to take an initial look at this in the multi-agency Lincoln-Lakeway Multimodal Transportation Study being conducted 2020-2021 by City of Bellingham with WSDOT, WTA, and WCOG partners.

5) SB on-ramp at Fielding Ave/36th Street intersection to I-5

Problem: The entrance to the I-5 SB on-ramp is located at the intersection of 36th Street and Fielding Ave as shown on *Exhibit 6-6*. 36th St is a full stop intersection, while vehicles on Fielding Ave have the right-of-way to continue through the intersection and northeast onto 36th St or precede onto the I-5 SB on-ramp.

Solution: Fielding Ave and 36th Ave may be a potential location for a roundabout.

Benefits: Increase operational efficiencies and reduce crashes on the local street system and I-5 SB on-ramp. There will be an opportunity to take an initial look at this in the multi-agency Lincoln-Lakeway Multimodal Transportation Study being conducted 2020-2021 by City of Bellingham with WSDOT, WTA, and WCOG partners.

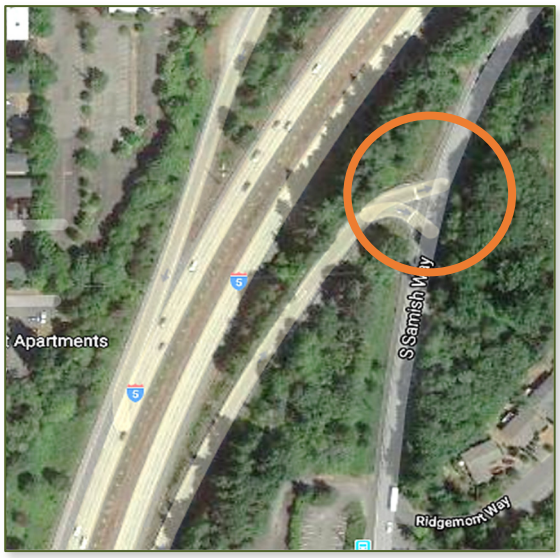
Exhibit 6-6: SB on-ramp at Fielding / 36th Street to I-5.

6) NB off-ramp at I-5 / Samish Way

Problem: The intersection at Samish Way is a stop-controlled intersection with an odd angle T-intersection to S. Samish Way as shown on *Exhibit 6-7*. It is currently operating within standards; however, additional forecasted growth anticipated over the next few years may reduce the function of the intersection. This area has significant bicycle utilization and is a major corridor to Western Washington University (WWU).

Solution: Long-term intersection improvements maybe necessary. A roundabout may be one of the best options and would address rear-end collision, but would need to be designed to support more intense nonmotorized users. Construction costs may be high at this location due to existing topography.

Exhibit 6-7: NB off-ramp at I-5 / Samish Way.



Benefits: This intersection is operating within standards, however long-term, a roundabout would improve traffic operations and address safety issues. Additionally, there will be an opportunity to take an initial look at this intersection in the multi-agency Lincoln-Lakeway Multimodal Transportation Study in 2020-2021 by City of Bellingham, in partnership with WSDOT, WTA, and WCOG partners.

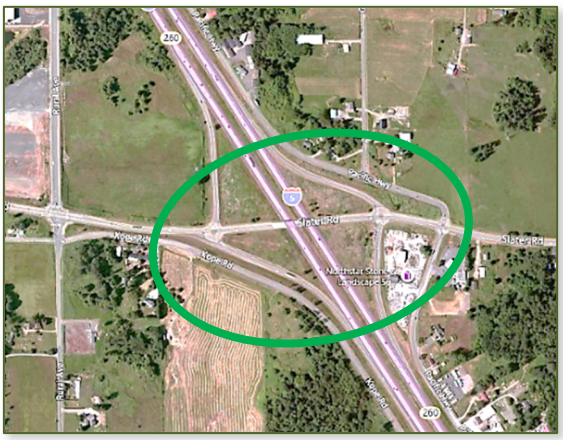
Focus Area #2

This alternative proposes to place ramp meters and Automated Travel Advisory Signage on I-5. The placement of ramp meters may improve traffic operations and safety by addressing congestion, platooning of vehicles and merging traffic crashes on I-5. The placement of automated traveler information signs would provide advanced notification to help inform the traveling public of emergencies or other potential issues on the corridor. Both ramp metering and placement of traveling information signs would involve coordination with Bellingham to analyze the feasibility, impact and cost of improvements in the Analysis Area. An assessment was conducted on Ramp Metering however, no assessment has been conducted to date on traveler information signs.

