Washington State
Department of Transportation

Fairhaven to Slater Interstate 5 Master Plan

Final Report

November 2008

For more information regarding the Conway to Cook Interstate 5 Master Plan contact:

Washington State Department of Transportation
Northwest Region, Mount Baker Area
Transportation Planning
1043 Goldenrod Road, Suite 101
Burlington, WA. 98233-3415
Phone: 360-757-5999

Acknowledgements

WASHINGTON STATE DEPARTMENT OF TRANSPORTATION

FEDERAL HIGHWAY ADMINISTRATION

WHATCOM COUNCIL OF GOVERNMENTS

CITY OF BELLINGHAM

WHATCOM TRANSIT AUTHORITY

HW LOCHNER

DKS ASSOCIATES

Transportation affects everyone. Whether commuting to work, delivering products, taking a vacation, or running errands, our lives and livelihood depend on a safe, efficient and reliable transportation system. Washington State's population continues to grow, as does the need to move more people and freight. The Washington State Department of Transportation (WSDOT) is dedicated to providing a safer, more efficient and reliable transportation system to demonstrate its commitment to being good stewards of the State's transportation system.

Project Decision Team Endorsement
Fairhaven to Slater Interstate 5 Master Plan

Endorsement Statement

"We endorse the Fairhaven to Slater Interstate 5 Master Plan and are committed to actively supporting it. Our endorsement acknowledges that we have completed our review and oversight responsibilities and agree with the findings and recommendations documented in the Master Plan."

Project Support Team

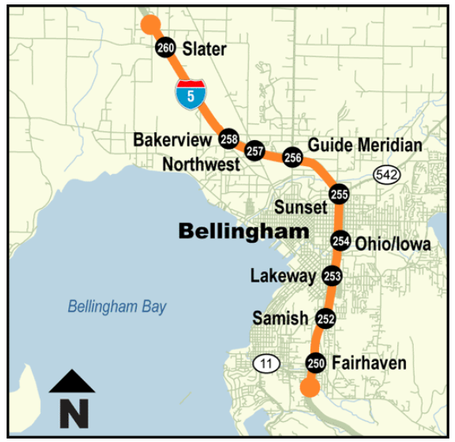
Name	Initials	Role
Kristine Edens, EnviroIssues	.....	Public Involvement
Lara Gricar, EnviroIssues	.....	Public Involvement
Steve Chestnut WSDOT	.....	Access Engineer

Project Decision Team

Name	Initials	Role
Brian Hasselbach, FHWA	.....	Area Engineer
Terry Berends, WSDOT	.....	Assistant State Design Engineer
LeRoy Patterson, WSDOT	.....	Access and Hearings Manager
Todd Carlson, WSDOT	.....	Mt. Baker Area Planning & Engineering Services Manager
Jay Drye, WSDOT	.....	Mt. Baker Area Engineering Manager (Design)
Dina Swires, WSDOT	.....	Mt. Baker Area Traffic Engineer
Mike Koidal, WSDOT	.....	Mt. Baker Area Traffic Operations Specialist
Alan Soicher, WSDOT	.....	Mt. Baker Area Assistant Environmental Programs Manager
Mark Yand, DKS Associates	.....	DKS Project Manager (Interstate Master Plan)
Bob Munchinski, HW Lochner, GEC Consultant	.....	GEC Project Manager
Tom Stacey, WSDOT	.....	Asst. Project Manager/Project Coordinator
Dustin Terpening, WSDOT	.....	Mt. Baker Area Public Information Officer

EXECUTIVE SUMMARY

The purpose of the Fairhaven to Slater Interstate 5 Master Plan is to identify safety and mobility needs on the interstate and connected local roads, and recommend a set of improvements to maintain efficient operations, improve safety and manage congestion. Although there is no funding currently available for plan recommendations, the master plan is a necessary first step toward making I-5 improvements in the future. The plan empowers WSDOT and partner agencies to set priorities and pursue funding for detailed design and construction.



PROBLEMS

The plan process identified a number of safety and congestion issues that have negative consequences on those who depend on I-5. These problems degrade the quality of life of people who live and work in the region, and slow the flow of commerce on this nationally-significant corridor.

- There were 680 collisions on I-5 lanes and ramps in three years, from 2003 to 2005.
- Currently, high collision rates occur at several interstate ramps.
- Short lengths and tight curves at on- and off-ramps slow vehicles on I-5 and increase congestion.
- Local arterial streets are severely congested.
- I-5 is nearing capacity during peak periods today.
- Over half the traffic on I-5 is generated by local trips traveling short distances.
- By 2035 local traffic will grow by 55 percent, through traffic by 115 percent, and truck through traffic by 275 percent.
- "Rush hour" will extend from the current 15-30 minutes today to over two hours in 2035.
- Travel times will triple by 2035.

IMPROVEMENTS

The plan incorporates state and federal transportation policy, transportation analysis, and input from elected officials and local agency staff, stakeholders and members of the community and identifies the following strategies to improve safety and help relieve congestion on I-5:

- Implement a collector-distributor (C/D) system that would connect the Samish Way, Lakeway Drive and Iowa Street interchanges as one "system" with the middle interchange connected only to the C/D. A similar system would be implemented at the Guide Meridian Road, Northwest Avenue, and Bakerview Road interchanges with the middle interchange connected only to the C/D.
- Build weave lanes on the mainline between the Sunset Drive and the Guide Meridian Road interchanges, between Sunset Drive and Iowa Street interchanges, and between Bakerview Road and Slater Road.
- Provide ramp improvements at the Fairhaven Parkway interchange.
- Preserve space in the median of I-5 for future managed lanes (one lane in each direction) to provide flexibility to accommodate future improvements.
- Accommodate non-motorized transportation.
- Implement active traffic management improvements including ramp metering.
- Replace the existing Samish Way interchange with a new interchange.
- Build a new single-point urban interchange (SPUI) at Lakeway Drive that is connected only to the C/D roadway.
- Build a new SPUI interchange at Iowa Street. The northbound off- and southbound on-ramps at Iowa Street would connect to the mainline. The northbound on- and southbound off-ramps would connect to the C/D.
- Replace the Sunset Drive interchange with a SPUI.
- Build a new SPUI interchange at the Guide Meridian Road and eliminate the northbound left turn at the Guide Meridian Road/ Telegraph Road intersection.
- Provide interchange improvements at the Northwest Avenue interchange.
- Build a new SPUI interchange at Bakerview Road.
- Implement ramp terminal improvements at the Slater Road interchange. These improvements would include lengthening the ramps and making improvements to the ramp terminal intersections.

I-5 southbound near the Guide Meridian Road interchange

BENEFITS

The estimated cost for implementing the recommended improvements is $1.3 billion to $1.6 billion in 2008 dollars. This investment would generate the following safety and mobility benefits:

- Reduce the number of conflict points at interchanges.
- Reduce vehicle conflicts where ramp volumes are highest.
- Separate lower speed, local traffic exiting and entering I-5 from regional traffic passing through the corridor.
- Reduce congestion at interchange intersections that cause traffic backups on the off-ramps.
- Reduce local arterial street congestion which causes traffic backups on the off-ramps.
- Provide dedicated bicycle and pedestrian facilities.
- Decrease travel time by 75 percent northbound and 50 percent southbound in the 2035 peak periods.
- Generate travel time savings of 25 minutes northbound and 10 minutes southbound in the 2035 peak periods.
- Increase average vehicle corridor throughput by 35 percent northbound and 40 percent southbound in the 2035 peak periods.

The strategy proposed in the plan is ***one*** way to address safety and mobility needs on the interstate; it is not the ***only*** way. The plan recognizes that needs change over time depending on population growth, travel patterns, new technologies and local street improvements. In addition, there may be other strategies available to address interstate needs that merit additional review and discussion. The plan will be revisited periodically to respond to changing conditions, evaluate alternative strategies, and modify the list of improvements accordingly.

NEXT STEPS

The plan identifies over one billion dollars of needs that cannot be met within the limits of existing funding. The next step is to develop an implementation strategy that will lead to funded projects.

WSDOT will use the technical analysis and public comments generated in the development of the Interstate Master Plan to:

- Obtain approvals from the Federal Highway Administration (FHWA).
- Coordinate I-5 improvements with local land use and transportation plans.
- Partner with local agencies and private developments on funding improvements.
- Design, conduct environmental review, and construct improvements.

As funding becomes available, WSDOT will work with project partners and local agencies to move forward with design and construction of high-priority improvements.

Table of Contents

Executive Summary i
- Problems i
- Improvements i
- Benefits i
- Next Steps i

Chapter 1. Introduction 1-1
- What Is The Purpose Of The Interstate Master Plan? 1-1
- What Guided Our Evaluations And Recommendations? 1-1
- Who Helped Us Develop The Interstate Master Plan? 1-2
- What Is In The Report? 1-2

Chapter 2. Overview Of Findings And Recommendations 2-1
- What Did We Learn? 2-1
- How Do Recommended Improvements On The Interstate Address Safety And Mobility? 2-1
- Problems And Recommended Improvements 2-2

Chapter 3. What Are The Problems? 3-1
- Introduction 3-1
- Interchange Geometric Deficiencies 3-2
- Collisions 3-3
- I-5 Congestion, Mobility And Freight 3-5
- I-5 Corridor Volume Comparisons 3-5
- Local Internal VS. Regional Through Trips On I-5 3-6
- Local Connections For Non-Motorized Users 3-7
- Aging Bridge Structures And Pavements 3-7
- Summary Of Interstate Problems 3-8

Chapter 4. Evaluation Of Potential Interstate Improvements 4-1
- Eliminate Interchange(s) 4-2
- Close Deficient Ramps 4-2
- Add Collector Distributor Lanes 4-2
- Add Weave Lanes 4-3
- Braid High Volume Ramps 4-3
- Rebuild Existing Interchanges 4-3
- Add New Interchanges In A New Location 4-3
- Improve Ramps To Fix Geometric Deficiencies 4-4
- Add Two General Purpose Lanes In Each Direction 4-4
- Add A Managed Lane In Each Direction 4-4
- Improve Local Street Connections 4-4
- Provide Ramp Intersection Improvements 4-4
- Ramp Metering 4-5
- Active Traffic Management 4-5
- Increase Transit Service 4-5
- Implement Transportation Demand Management Measures (TDM) 4-5
- Summary 4-5

Chapter 5. Recommendations 5-1
- Recommendation #1—Make I-5 Improvements 5-1
- Safety Benefits Of I-5 Improvements 5-2
- Traffic Operations And Level Of Service (LOS) Benefits 5-3
- Travel Time Benefits 5-4
- Throughput Benefits 5-4
- Freight Benefits 5-4
- Recommendation #2—Make Local Street Improvements 5-5
- Recommendation #3—Make Non Motorized Improvements 5-6
- Recommendation #4—Plan For Future Transportation Options 5-6
- Recommendation #5—Adopt The IMP Into State, Regional, Tribal, And Local Plans 5-6

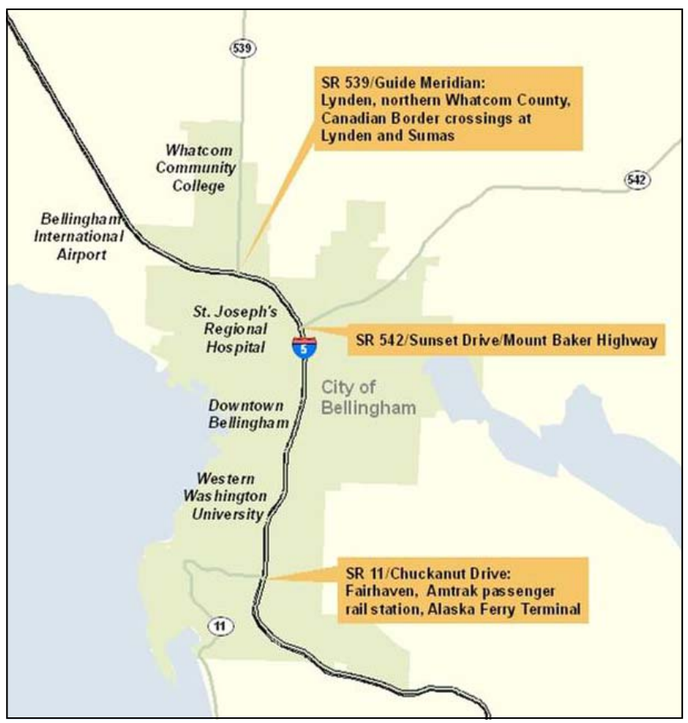
Chapter 6. Implementation 6-1
- Discrete Projects—Building Blocks To Improve I-5 6-1
- Identifying And Assessing Risk 6-1
- Risk Evaluation 6-2
- Setting Priorities 6-3

CHAPTER 1 - INTRODUCTION

Interstate 5 (I-5) is the primary highway corridor for the movement of goods, and people traveling north and south on the west coast of North America. The corridor is a highway of national and statewide significance that runs north-south through the state of Washington from the Canadian border to the Oregon border. It links key population centers in the state of Washington and provides convenient access to the city of Bellingham and surrounding cities, towns and communities in Whatcom County.