I-5 Ramp Metering Assessment

WSDOT NW Region Mount Baker Area and representatives from our Region Traffic Office met on December 17, 2019 to discuss Bellingham I-5 ramp meters. The assessment focused on interchange ramps between Slater Road and Lakeway Drive, however, Traffic indicated that it would be important to include Samish Way and Old Fairhaven Parkway when considering traffic operations on I-5 through Bellingham. Additionally, research has shown that ramp meters can have a 30 % crash reduction when put in place.

Exhibit 6-8: Slater Road Interchange.

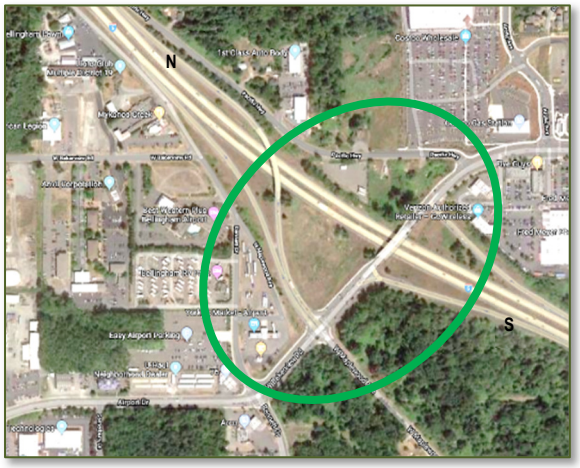


The initial assessment used a number of criteria to determine ramp metering feasibility. These include using a 50-mph design speed, 450 feet of vehicle storage, and a minimum of 750 feet for acceleration length. A density threshold of 1600 vehicles trips per hour on the I-5 mainline was also used as the threshold to determine metering feasible. Additional information on the ramp meter assessment is located in *Appendix C*.

1) Slater Road Interchange

The NB and SB on-ramps at the Slater interchange meet the minimum requirements for ramp width and storage shown on *Exhibit 6-8*. No additional investigation or widening is required. Additionally, the Slater interchange area is one of several projects on I-5 in the Bellingham area to receive funding through the Connecting Washington program. The Slater project is in design now. Design consideration at the interchange should accommodate future technologies to address ramp metering to address safety and congestion on the I-5 mainline. Preliminary Engineering for the project began in 2019.

Exhibit 6-9: Ramp Assessment Bakerview Interchange



2) Bakerview Road Interchange

The existing NB on-ramp at the interchange meets the minimum requirements for ramp storage.

A new NB on-ramp at the interchange is proposed. Both the existing and proposed new ramp location are shown as *Exhibit 6-9.* The new ramp is funded through the Connecting Washington program. In January of 2020, 100% Design (PE) for the project was completed. Currently, the design does not accommodate ramp meters to enhance traffic operations and safety on the I-5 mainline. However, efforts should be made to include future technologies to address ramp metering to enhance traffic operations and safety on the I-5 mainlines as well as reduce future costs and disruption to I-5.

The existing SB on-ramp at the interchange meets the minimum requirements for ramp width, acceleration and storage. No additional investigation or widening is required.

3) Northwest Avenue Interchange

The NB onramp at the Northwest interchange does not meet the minimum design requirements for ramp meters. The storage necessary to accommodate ramp meters would create backups on the local transportation network due to the ramp configurations with the local street network.

The SB onramps at the Northwest interchange does not meet the minimum design storage requirements for ramp meters in its current configuration. Additional investigation is needed to determine if the ramp can be realigned to the roundabout on Northwest Drive to address the shortfall in ramp storage. However, this option may require extensive right-of-way to align the ramp with the existing roundabout which is now served by McLeod Road. Both interchange ramp locations are shown in *Exhibit 6-10.*

Exhibit 6-10: Northwest Avenue Interchange

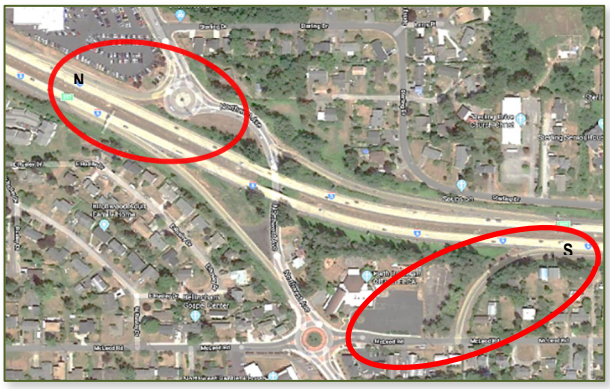
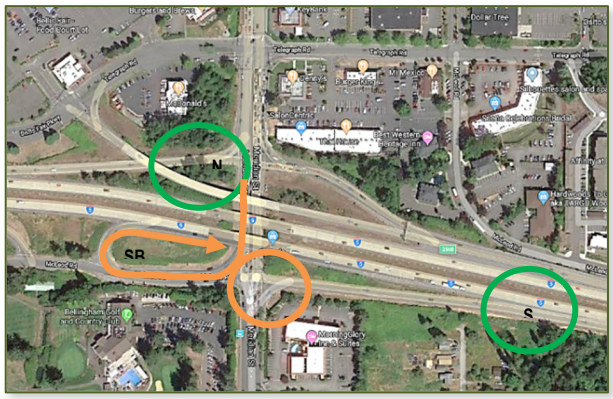


Exhibit 6-11: Meridian Street / SR 539 Interchange.



4) Guide Meridian Street / SR 539 Interchange

The NB onramp at the interchange meets the minimum requirements for ramp width, storage and acceleration. No additional investigation or widening is required.

Two existing SB onramps are located at this interchange.

- The SB Loop onramp from Meridian Street does not meet current standards; however, additional investigation is needed to determine if the addition of a dedicated right lane to the SB Loop onramp would allow for additional vehicle storage. Additional storage maybe captured by managing access by installing curb separation through the intersection under I-5 to create a dedicated lane to the SB loop onramp. A similar solution was discussed during a meeting with the City of Bellingham for Focus Area #1 to relieve congestion and reduce crashes on the local street network and with the I-5 onramp merge.
- The SB Slip onramp to I-5, on the east side of the interchange, has access both eastbound and westbound on Meridian Street and meets the minimum requirements for ramp width, storage and acceleration. No additional investigation or widening is required.

Both interchange ramp locations are shown on *Exhibit 6-11*. Additionally, several fish passage barriers are located within the Meridian St Interchange and depending on the fish passage location and design; opportunities may be available to improve traffic operations and safety simultaneous with the project to avoid future traffic operations disruptions.

Exhibit 6-12. E Sunset Drive / SR542 Interchange

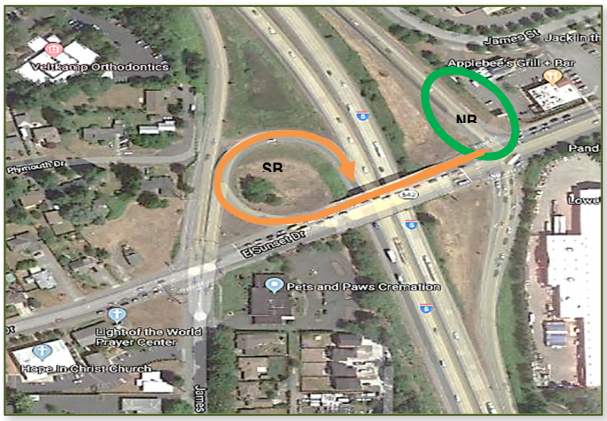


Exhibit 6-13: Iowa Street and Ohio Street Interchange

5) East Sunset Drive / SR 542 Interchange

The NB onramp at the interchange meets the minimum requirements for ramp width, storage and acceleration. No additional investigation or widening is required.