The I-5 corridor through Bellingham is a 10 mile, divided, four-lane, limited access, interstate highway (two lanes in each direction) running from the interchange at Old Fairhaven Parkway (SR 11) at exit 250, to the Slater Road interchange at exit 260. Along this stretch of I-5 there are nine interchanges and 38 ramps that provide access between I-5 and the local roadway system. Three of those interchanges provide connections to other state highways. Those connections and key regional destinations are:

- Exit 250 linking I-5 to SR 11 (Old Fairhaven Parkway) provides access to Bellingham's Fairhaven district, Amtrak's passenger rail station, and to the Alaska ferry terminal.
- Exit 255 linking I-5 with SR 542 (Sunset Drive/Mount Baker Highway) provides access to growing communities in east Whatcom County, and to recreational activities at or near Mount Baker.
- Exit 256 linking I-5 with SR 539 (Guide Meridian Road) provides access to Lynden, northern Whatcom County, and to Canadian Border crossings at Lynden and Sumas.



State highway connections and key regional destinations

Other key destinations in the I-5 corridor include Western Washington University (exit 252), Downtown Bellingham (exits 252—254), St Joseph's Regional Hospital (exit 255), major retail centers (exit 256) and Whatcom Community College (exit 256), and Bellingham International Airport (exit 258).

I-5 was constructed through the Bellingham area in three segments from the mid 1950's to the mid 1960's with additions and modifications to interchange ramps continuing to the present day. Some sections of I-5 were built alongside the alignment of US Highway 99 which has its origins back to the 1920's and 1930's. Other sections were all new highway alignments.

Whatcom County's population has almost tripled since I-5 was built, increasing from 70,000 residents in 1960 to more than 190,000 today. Traffic volumes on I-5 increased at a faster rate than population growth. The population is expected to significantly increase by 2035, especially in the Bellingham urban area. Growth in the number of vehicles traveling on I-5 through Bellingham have placed greater demands on I-5 and connected local roads than they are currently designed to handle. The result of higher volumes on I-5 is a high number of collisions and increased congestion.

WSDOT's mission is to keep people and goods moving by operating and improving the state's transportation system. To accomplish the mission, WSDOT needs a current, factual understanding of the problems on I-5, and must develop and evaluate improvements to address the problems. This is the master planning process.

WHAT IS THE PURPOSE OF THE INTERSTATE MASTER PLAN?

The purpose of the Fairhaven to Slater Interstate 5 Master Plan (IMP) is to identify the safety and mobility needs on the interstate and connected local roads, now and into the future, and recommend an integrated set of improvements to maintain safe, efficient and acceptable I-5 operations. Specific objectives to be accomplished with the IMP were as follows:

- Identify areas with congestion, high collisions and geometric deficiencies.
- Establish a plan that provides guidance for the stewardship of resources, funding of future improvements, and the integration of interstate operations with other planned improvements in the region.
- Obtain Federal Highway Administration project approvals for I-5 improvements.
- Be prepared for funding when it becomes available.
- Enable opportunities to partner with local agencies and private developments to fund improvements.
- Enhance regional transportation planning.
- Coordinate I-5 improvements with local land use and transportation plans.

WHAT GUIDED OUR EVALUATIONS AND RECOMMENDATIONS?

The improvements considered for I-5 are guided by federal, state and local transportation goals and policies, including those identified in the Washington State Transportation Plan, regional and metropolitan transportation plans, transit and port long range plans, and city and county local comprehensive plans.

Most importantly, this plan is guided by the following Washington State transportation policy goals contained in RCW 47.04.280:

1. **Preservation:** to maintain, preserve, and extend the life and utility of prior investments in transportation systems and services;
2. **Safety:** to provide for and improve the safety and security of transportation customers and the transportation system;
3. **Mobility:** to improve the predictable movement of goods and people throughout Washington State;
4. **Environment:** to enhance Washington's quality of life though transportation investments that promote energy conservation, enhance healthy communities, and protect the environment; and
5. **Stewardship**: to continuously improve the quality, effectiveness, and efficiency of the transportation system.

How do we know when we have accomplished these goals? We recognize that stakeholders measure success differently and place different demands on the interstate. Local communities often value access most highly, while state and federal agencies emphasize the importance of mobility for through traffic. WSDOT's charge under state law is to consider the necessary balance between providing for the free inter-jurisdictional movement of people and goods on I-5, and the needs of local communities using I-5.

With the guidance of the IMP, WSDOT will identify a list of improvements that can be implemented in phases and scaled to funding that may be available in the future. WSDOT recognizes that the IMP is not a perfect road map for future improvements. Though the concepts may change over time, the improvements identified through the IMP are a benchmark that will allow WSDOT to pursue funding for detailed design, environmental analysis and construction, and provide a context to evaluate other improvement strategies that may develop in the future.

WHO HELPED US DEVELOP THE INTERSTATE MASTER PLAN?

WSDOT met with the public, with local agency officials and staff, and technical experts to guide the development of the IMP. Public comments were received through a number of effective outreach methods. Those methods included a traveling project display, a project webpage, newspaper and radio news stories, one-on-one meetings with constituent groups, stakeholder meetings, a public open house, and through input we received via emails, phone calls and letters.

WSDOT listened to the public and integrated their thoughts, concerns and advice into the identification of I-5 problems, and in the development and evaluation of improvements. Also key to the development of the plan was coordination with the Whatcom Council of Governments (WCOG) on regional planning policy. WCOG is the Metropolitan Planning Organization (MPO) and the Regional Transportation Planning Organization (RTPO) in the IMP corridor. WCOG's regional transportation travel demand model is the basis for all of the forecasted growth in traffic used in the IMP.

WSDOT relied on a Project Decision Team (PDT) for review and oversight of analysis of existing and future conditions, the evaluation of improvements and the final recommendations prepared for the master plan. The PDT was comprised of representatives from the Federal Highway Administration (FHWA); WSDOT headquarters design engineering and access management offices; WSDOT region design engineering, traffic engineering, environmental, planning, and communications; and consultant staff. A complete list of PDT members is shown on the Project Decision Team endorsement page near the front of this report.

The cooperation and input we received is referenced throughout this report where problems and needs are identified, and where improvements are recommended. WSDOT greatly appreciates the time and careful thought expressed by community members in their comments. This cooperation will continue well after completion of the IMP. WSDOT will engage local agency officials and the public to define improvement priorities and implement I-5 improvements.

The technical appendices to this report contain details of our public involvement activities and the feedback we received, as well as information summarizing our Project Decision Team meetings.

WHAT IS IN THE REPORT?

This report describes the existing and forecasted (2035) problems on I-5, the improvements that were considered to address these problems and the improvements that are recommended for funding and implementation over the next 25 years.

Attendees at a public stakeholder meeting

CHAPTER 2 - OVERVIEW OF FINDINGS AND RECOMMENDATIONS

The Interstate Master Plan identifies safety and mobility needs on I-5 and connected local roads, and describes potential improvements that address the physical needs of the roadway. The plan also provides flexibility for meeting the long term transportation needs of the region and the state beyond 2035. Plan recommendations incorporate feedback received from local governments and members of the community.

This chapter provides an overview, in the form of five aerial photos with graphics, describing the problems and the recommended improvements to address those problems. An in-depth analysis of the problems identified, and the improvements considered, evaluated, and recommended, is provided in subsequent chapters.

WHAT DID WE LEARN?

Significant improvements are needed to meet the state and federal design standards for interstate facilities. Land use changes adopted by local governments within Whatcom County will significantly increase the demand for travel on I-5. In addition, trips traveling through the I-5 corridor in the Bellingham area from Canada and locations outside Whatcom County (Skagit County, King County) will more than double by 2035. These increases in demand will choke I-5 leading to an operational breakdown of the mainline, ramps and local intersections.

The 10 mile section of I-5 through the Bellingham urban area is experiencing a high number of collisions as a result of the close spacing of interchanges and on- and off-ramps that are too short and have curves that are too tight. This section of I-5 is also rapidly becoming a chokepoint because of the significant amount of local traffic entering and exiting within the corridor mixing with the growing volume of through traffic on I-5.

Two key chokepoints on I-5 are the Guide Meridian Road and Sunset Drive interchanges. These two interchanges will experience high volumes of traffic in the future (2035) with high levels of congestion at the ramp terminal intersections. In the future, peak hour volume and demand will overwhelm these interchanges causing extreme backups and congestion on I-5.

In the future (2035), traffic from the northbound off-ramp to the Guide Meridian Road will backup onto the I-5 mainline causing complete breakdown of mainline operations. The high volume of northbound traffic which enters I-5 from the Sunset Drive interchange will compound the queuing and congestion problems that currently exist at the Guide Meridian Road interchange. With only two northbound lanes between Sunset Drive and the Guide Meridian Road, simulation modeling shows that the mainline lanes quickly breakdown when additional volume is added, resulting in stop and go conditions and severe congestion. The result of these chokepoints include congestion and stop and go conditions extending from the Lakeway Drive interchange to the Guide Meridian Road interchange in the 2035 p.m. peak hours in the northbound direction. Other future (2035) northbound congestion points include backups from queuing at the off-ramps which extend onto the mainline. These backups occur at the Fairhaven Parkway, Northwest Avenue, and Bakerview Road interchanges.

In the southbound direction, high volumes of traffic enter I-5 from the Guide Meridian Road southbound on-ramps. This traffic must merge and weave with a high volume of traffic destined to the Sunset Drive interchange. Queuing and backups from the southbound off-ramp to Sunset will cause the southbound mainline to breakdown in the future. The result of this future bottleneck is stop and go conditions in the southbound direction in the 2035 p.m. peak hours extending from Sunset Drive to north of the Bakerview Road interchange. Other future (2035) southbound congestion points include backups from queuing from off-ramps which extend onto the mainline. These backups occur at the Bakerview Road and Guide Meridian Road interchanges.

Federal interstate requirements, or design standards, are specifications that have been developed by the Federal Highway Administration and state highway officials based on years of experience designing and operating the interstate system. These standards are applied uniformly from coast to coast across the United States to ensure that drivers experience the same visual directions nationwide in order to improve safety and operational efficiency. Design problems in the I-5 corridor are identified in the Interstate Master Plan as geometric deficiencies. The key geometric deficiencies in the corridor include inadequate interchange spacing, lack of full interchanges, and substandard ramp acceleration and deceleration lengths.

The worst deficiencies occur at the following interchanges:

Samish Way: Inadequate interchange spacing, poor ramp configuration, short on- and off-ramps.

Lakeway Drive: Inadequate interchange spacing, poor ramp configuration, short on- and off-ramps.

Iowa/Ohio Street: Inadequate interchange spacing, poor ramp configuration, short on- and off-ramps.

Sunset Drive: Deficient southbound on-ramp.

Guide Meridian Road: Inadequate interchange spacing, poor ramp configuration, short on- and off-ramps.

Northwest Avenue: Inadequate interchange spacing, poor ramp configuration, short on- and off-ramps.

Bakerview Road: Inadequate interchange spacing and poor ramp configuration.

HOW DO RECOMMENDED IMPROVEMENTS ON THE INTERSTATE ADDRESS SAFETY AND MOBILITY?

Improvement	Benefit
Managed Lanes	Move more people and/or freight safely and efficiently.
Weave Lanes	Improves safety and provides congestion relief. Provides longer area for merging on and off I-5. Reduces vehicle conflicts merging on and off the interstate where ramp volumes are high.
Collector Distributor Lanes	Improves safety and provides congestion relief. Reduces vehicle conflicts merging on and off the interstate where interchanges and ramps are spaced too close together.
Single Point Urban Interchange	Moves more traffic through the interchange which reduces backups to the ramps and arterial streets and improves safety.
Lengthened ramps / widened ramp curves	Improves safety and reduces congestion at the ramp merge area on I-5.
Ramp Intersection Improvements	Improves ramp and arterial street safety and reduces dangerous backups at off-ramps.
Improve bicycle and pedestrian facilities at interchanges when they are modified or rebuilt	Provides dedicated bicycle and pedestrian facilities to improve safety and improve connections to adjacent bicycle and pedestrian facilities.
Additional lanes crossing I-5 at bridges and undercrossings	Improves safety and provides congestion relief. Reduces local arterial street congestion which causes traffic to backup on I-5 off-ramps.
Active Traffic Management	Using integrated systems and a coordinated response, both recurrent and non-recurrent congestion can be managed to improve roadway safety and traffic flows.
Improve Local Street Connections	Reduces the number of short trips on the interstate and enables better transit connections.

PROBLEMS AND RECOMMENDED IMPROVEMENTS

PROBLEMS

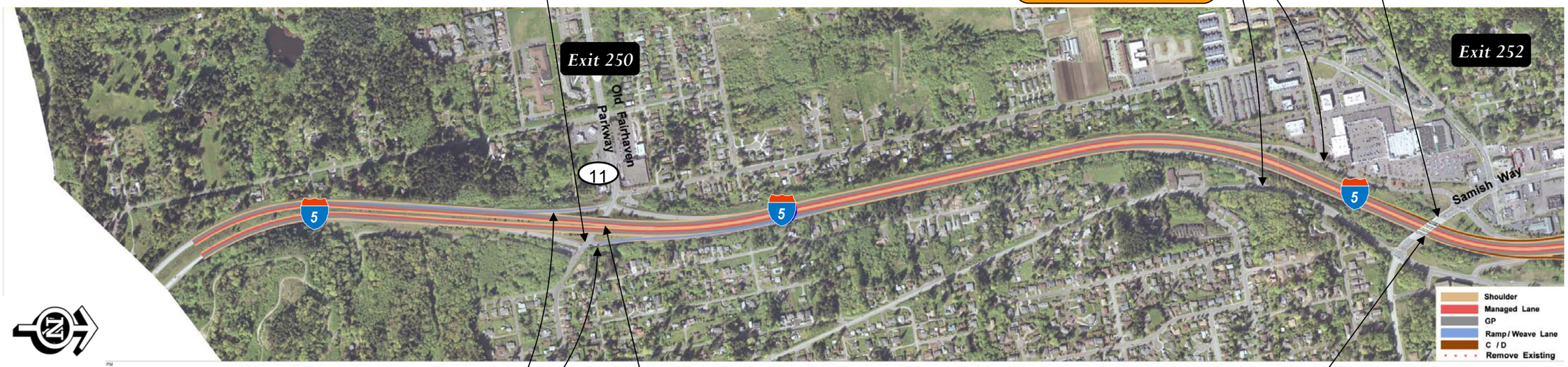
Existing Geometric Deficiencies

Future Mainline Congestion

Congested Ramp Terminals

Congested Stop Controlled Intersections

Nonstandard and Congested Ramps



See Chapter 5 for Additional Details

IMPROVEMENTS

Improve Ramps to Design Standards

Ramp Terminal Improvements

Reconfigure or relocate Samish Way Interchange. Location and alignment to be determined as part of a public process.

Active Traffic Management

Reserve space for future managed lanes

PROBLEMS AND RECOMMENDED IMPROVEMENTS

PROBLEMS

- High Collisions
- Future Mainline Congestion
- Closely Spaced Interchanges
- Existing Geometric Deficiencies

See Chapter 5 for Additional Details

IMPROVEMENTS

- Reconfigure or relocate Samish Way Interchange. Location and alignment to be determined as part of a public process.
- Add C/D lanes between Samish Way Interchange and Iowa Street Interchange
- Connect Lakeway Drive ramps to C/D lanes and Build new SPUI Interchange
- Construct new SPUI Interchange at Iowa Street
- Close Kentucky Street for vehicles, maintain access for bicycles and pedestrians

- Active Traffic Management
- Reserve Space for future Managed Lanes

PROBLEMS AND RECOMMENDED IMPROVEMENTS

PROBLEMS

- High Collisions
- Future Mainline Congestion
- Existing Geometric Deficiencies

See Chapter 5 for Additional Details

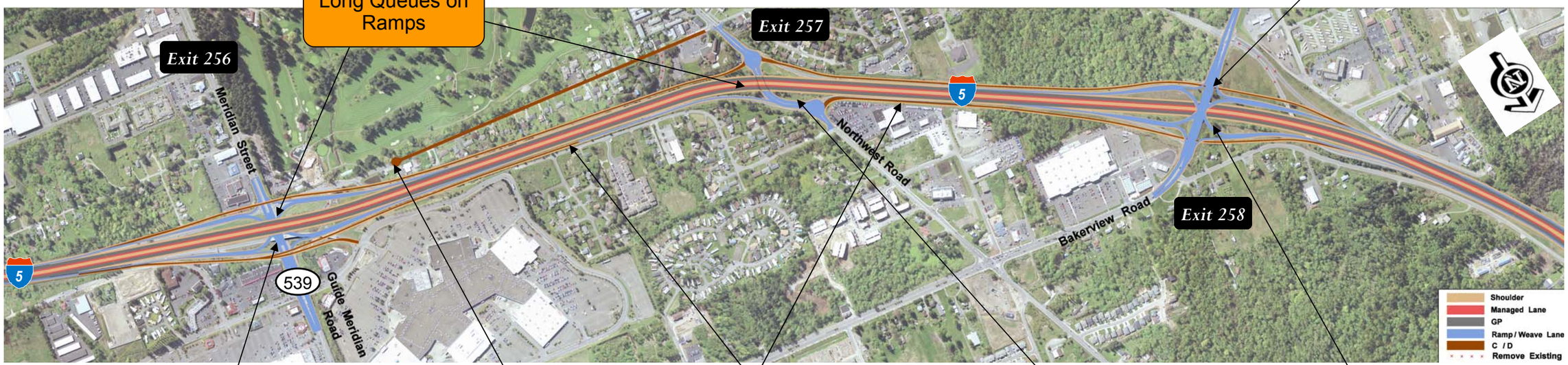
IMPROVEMENTS

- Long Queues on Ramps
- Weave Lanes
- Rebuild Alabama Street Overpass
- Rebuild Pedestrian Overpasses
- Construct new SPUI Interchange at Sunset Drive
- Weave Lanes
- Active Traffic Management
- Reserve Space for future Managed Lanes

PROBLEMS AND RECOMMENDED IMPROVEMENTS

PROBLEMS

- Existing Geometric Deficiencies
- Future Mainline Congestion
- Closely Spaced Interchanges
- High Collisions



See Chapter 5 for Additional Details

IMPROVEMENTS

- Construct new SPUI Interchange at Guide Meridian Road
- Cul-de-sac McLeod Road
- Add C/D lanes between Guide Meridian Road and Bakerview Road Interchanges
- Connect Northwest Avenue to C/D lanes and make interchange improvements
- Construct new SPUI Interchange at Bakerview Road
- Active Traffic Management
- Reserve Space for future Managed Lanes

PROBLEMS AND RECOMMENDED IMPROVEMENTS

PROBLEMS

Existing Geometric Deficiencies

Future Mainline Congestion

Long Queues on Ramps

See Chapter 5 for Additional Details

IMPROVEMENTS

Weave Lanes

Ramps and Ramp Terminal Improvements

Active Traffic Management

Reserve Space for future Managed Lanes

CHAPTER 3 - WHAT ARE THE PROBLEMS?

INTRODUCTION

The I-5 corridor from Fairhaven to Slater has a number of existing problems that need to be addressed. The problems are summarized below:

- Geometric deficiencies - 28 of 38 ramps are too short and/or the ramp curves are too tight.
- Non-standard interchanges - Interchange ramps are dispersed and connected to multiple local streets causing driver confusion and increasing out-of-direction travel.
- Closely spaced interchanges - Six of nine interchanges are spaced too close together.
- High frequency of collisions - A total of 680 of collisions occurred over a three-year period in the corridor. These collisions were concentrated around high volume ramps and interchanges.
- Increasing congestion on I-5 - Vehicular throughput is low due to slower speeds, poor geometrics and closely spaced interchanges. Travel speeds fluctuate and are highly variable throughout the corridor.
- Increasing local street congestion - Congested local streets at ramp terminals cause traffic to back up onto mainline I-5.
- High percentage of local trips using I-5 - 50 percent of trips on I-5 during the peak hour are local trips traveling less than 5 miles.
- Lack of local routes crossing I-5 for cyclists and pedestrians - Inadequate bicycle and pedestrian facilities exist at many ramp terminal intersections and there are few connections crossing I-5 in between interchanges.
- Aging I-5 structures and pavement - Many of the bridges and pavements are nearing the end of their useful life. Modifying exiting bridges to accommodate improvements may be unfeasible at some locations.

These existing problems will worsen as the demand for travel on I-5 and on the connected local streets grows in the future. By the year 2035, population in Whatcom County is expected to increase by 52 percent. Peak hour vehicle trips are expected to increase by 55 percent countywide. Peak hour vehicle trips passing through Whatcom County on I-5 are forecasted to increase by 115 percent and trucks trips on I-5 are forecasted to increase by 275 percent.

This increased growth and travel will have significant implications for how I-5 is used and operates in 2035. The resultant congestion on I-5 will cause long delays. More local trips will use the local streets to avoid the congestion on I-5. Congestion will have a detrimental affect on freight movements and on local and regional economic activity as the time and cost to transport goods will dramatically increase.

Existing and future problems on I-5, and what causes them, is explained in more detail on the following pages.