The SB on-ramp at the interchange does not currently meet minimum storage requirements. However, additional investigation is warranted to determine if curbing to provide a designated lane to the SB onramp would meet storage and acceleration criteria for ramp operations. *Exhibit 6-12*.

6) Iowa Street Interchange

The NB onramp at the interchange in *Exhibit 6-13* does not have sufficient storage space to meet the minimum standards. However, the NB onramp was extended several years ago and options may exist to place curbing adjacent to the mainline to separate vehicles on the ramp to address storage and acceleration needs. More investigation is needed.

7) Ohio Street Interchange

The SB on-ramp at the interchange as shown in *Exhibit 6-13* does not currently meet minimum storage requirements. However, additional investigation is needed to determine if limiting access to /from driveways on Ohio Street, between James and King Street would provide the storage necessary to meet minimum requirements on the I-5 SB off-ramp.

Exhibit 6-14: Lakeway Drive Interchange.

8) Lakeway Drive Interchange

The NB and SB on-ramps to I-5, location shown in *Exhibit 6-14* does not have enough vehicular storage to meet minimum requirements for ramp meters. Alternative solutions to improve traffic operations and safety for these on-ramps maybe identified during solution development in the Lincoln-Lakeway Multimodal Transportation Study identified in Focus Area 3. However, the study will not address I-5 mainline issues. These issues will be address by WSDOT.

Ramp Meting Summary Results

During the Workshop, 8 interchanges and 16 ramps were discussed. Slater Road and Bakerview Road with their associated ramps (5) had sufficient ramp storage and acceleration distance to accommodate ramp meters. Four other interchanges Meridian Street, E Sunset Drive, Iowa Street and Ohio Street need further investigation to determine feasibility, impacts and costs. Potential solutions included providing on-ramp dedicated lanes, geometric changes, access management/curbing, restriping, and some closing access points. Northwest Drive and Lakeway Drive ramps (4) did not meet the threshold standards and/or would be hard to accommodate requiring large capital expenditures. It is important to note, that many potential improvements for vehicle storage, lane acceleration, and ramp meters are also included in Focus Area 1: Interchange Operation and Safety Enhancement Improvements. *Table 6.1* summarizes these findings:

Table 6-1: Ramp Meter Summary and Feasibility.

	Location	Metered Lanes	Storage / Acceleraton Met	Potential Solution	Relationship / Focus Area 1 Solution	Comment
a)	**Slater Rd**					
	NB	1	Yes		---	
	SB	2	Yes		---	
b)	**Bakerview Rd**					
	NB	2	Yes		---	
	NB (new)		Yes	Install Metering Equipment during new construction during construction	---	
	SB	1	Yes		---	
c)	**Northwest Dr**					
	NB	1	no		---	
	SB	1	no	Realign SB onramp with Northwest aroundabout	---	Large Capital Expenature
d)	**Meridian St**					
	NB	1	Yes		---	
	SB Loop	2	no	Add a dedicated westbound lane for additional storage and speration of local through traffic on Meridian St	Yes	Additional investigation needed
	SB Slip	1	Yes		---	
e)	**Sunset Dr**					
	NB	2	Yes			
	SB	2	no	Add a dedicated westbound lane for additional storage and speration of local through traffic on Sunset Dr	Yes	Additional investigation needed
f)	**Iowa St**					
	NB	2	no	Extend gore point and barrier to separate the NB ramp from the I-5 Mainline to address storage and acceleration needs		Additional investigation needed
g)	**Ohio St**					
	SB	2	no	Extend the the dedicated lane on Ohio St to to address storage and acceleration needs for the SB offramp	Yes	Additional investigation needed
h)	**Lakeway Dr**					
	NB	2	no			The interchange will be reviewed during the Lincoln-Lakeway Multimodal Study now underway
	SB	2	no			