I-5 mainline between Iowa Street and Sunset Drive

Guide Meridian Road (SR 539) at Bakerview Road

EXISTING CONDITIONS (2006) PROBLEMS

- 28 out of 38 interchange ramps do not meet current interstate standards.
- I-5 experienced 680 crashes in three years with 454 on mainline I-5 and 226 on the ramps.
- Tight on- and off-ramps reduce I-5 operating speeds and increase congestion.
- Congestion on local streets clogs interchanges and causes dangerous backups onto I-5.
- The highest volumes and densities on I-5 are concentrated between the Guide Meridian Road and Iowa Street interchanges.
- The interstate mainline is nearing capacity and there are a few locations where the interstate currently operates near LOS E.
- Ramp geometrics are poor and degrade mainline operations.
- Ramp queuing and storage is a problem at many of the ramp terminals.
- I-5 is used as a primary route for local as well as regional trips. About 50 percent of the trips are local using I-5 to travel short distances.
- Traffic volume and conditions on I-5 and connecting arterials can vary greatly by season and time of day.

FUTURE CONDITIONS (2035) PROBLEMS

- Adopted land use changes will increase demand on I-5 and local roadways.
- Whatcom County population is projected to increase by more than 50 percent by 2035.
- Travel demand will increase by 55 percent for local trips, 115 percent for through trips and 275 percent for freight trucks.
- The number of trips using I-5 to travel long distances will constitute 50 percent or more of the peak hour demand by 2035.
- The ability of I-5 to absorb additional growth is limited.
- The future 2035 peak period demand will greatly exceed existing I-5 capacity. I-5 will be severely congested during peak periods lasting from 15-30 minutes today, to two or more hours in 2035.
- High ramp volumes cause breakdown of the I-5 mainline and local street intersections.
- Local streets in the vicinity of I-5 will operate at LOS F.
- Insufficient local street capacity and poor local street connections contribute to congestion and safety problems on I-5.
- Currently, there are very few funded improvements that add lane capacity to the roadway network in Whatcom County.

INTERCHANGE GEOMETRIC DEFICIENCIES

Federal and state design standards have been developed based on engineering principles and years of experience designing and operating highways in the state of Washington and across the country. In this report we use the term *geometric deficiencies* to identify I-5 facilities (bridge structures, ramps, and mainline lanes) that do not meet current design standards.

Interstate facilities are designed to operate at high speeds with limited access. Access to I-5 is made by way of interchanges comprised of on- and off-ramps that connect to local streets crossing over or under I-5. Federal interstate standards require a minimum one-mile spacing between interchanges in urban areas. In the Bellingham corridor, six interchanges do not meet this standard. Those interchanges and the spacing between them are as follows:

- Samish Way to Lakeway Drive (0.95 mile spacing)
- Lakeway Drive to Ohio/Iowa Street (0.69 mile spacing)
- Guide Meridian Road (SR 539) to Northwest Avenue (0.77 mile spacing)
- Northwest Avenue to Bakerview Road (0.68 mile spacing)

In addition to spacing requirements, state and federal policies require that I-5 interchanges provide fully directional access that meets driver expectations. Drivers should be able to enter and exit I-5 in both northbound and southbound directions at every interchange. Provision for all movements at each interchange is critical to a driver's expectation of gaining access on and off of I-5 at the same location. Interchanges that do no provide full movements, or separate ramp access points, do not meet these policy standards and are referred to as "non standard ramp configurations" in this document.

A total of forty-two geometric deficiencies exist on the on- and off-ramps in the I-5 corridor between Fairhaven and Slater. These ramp deficiencies include stopping sight distance, merge and diverge distances, and acceleration and deceleration distances. An example of these deficiencies is the Ohio/ Iowa Street interchange ramps shown in the graphic to the lower-right.

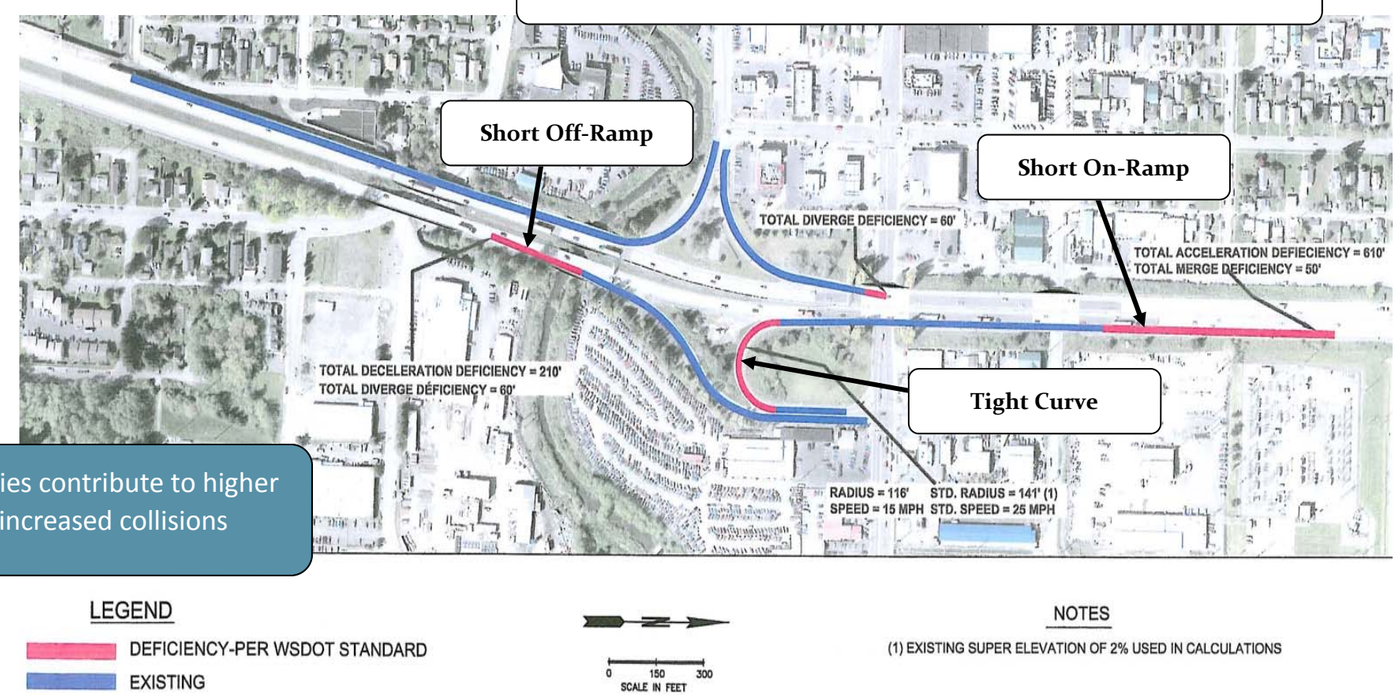
Where on- and off-ramps merge with I-5, significant lane changing and acceleration and deceleration movements occur. Ramps that are too short contribute to collisions and reduce the effective capacity of I-5. Vehicles entering or leaving I-5 at less than desirable speeds due to short acceleration/ deceleration lengths and tight curves on the ramps cause other vehicles on I-5 to brake and slow down which reduces speeds and vehicle throughput. Likewise, heavy queuing at off-ramps reduces the space available for vehicles exiting I-5, further reducing speeds and the capacity of I-5 to move traffic.

Northbound on- and off-ramps at Lakeway Drive

Summary of Key Interchange Problems

Location	Interchange Spacing	Interchange Capacity	Interchange Configuration
Samish Interchange	√	√	√
Lakeway Interchange	√	√	√
Iowa / Ohio Interchange	√	√	√
Sunset Interchange		√	
Guide Meridian Interchange	√	√	
Northwest Interchange	√	√	
Bakerview Interchange	√	√	

IOWA/OHIO STREET INTERCHANGE GEOMETRIC DEFICIENCIES



Geometric deficiencies contribute to higher congestion and increased collisions

COLLISIONS

Future improvements need to make I-5 safer by reducing the frequency and severity of collisions. In order to reduce collisions and improve safety it is important to understand where, why and how collisions occur on I-5. To do this, I-5 collisions were analyzed for a three year period from 2003 through 2005 using WSDOT collision records. During that time period the highest collision locations included the northbound off-ramp to the Guide Meridian Road (65 collisions in a three-year period) and the mainline between the Guide Meridian Road and Sunset Drive interchanges and in the vicinity of the Ohio/Iowa Street interchange ramps. The frequency of collisions was also high on the I-5 mainline southbound between the Guide Meridian Road and Sunset Drive Interchange ramps (54 collisions).

Many of the collisions are caused by vehicles slowing or braking at entry and exit points to I-5. Additional causes include sudden weaving or merging maneuvers as vehicles try to avoid or go around vehicles entering or exiting I-5. Some collisions are caused by vehicles rear ending other vehicles queued on the off-ramps. This is particularly true at locations with congested off-ramps such as the northbound off-ramp to the Guide Meridian Road.

In most cases, rear end collisions (presumably from vehicles stopped or slowing down) are cited in the collision records as the primary cause of collisions on the ramps and I-5 mainline. This percentage is especially high at the Guide Meridian Road interchange where 87 percent of northbound off-ramp collisions are rear-end and 60 percent of southbound mainline collisions are rear-end. At the Iowa/Ohio Street interchange, 60 percent of mainline collisions (northbound and southbound) are rear-end. There are several factors that contribute to rear-end collisions caused by vehicles braking or slowing down. These factors include geometric deficiencies on the ramps that require slower speeds, closely spaced interchanges that cause vehicles to "stack" in the right-hand lane with poor weaving distance between interchanges, weaving around vehicles entering and exiting the I-5 mainline, and congestion at off-ramps that causes vehicles to queue from off-ramps onto the mainline.

> Rear-end collisions occur when vehicles brake unexpectedly on the mainline and ramps due to congestion (slow moving vehicles) or queuing at ramp terminal intersections.

A summary of some of the highest collision locations in the corridor are illustrated here and include the Samish Way, Lakeway Drive, Iowa/Ohio Street, Guide Meridian Road (SR 539) and Sunset Drive interchanges. At some locations, seven year totals (2000-2006) were analyzed in order to evaluate the effectiveness of safety improvements recently made at those locations, while at other locations three year totals (2003-2005) were analyzed. Collisions are categorized by type. The concentration of collisions near the ramp entry and exit points to I-5, and where queuing occurs on the off-ramps, are illustrated in the graphics.

Collisions at the Sunset Drive interchange northbound off-ramp (diagram shown on next page) have decreased significantly since ramp improvements were completed in 2005. Improvements were also made on Sunset Drive which, in conjunction with the ramp improvements, helps clear traffic queuing on the off-ramp. At the Ohio Street southbound off-ramp the majority of collisions involve vehicles entering the intersection from King Street and/or vehicles turning left from Ohio Street onto King Street.

Unlike many of the other interstate ramps, all but one of the collisions at the Samish Way southbound off-ramp (shown on next page) occurred in the signalized intersection with Samish Way and 36th Street and not on the ramp itself.

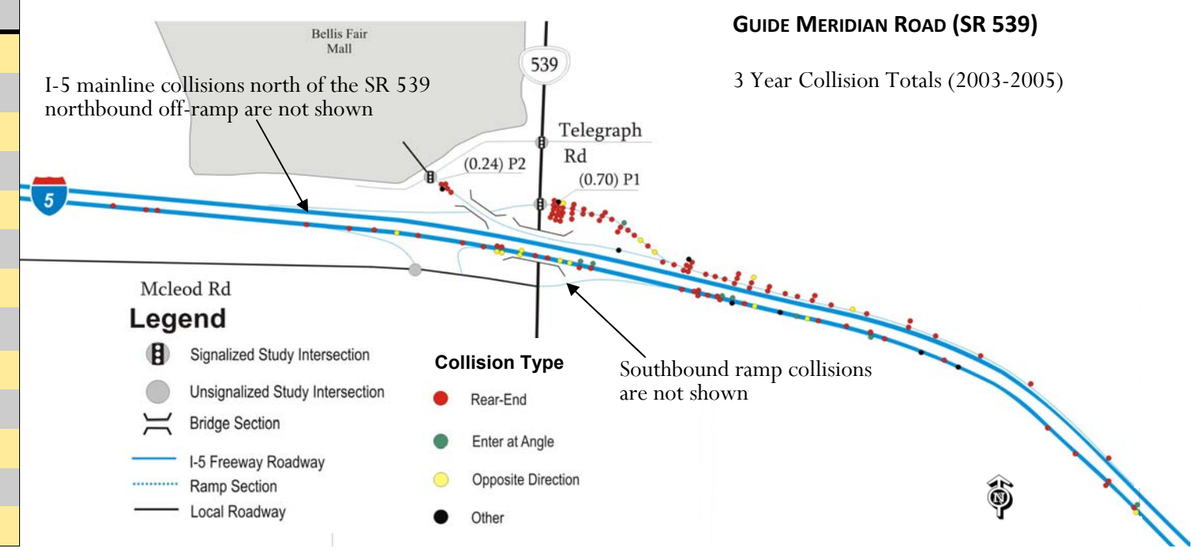
Northbound off-ramp at Guide Meridian Road (SR 539)

Existing Collisions Summary (3-Year Collision Totals)

Location	Totals		Contributing Factors			
	Mainline	Ramps	Interchange Spacing	Short Accel & Decel Lanes	Heavy Ramp Volumes	Off-Ramp Queues
Fairhaven Interchange	18	4		√	√	
Mainline: Fairhaven to Samish	10			√	√	
Samish Interchange	37	22	√	√	√	√
Lakeway Interchange	50	7	√	√	√	√
Iowa / Ohio Interchange	86	36	√	√	√	
Mainline: Iowa to Sunset	34			√	√	
Sunset Interchange	72	26		√	√	√
Guide Meridian Interchange	88	91	√	√	√	√
Northwest Interchange	13	20	√	√		
Bakerview Interchange	18	11	√		√	√
Mainline: Bakerview to Slater	9				√	
Slater Interchange	19	9			√	√
Totals	454	226				

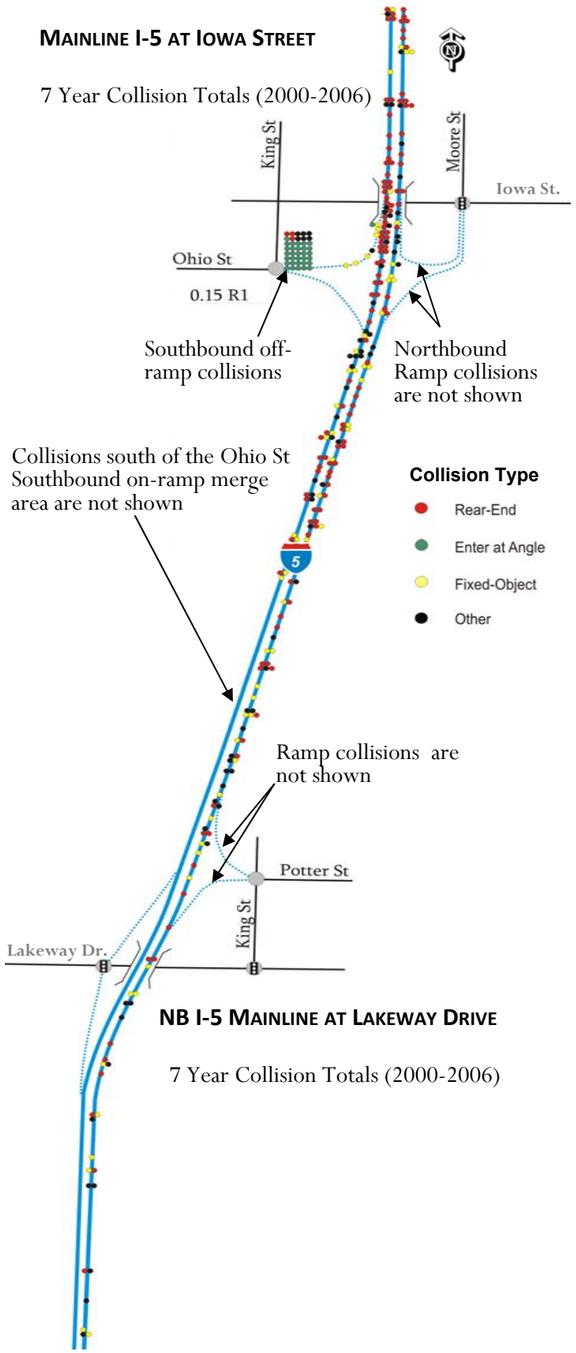
GUIDE MERIDIAN ROAD (SR 539)

3 Year Collision Totals (2003-2005)



MAINLINE I-5 AT IOWA STREET

7 Year Collision Totals (2000-2006)



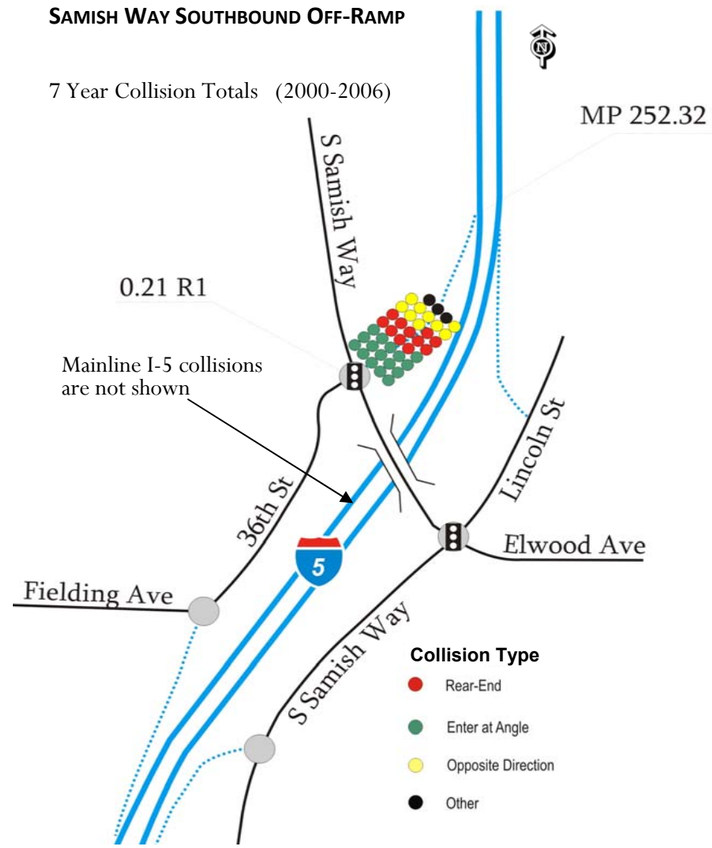
NB I-5 MAINLINE AT LAKEWAY DRIVE

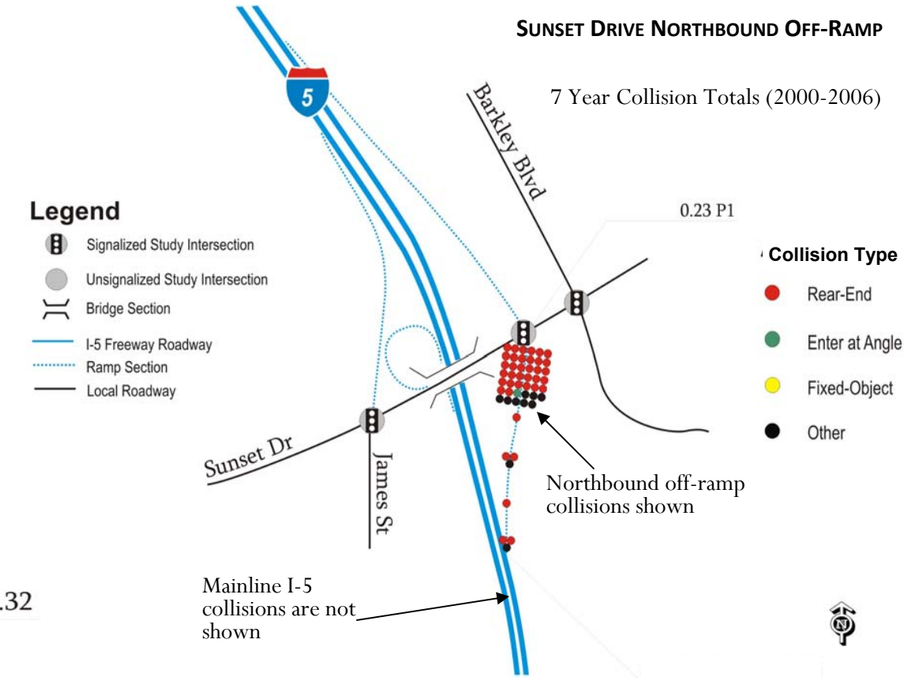
7 Year Collision Totals (2000-2006)

I-5 mainline near Old Fairhaven Parkway (SR 11)

SAMISH WAY SOUTHBOUND OFF-RAMP

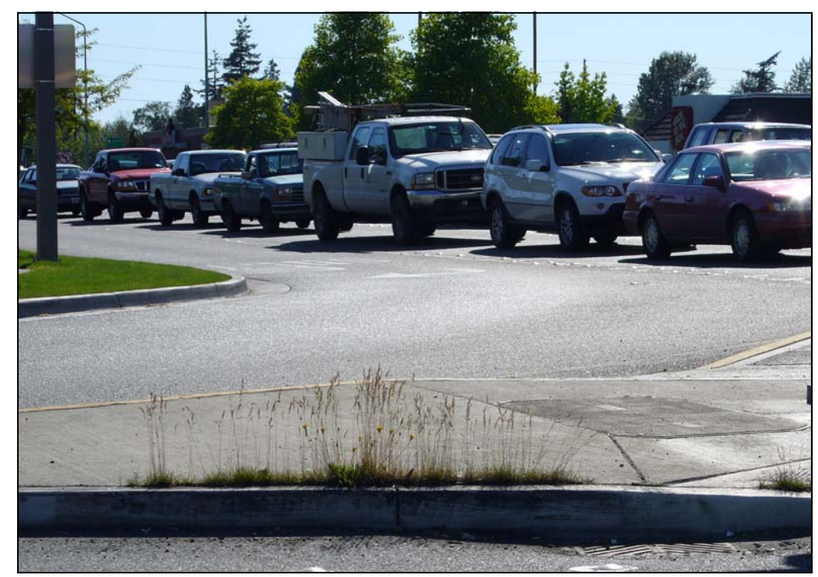
7 Year Collision Totals (2000-2006)





SUNSET DRIVE NORTHBOUND OFF-RAMP

7 Year Collision Totals (2000-2006)



Traffic congestion on Sunset Drive (SR 542) near the I-5 Interchange

I-5 CONGESTION, MOBILITY AND FREIGHT

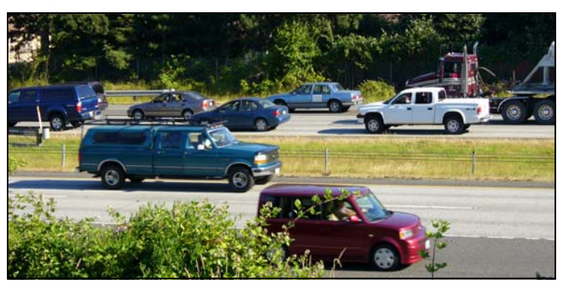
Today I-5 is nearing capacity with very little ability to absorb additional growth in traffic volumes. With forecasted growth in population (52 percent increase), local vehicle trips (55 percent), regional through-trips (115 percent) and regional truck trips (275 percent), I-5 will experience significant congestion by 2035 (see table below). During the 2035 PM peak hours, travelers will experience stop and go conditions in both the northbound and southbound directions. Travel time on I-5 corridor from the Fairhaven Parkway to Slater Road interchanges will increase from about 10 minutes today to 30 minutes or more in the PM peak hour. The duration of the peak hour with stop and go conditions is forecasted to last for more than two hours by 2035.