Focus Area #3

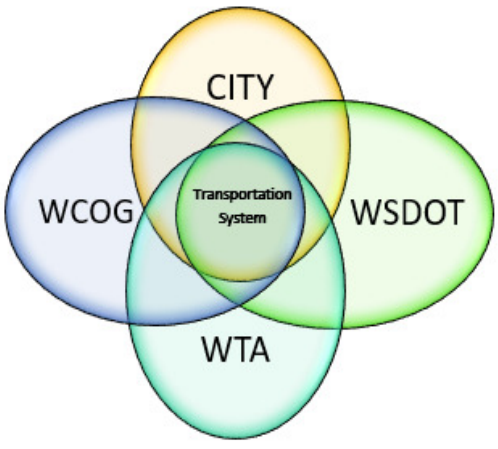
Lincoln- Lakeway Multimodal Transportation Study

This alternative is a multi-agency subarea planning study with participation from WCOG, City of Bellingham, Whatcom Transportation Authority and WSDOT. The Lincoln-Lakeway Multimodal Transportation Study (Study) seeks to identify comprehensive solutions that promote better utilization of the transportation network (local/highway) and encourages mode shift by emphasizing better connectivity and access between transit, bike, pedestrians and vehicles.

The Study Area includes three interchanges on I-5. Samish Way, Lakeway Drive and Ohio/Iowa streets. Lakeway Drive at the I-5 interchange is one of Bellingham's central access points to the downtown area. Lakeway Drive provides access to I-5 and is a major east/west multimodal corridor for people walking, biking, riding transit, freight, and driving passenger and service vehicles from the central core of the City, to retail commercial locations, education and recreation facilities and residential areas. Additionally, WTA has plans to expand transit facilities in downtown and on the Lincoln Street corridor between the I-5 and Samish interchanges. The City has designated an urban village west of I-5 north of Samish I-5 interchange and is also considering the designation of an urban village east of I-5 in the Lincoln-Lakeway area.

Following the identification of the final alternatives during the June 25, 2019 Advisory Committee workshop, WCOG initiated the first meeting to discuss the Study Area on September 18, 2019. During the workshop participants discussed Study Area objectives, existing and proposed land uses, process and Study Area boundary. The City led the second meeting on December 2, 2019 to discuss how the City would lead the Study with a consultant and participation from WCOG, Whatcom Transportation Authority, and WSDOT. The City discussed Study expectations and their objectives to identify potential transportation improvements necessary to support new growth in the Study Area as well as the importance of improving multimodal connectivity. On December 20, 2020, Bellingham published a Request for Qualifications (RFQ) and in February the Transpo Group was selected as the consultant for the study. In May a Public survey was conducted for three weeks. Analysis is underway of the survey results with result available this summer.

Lincoln-Lakeway Subarea Transportation System Partnership



City of Bellingham
- Land Use
- Local streets
- Bike/Pedestrian

Whatcom Transportation Authority
- Transit
- Vanpool

Whatcom Council of Governments
- Regional multimodal transportation system
- Smart Trips

Washington State Department of Transportation
- I-5 operations and safety
- Regional multimodal transportation

Recommended Action Plan / Next Steps

It is important to note that recommended alternatives will be prioritized on a statewide basis for future implementation, but due to limited state funding, will need to compete for funding with other proposed improvements throughout the state absent other funding sources. Leveraging of funds from a variety of sources from federal, state, agency grants, developer contributions, or other sources, should be investigated and pursued.

The following recommended actions should be initiated to determine project feasibility, benefit and costs of recommended actions to improve the regional transportation network for the following Alternatives.

Focus Area 1: *"Interchange Operation and Safety Enhancement Improvements"*

Action: As indicated above, the WSDOT NWR Mount Baker Area's Traffic team has already been coordinating with Bellingham on the NB on-ramp and SB on-ramp at the SR 539 / Meridian St to develop low-cost Practical Solutions. Several proposed improvements have been identified following a traffic operational and safety analysis. Work on the remaining five interchange areas has not been scheduled.