Congestion on the I-5 mainline and ramps will reduce the attractiveness of I-5 for local and short trips. Insufficient local street capacity and poor local street connections will contribute to the increased congestion on I-5.

The tables on this page and the next page show the effect of congestion on I-5 and at local street intersections at or near the I-5 interchanges. The degree of congestion is represented by a level of service (LOS) rating that ranges from "A" (the best) to "F" (the worst) in terms of measures of congestion and the performance of the transportation system. For more detail about level of service go to the technical appendix to this report.

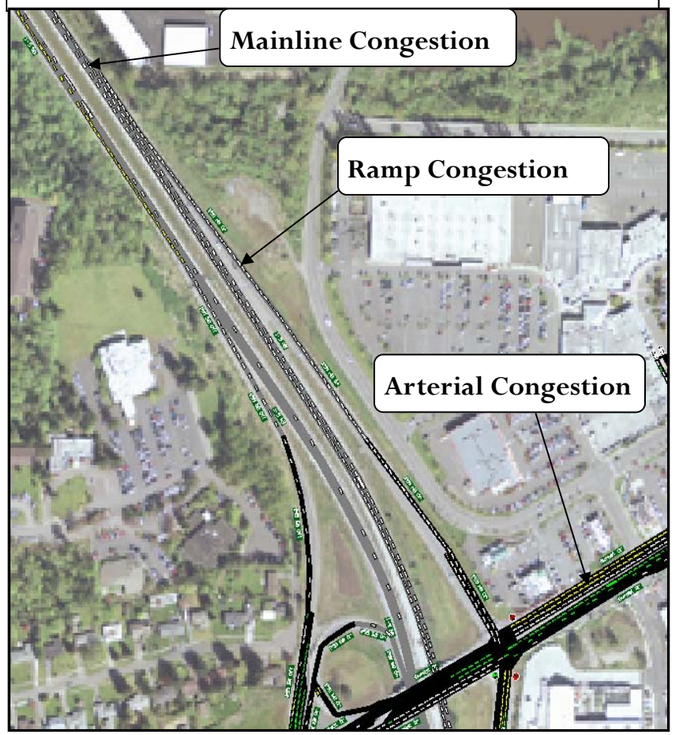
Interstate 5 is a highly strategic and important element of the freight transportation system, serving a major role in enabling local, regional, state, national and international commerce. A healthy, efficient and resilient freight transportation system is vital to the state's economy, as well as to the economy of the region served in the I-5 Fairhaven to Slater corridor. In 2006, commercial freight trucks represented more than five percent of the traffic in the corridor. It is forecasted that by 2035 freight truck trips will nearly triple in volume, far outpacing the growth in passenger vehicle trips on I-5.

The primary concerns for freight are the need to minimize travel time, have a reliable and predictable travel time, have access to pickup, delivery and services along the corridor, and safety. As congestion worsens, the duration of hours during the day in which it occurs also grows. These factors have a highly detrimental affect on freight transport and cost. Travel times grow as more time is spent in traffic, and the reliability of travel time through the corridor worsens as congestion occurs, sometimes unpredictably. Large trucks have much more difficulty merging on and off I-5 due to their size and weight. Coupled with the closely spaced interchanges, short ramps, sharp ramp curves and undulating terrain in Bellingham, merging on and off I-5 is more



I-5 mainline near the Guide Meridian Road (SR 536) interchange

FUTURE (2035) GROWTH WILL CHOKE THE INTERSTATE

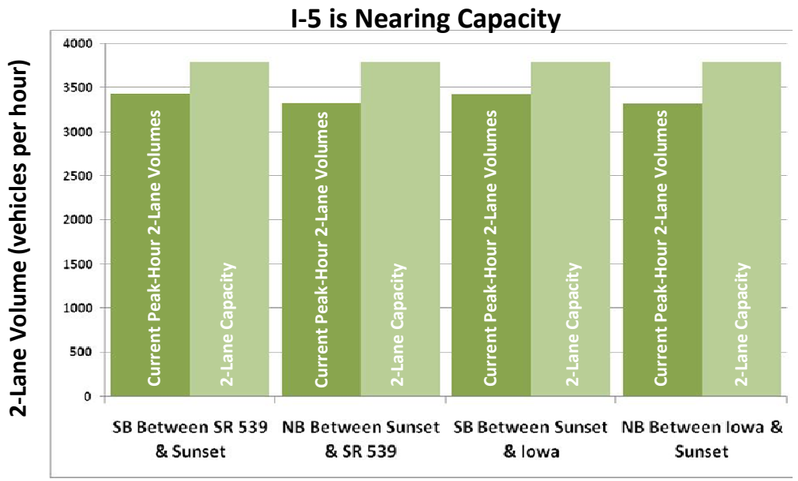


Level of service (LOS) is an estimate of congestion and performance of the transportation system.

I-5 CORRIDOR VOLUME COMPARISONS

Interstate 5 traffic volumes from Fairhaven to Slater are highest in the section between the Iowa Street and Sunset Drive interchanges. On average, this section of I-5 carries approximately 80,000 vehicles per day in four lanes. Traffic volumes for other congested state highways are shown below for comparison purposes:

- Alaska Way Viaduct has 110,000 vehicles per day on 6 lanes
- I-90 across Lake Washington carries 130,000 vehicles per day on six lanes and a reversible two-lane center roadway
- SR 520 bridge across Lake Washington has 115,000 vehicles per day on four lanes
- Tacoma Narrows bridge (SR 16) carried 90,000 vehicles per day on four lanes



Changes in Mainline I-5 PM Peak Congestion Level of Service

	Existing Conditions		2035 No Build	
Interstate Segment	Northbound	Southbound	Northbound	Southbound
Old Fairhaven Pkwy to Samish Way	A/B	C	F	F
Samish Way to Lakeway Dr	C	C	E	E
Lakeway Dr to Iowa/Ohio St	C	C	F	A/B*
Iowa/Ohio St to Sunset Dr	D	D	F	C
Sunset Dr to Guide Meridian Rd	D	D	F	F
Guide Meridian Rd to Northwest Ave	C	C	F	F
Northwest Ave to Bakerview Rd	C	A/B	F	F
Bakerview Rd to Slater Rd	C	C	A/B*	D

* Level of service improves over existing conditions because of upstream bottlenecks.

Changes in Local Street Intersection PM Peak Level of Service

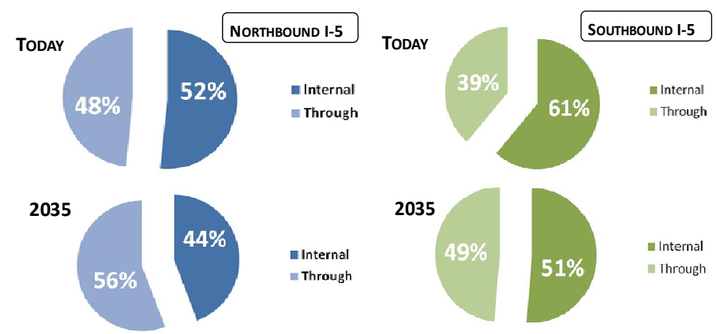
Intersection	Existing Conditions	2035 No Build
Old Fairhaven Pkwy & NB I-5 On/Off-Ramps	F	F
Old Fairhaven Pkwy & SB I-5 On/Off-Ramps	C	F
S Samish Way & 36th St	C	F
S Samish Way & Elwood Ave	C	F
S Samish Way & NB I-5 Off Ramp	E	F
Lincoln St & NB I-5 On Ramp	B	F
Fielding Ave & 36th St	F	F
Lakeway Dr & SB I-5 On/Off-Ramps	C	F
Potter St & King St/NB I-5 On/Off-Ramps	F	F
Iowa St & Moore St	C	F
Ohio St & King St	F	F
Sunset Dr & James St	F	F
Sunset Dr & NB I-5 On/Off-Ramps	C	F
Sunset Dr & Barkley Blvd	E	F
Guide Meridian Rd & Mcleod Rd	B	F
Mcleod Rd & SB I-5 On-Ramp	A	A
Mcleod Rd & SB I-5 Off-Ramp	B	E
Guide Meridian Rd & NB I-5 On/Off-Ramps	E	F
Guide Meridian Rd & Telegraph Rd	F	F
Bellis Fair Rd & NB I-5 Off-Ramp	B	C
Guide Meridian Rd & E Bellis Fair Pkwy	C	F
Guide Meridian Rd & Bakerview Rd	F	F
Guide Meridian Rd & Westerly Rd	F	F
Guide Meridian Rd & Kellogg Rd	B	F
Guide Meridian Rd & Stuart Rd	B	E
Guide Meridian Rd & Horton Rd	B	F
Northwest Ave & NB I-5 Off-Ramp	F	F
Northwest Ave & NB I-5 On-Ramp	F	F
Northwest Ave & SB I-5 Off-Ramp	E	F
Northwest Ave & Mcleod Rd	F	F
Mcleod Rd & SB I-5 On-Ramp	A	A
Bakerview Rd & NB I-5 Off-Ramp	E	F
Bakerview Rd & SB I-5 On-Ramp	B	E
Bakerview Rd & Maplewood Ave	F	F
Slater Rd & NB I-5 On/Off-Ramps	F	F
Slater Rd & SB I-5 On/Off-Ramps	D	F

LOCAL INTERNAL VS. REGIONAL THROUGH TRIPS ON I-5

Today 50 percent or more of trips on I-5 during the PM peak hour are local internal trips traveling less than five miles on I-5. Many of these local trips use I-5 to travel short distances from one interchange to the next. Some of the reasons I-5 is used for short local trips include:

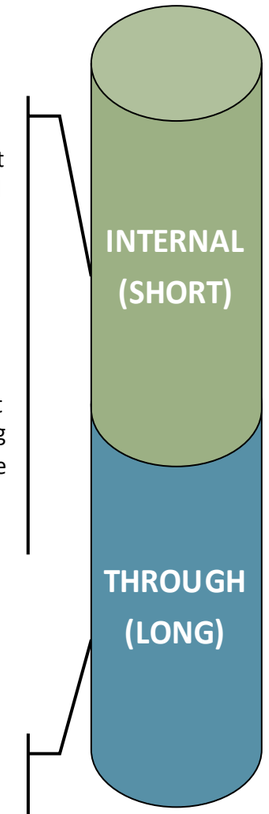
- Existing local streets are congested.
- The interstate is faster and more convenient than local streets.
- Lack of local street connections between local destinations.

As congestion grows on I-5, the number of local trips using I-5 is forecasted to decrease as travel becomes less convenient and travel times increase significantly. Conversely, the proportion of through trips on I-5 are forecasted to increase significantly as these trips are traveling long distances and have fewer alternative routes.



Bakerview Road near the I-5 interchange

Congestion affects how I-5 is used. Future growth will choke the I-5 and make it less attractive for short distance trips.



Internal refers to trips that make use of the interstate for only a short distance. Many of these trips could be served by the local roadway system.

- These trips begin and end in Whatcom County and have more alternative routes
- These trips are more sensitive to transportation management systems such as ramp metering
- These trips are less likely to use managed lanes on the interstate

Through trips make use of the interstate for long distances.

- These trips have few alternative routes.
- These trips are more likely to use managed lanes on the interstate

The type of trip that uses I-5 has implications on the types of interstate management strategies that can be successful in the future.

LOCAL CONNECTIONS FOR NON-MOTORIZED USERS

Addressing the problems facing I-5 today and in the future requires a multi-modal approach to reduce the growth in travel demand on I-5, particularly the increasing demand for local trips as the population in Bellingham grows. The I-5 corridor through Bellingham constrains the ability to make bicycle and pedestrian trips between many parts of the city, particularly between residential areas, areas of employment, and retail shopping.

Currently there are two dedicated non-motorized crossings between the Fairhaven Parkway and Slater Road interchanges on I-5. Those crossings are in close proximity to each other in the section of I-5 north of the Alabama Street overcrossing and south of the Sunset Drive interchange.

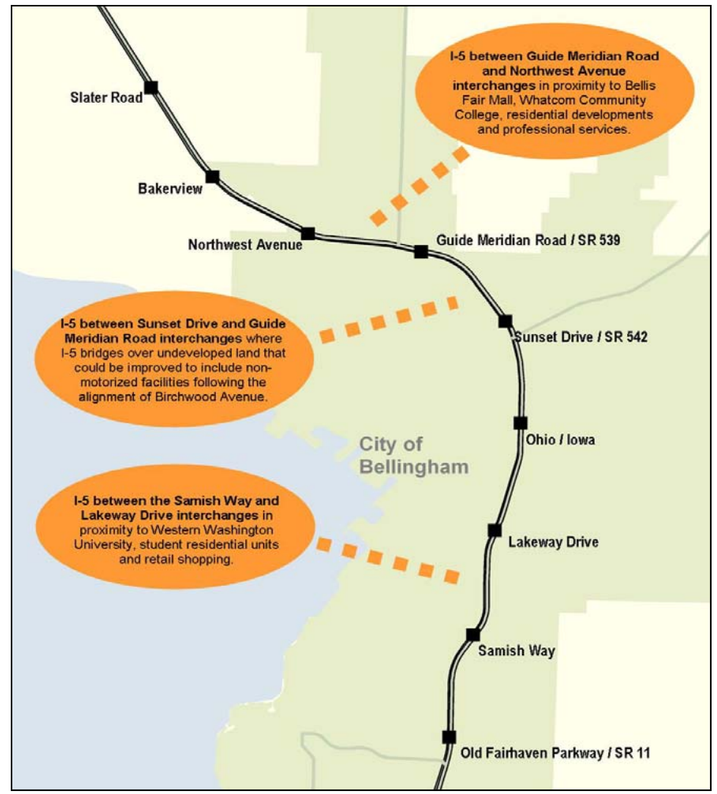
Of the nine interchanges from Fairhaven to Slater Road, six have pedestrian sidewalks for one or both directions of travel. Only one of the nine interchanges has designated bicycle lanes (Samish Way interchange) denoted by pavement markings in a striped bicycle lane. The remaining eight interchanges have shoulders of varying widths that bicyclists use to cross over or under I-5. There are also local arterial streets crossing I-5 at three locations (Meador Street, Kentucky Street and Alabama Street).

I-5 Bridge over Northwest Avenue

Input received from the public as well and from field observations at each of these locations indicates a need to improve non-motorized facilities, particularly those for bicyclists which often have to share narrow shoulders or travel lanes with automobiles and trucks during congested travel periods.

In several sections of the I-5 corridor, where there is an opportunity to attract greater non-motorized mode share, the availability of I-5 crossings is limited to highly congested interchanges that do not provide a safe or direct connection between origin and destination. Those sections of I-5 include the following:

- I-5 between the Samish Way and Lakeway Drive interchanges in proximity to Western Washington University student residential units and retail shopping.
- I-5 between Sunset Drive and Guide Meridian Road interchanges where I-5 bridges over undeveloped land that could be improved to include non-motorized facilities following the alignment of Birchwood Avenue.
- I-5 between Guide Meridian Road and Northwest Avenue interchanges in proximity to Bellis Fair Mall, Whatcom Community College, residential developments, and professional services.



Non-motorized connections crossing I-5 are inadequate in sections of the corridor

I-5 bridge over Squalicum Creek near Birchwood Avenue

AGING BRIDGE STRUCTURES AND PAVEMENTS

Interstate 5 was constructed through Bellingham back to the late 1950's. All but two of the original 21 bridge structures on I-5 between Fairhaven Parkway and Slater Road were built between 1957 and 1962 and are still in use today with the exceptions being the Sunset Drive bridge (replaced in 1996) and the Samish Way bridge (replaced in 2000). Additional bridge structures were built at Slater Road (1972), Bakerview Road (1975) and at Bellis Fair Parkway (1988).

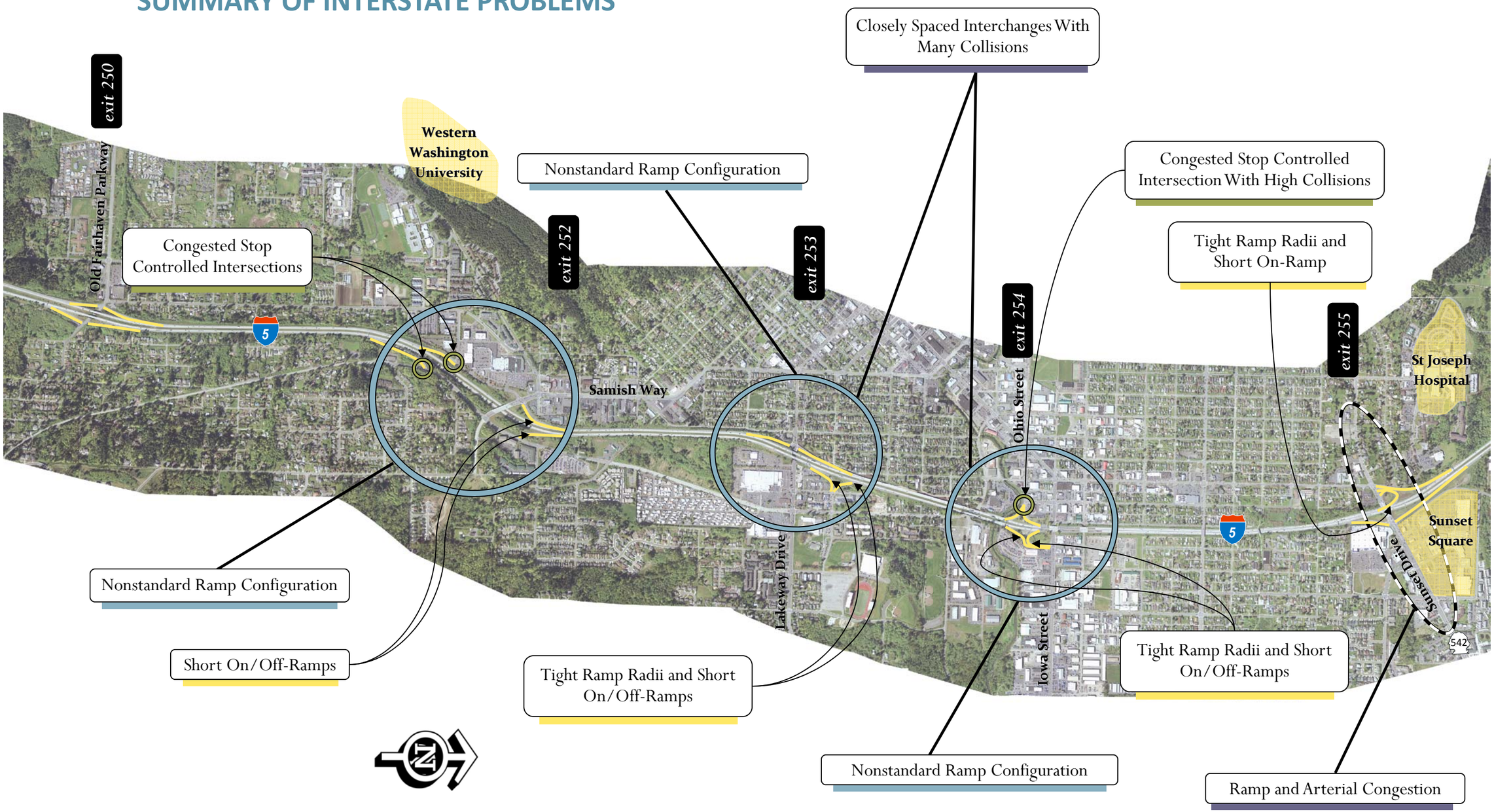
All of the bridges along the I-5 corridor in Bellingham are structurally sound and safe. Washington State has a meticulous inspection system which rates the primary components of bridges. The age and design of most of the oldest bridge structures makes it economically infeasible to modify most of the older bridges to accommodate widening of I-5 for ramp or lane improvements, or to accommodate wider arterial streets crossing I-5.

I-5 Bridge over Lakeway Drive

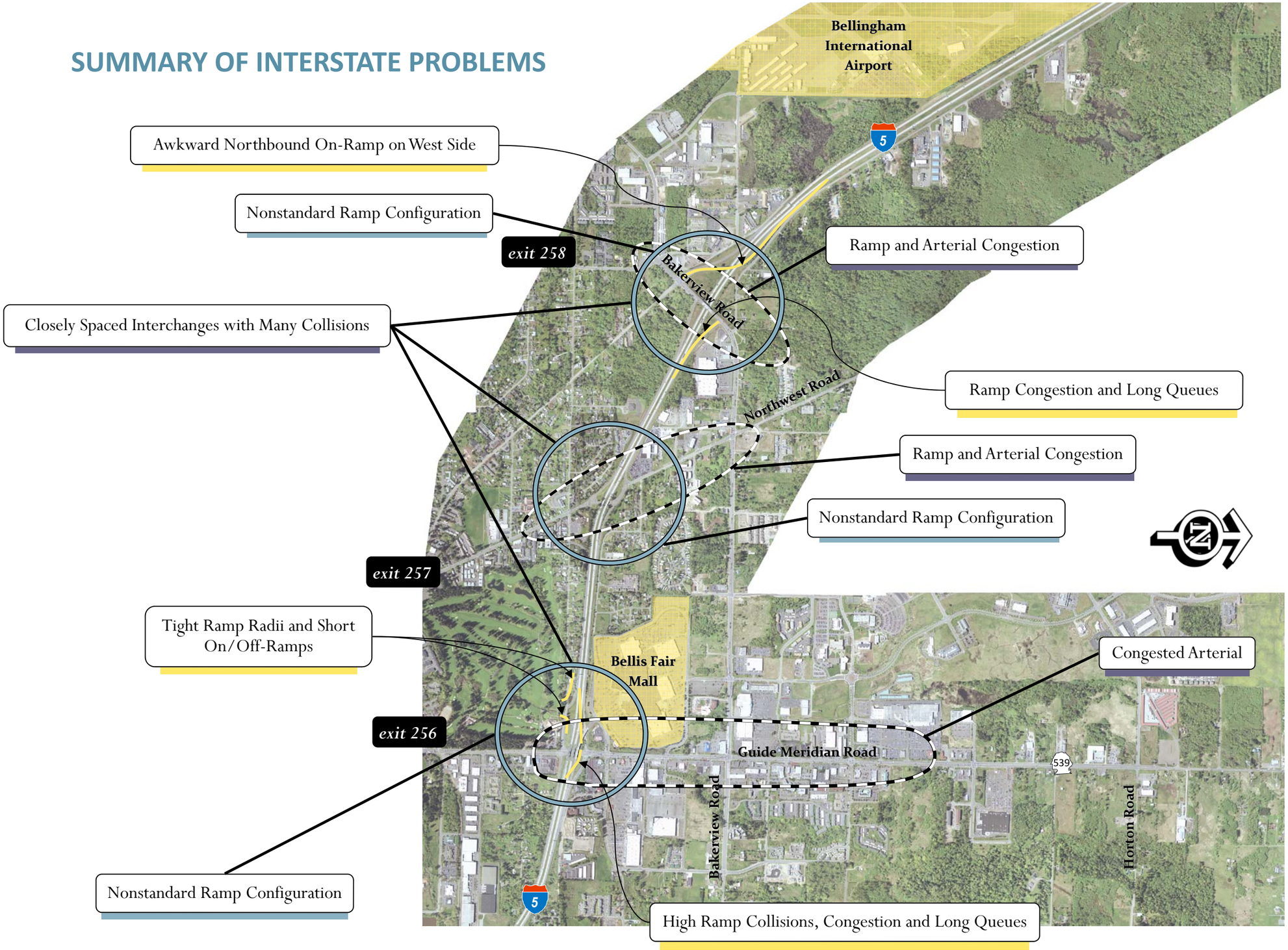
I-5 pavement through Bellingham also dates back to the late 1950's and early 1960's. Through the years sections of pavement have been repaired or replaced on the mainline lanes and the interchange ramps. Many more sections of pavement need repair or replacement. Replacement and repair of state highway pavements, including I-5 through Bellingham, is prioritized regionally and statewide to ensure pavements remain safe for travel and that their useful life is optimized in order to make the best use of limited funds.