Recommendations: We would recommend that funds be identified to support the Mount Baker Area's Traffic team's work to coordinate with the Bellingham to develop a work plan to identify the feasibility, pre-design and cost estimates for addressing identified needs on the local system associated with the remaining interchange areas identified under Focus Area I. Identification of improvements should consider forward compatibility with Focus Area II when addressing ramp storage and acceleration requirements to address WSDOT standards as well as coordination with the Lincoln-Lakeway Multimodal Transportation Study. Analysis should also consider potential solutions that may arise from implementation of transit needs as well as bicycle and pedestrian connectivity improvements.

Focus Areas 2: *"I-5 Ramp Meters and Automated Travel Advisory Signage on I-5*

Action: The WSDOT NW Region Traffic team has conducted the first step in identifying the feasibility of ramp meter on I-5 within the Analysis Area. They also noted that if ramp meters are deployed that consideration be given to metering two additional interchanges. These include Samish Way, the southern Analysis Area boundary and Old Fairhaven Parkway, which is outside of the Analysis Area. An assessment for vehicle storage and acceleration length were not conducted however, both ramps associated with the interchanges have recently been upgraded to WSDOT standards and it is estimated that they would meet the criteria. The feasibility for Automated Travel Advisory Signage has not been assessed

Recommendations: The ramp metering analysis will require collaboration between Bellingham, and WSDOT Planning and Traffic teams. We would recommend that funds be identified to support the development of a work plan to initiate a feasibility analysis, pre-design and cost estimates for placing ramp meters on I-5 as well as identifying locations for Automated Traveler Advisory Signage. Identification of improvements should consider impacts to the local street network, transit operations, and bicycle and pedestrian activity. When possible, analysis of interchanges on I-5 should consider identified needs in Focus Area I in coordination with Bellingham and the Mount Baker Traffic Team.

Focus Area 3: *Lincoln-Lakeway Multimodal Transportation Study*

Action: The Lincoln-Lakeway Multimodal Transportation Study provides opportunities to enhance the multimodal regional transportation system and capitalize on near-term and long-term land use actions, new transit center expansion plans, bicycle/pedestrian connectivity, and east/west local access connections across/under I-5 as well as I-5 access. The Study will also help to inform best practices for enhancing opportunities and implementation of Bellingham's for mode shift goals as well as transit speed and reliability. The Study includes the following I-5 interchanges:

- I-5 / Samish Way
- I-5 / Lakeway
- I-5 / Iowa

The City of Bellingham is the lead agency with support from WSDOT, WCOG, and WTA. Transpo Group was selected as the consultant for the study through a competitive bid process to help analyze multimodal transportation issues in the Study Area. The Study is expected to be completed by 2021.

Recommendations: WSDOT is excited to work with our partners to engage in multimodal planning in Bellingham. If successful, this Study will help maintain and or remove vehicular trips from I-5 and the local transportation system. WSDOT is looking forward to exploring methods to improve mode shift, reduce congestion, improve interchange ramps and increase the effectiveness between land uses and the transportation network in the Lincoln-Lakeway Sub-area. Proposed actions from the Study will be coordinated with WSDOT traffic teams, public transportation and other subject matter experts, and decision makers.

Next Steps:

- Brief decision makers and stakeholders on the final results of the I-5 Traffic Operations and Transportation Demand Management Analysis.
- Initiate Stakeholder Outreach to gather additional comments on proposed recommendations.
- Forward recommendations to partner agencies for inclusion in their plans.
- Recommend incorporation of strategies and alternatives within state, regional and local plans and other work in alignment with the Washington State Transportation Plan, Public Transportation Plan, Active Transportation Plan and Highway System Plan.
- Evaluate alternatives and determine feasibility, impacts and cost to implement recommended Focus Areas through the Practical Solutions Framework.

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