Examples of recent I-5 pavement problems in Bellingham

SUMMARY OF INTERSTATE PROBLEMS



SUMMARY OF INTERSTATE PROBLEMS



CHAPTER 4 - EVALUATION OF POTENTIAL INTERSTATE IMPROVEMENTS

The master plan provides a set of recommendations that will guide future investment in I-5. To determine which set of improvements should be recommended as the most effective strategy, WSDOT examined the problems identified in Chapter 3 and generated a list of improvement strategies that would resolve geometric deficiencies, improve safety, and relieve traffic congestion. Sixteen types of interstate improvements were analyzed (shown above) and evaluated based on their effectiveness, benefits to the transportation system, and the ability to meet project goals. The results of the evaluation are described in this chapter and were used to develop the final recommendations shown in Chapter five.

The criteria used to evaluate potential improvements are listed in the graphic on the right. They were developed based upon FHWA and WSDOT standards and policies for interstate roadways and from local policies and public input. The criteria reflect statewide transportation policies that mandate the preservation of prior investments, improved safety, increased mobility, protecting the environment and good stewardship of our existing transportation system.

The evaluation identified several criteria that were considered mandatory. Improvements must satisfy mandatory criteria in order to be included in the final set of recommendations. Improving safety was one of those mandatory criteria. Improvements also had to be effective in moving more vehicles through the corridor (improving throughput) and had to provide a safer environment for bicycles and pedestrians that cross the interstate at interchanges. Remaining criteria were used to evaluate the comparative benefits of the potential improvement strategies.

A description of each improvement strategy, and the results of our evaluation, are provided in the following sections of this chapter.

SETTING PARAMETERS FOR OUR EVALUATION

The master plan identifies existing and future problems on I-5 and evaluates numerous improvement strategies to address them. The analysis is based on the best technical information available at this time, as well as feedback received from community members and local agencies. The result is the following set of assumptions that guided the evaluation of improvements:

Traffic volumes on the interstate and local street system will continue to grow. The evaluation of improvements is based upon existing conditions and future conditions that are forecasted to exist in 2035. The forecasts, developed by the Whatcom Council of Governments, is based on land use policies and zoning adopted by local governments which indicate that traffic volumes will increase by 2035.

Future improvements must meet interstate design standards. These standards, which are applied uniformly to interstate highways to improve safety and operational efficiency, include the accommodation of freight vehicles as well as geometric standards for high speed travel and a minimum spacing of one mile between interchanges.

Transit ridership will increase significantly. The analysis assumes increases in the use of alternate modes, consistent with the city of Bellingham's comprehensive plan. The city's plan identifies goals for increasing the use of alternate modes and decreasing the percentage travelers using single-occupancy vehicles by 2022.

Only those improvements to I-5 and to local streets that have secured funding as of 2008 are assumed to be completed in the future conditions analysis. WSDOT will revisit the plan and update the analysis appropriately as new transportation improvements that influence traffic on I-5 are funded and constructed.

WSDOT recognizes that actual conditions may differ from those that are predictd now, even though the predictions are based on the best available information. Whatcom County's transportation needs may change over time depending on population growth, travel patterns, new technologies and local street improvements. Increases in fuel prices, modifications in travel preferences, or amendments to local land use policy are just a few of the changes that could result in significantly different traffic volumes in 2035. Different traffic volumes could suggest a different set of needs for I-5. WSDOT will revisit the plan periodically to respond to these changes and modify the list of improvements accordingly.

LIST OF IMPROVEMENTS CONSIDERED FOR I-5

- Eliminate or close interchanges
- Close deficient ramps
- Add C/D roadway
- Add weave lanes
- Braid high volume ramps
- Rebuild existing interchanges
- Build a new interchange in a new location
- Improve ramps to fix geometric deficiencies
- Add two (2) general purpose lanes in each direction
- Add managed lanes (HOV, Toll, Freight or other uses)
- Improve local street connections
- Provide ramp intersection improvements
- Ramp metering
- Active traffic management
- Increase transit service
- Implement transportation demand management

Evaluation Criteria

SAFETY
- **Address the highest collision locations in the corridor.***
- **Reduce ramp or mainline collisions.***
- **Provide a safer environment for bicycles &pedestrians.***

DESIGN
- Address geometric problems
- No deviations from design standards.

OPERATIONS
- **Improve interstate throughput.***
- Maintain average mainline speed at 70 percent of posted speed.
- Improve ramp terminal operations and level of service.
- Do not degrade local street operations.

MOBILITY
- Provide future transit or HOV opportunities.
- Provide interstate management opportunities (Ramp metering).
- Improve non-motorized access across the interstate.

ACCESSIBILITY
- Maintain the same number of access points to the interstate.
- Maintain the location of the access points.

ENVIRONMENT
- Minimal impact on the natural environment.
- Minimal impact on the built environment.
- Minimal or no right-of-way required.
- Avoid sensitive and critical areas.
- Preserve existing parks and section 4(f) resources.

COST EFFECTIVENESS
- Improvement has a positive benefit/cost ratio (>1.0).

*** Bold indicates mandatory criteria that must be met in order for an improvement to be included as a final recommendation.**

The improvements considered for the I-5 corridor included a range of multimodal options, roadway improvements and operational strategies. This section discusses the type and range of improvements considered for I-5 and summarizes the results of the evaluation.

ELIMINATE INTERCHANGE(S)

Eliminating existing interchanges in order to address the problem of spacing between interchanges, although cost effective, would not meet the mandatory criteria for safety and throughput. Although removal of the interchanges at high collision locations addresses the highest collision locations, it would not improve overall safety on I-5. Removal of existing interchanges would cause overcrowding of other interchanges increasing congestion on other ramps. Studies have shown that collisions will increase with increased congestion. Eliminating interchanges will increase the intensity of the ramp queuing and spill back at other ramp terminals which must absorb displaced volume from closed interchanges. The resulting higher volumes at other ramps will increase congestion and degrade mainline throughput.

CLOSE DEFICIENT RAMPS

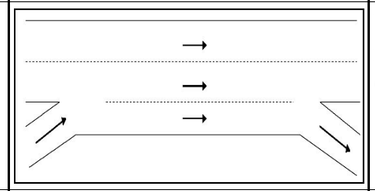
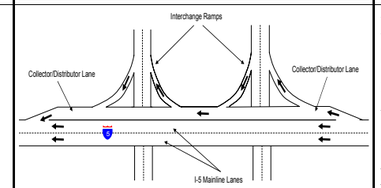
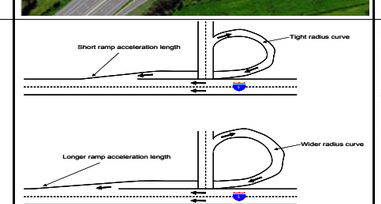
Closing existing deficient ramps would have positive and negative effects. Assuming that ramps would be closed where geometric deficiencies are the worst, this would include ramps at the following interchanges:

- Samish Way
- Lakeway Drive
- Ohio/Iowa Street
- Sunset Drive
- Guide Meridian Road

Closing deficient ramps could improve safety at one interchange but degrade safety at other adjacent interchanges. Closure at one location would overload other ramps and would increase the congestion on the mainline and other interchanges at other locations. If the closure is an off-ramp (as opposed to an on-ramp), this would increase backups on already congested ramps reducing throughput and degrading safety. Closing deficient on-ramps at one location (for example the southbound on-ramp at the Guide Meridian Road) would have positive benefits at the Guide Meridian Road but would increase demand at the Sunset Drive, Northwest Avenue and Bakerview Road interchanges.

ADD COLLECTOR DISTRIBUTOR LANES

Adding collector distributor (C/D) lanes would improve safety and reduce mainline and ramp collisions at the highest collision locations. C/D lanes could also provide connections to closely spaced interchanges while satisfying the one mile spacing requirement. By separating weaving and merging from the

Interstate Improvement	What They Look Like	How They Work	Benefits
Managed Lanes		Provides space for higher capacity transit modes, HOV lanes, transit lane, toll lanes, freight only lanes or passenger rail.	Moves people, vehicles and freight more efficiently. Provides flexibility to adapt to changing transportation modes.
Weave Lanes		Provides a dedicated lane for merging onto the interstate from the on-ramp to the next off-ramp.	Improves safety and relieves congestion at the entry and exits to the interstate. Reduces vehicle conflicts between high volume on- and off-ramps.
Collector Distributor (C/D)		Dedicated lanes that operate at lower speeds for traffic exiting and entering I-5 where merging and weave take place. C/D lanes are separated from the mainline but run parallel to the mainline.	Improves safety, relieves congestion, and reduces vehicle conflicts. Separates local traffic from traffic traveling through the corridor.
Single Point Urban Interchange (SPUI)		Interchange on- and off-ramps form one intersection where vehicles turn left or right onto the local arterial.	Improves safety and reduces vehicle conflicts. Increases the efficiency and capacity of the interchange to handle high volumes of traffic. Reduces dangerous backups onto I-5.
Lengthen On-Ramps & Widen Ramp Curves		Provides more distance for accelerating onto I-5. Allows vehicles to merge onto I-5 at the designed speed.	Improves safety and reduces collisions at the on- and off-ramps. Lessens the impact of vehicles merging onto or off the interstate.
Improved Ramp Intersections		Upgrades ramp intersections with improved channelization, signage and traffic control such as signals and roundabouts.	Improves safety and relieves congestion. Reduces dangerous backups onto I-5. Provides improved safety for pedestrians and bicyclists.

mainline, C/D lanes would improve throughput on I-5. New C/D roadways may cross sensitive areas such as streams and wetlands. It is likely that the C/D roadways may impact the built and natural environment.

ADD WEAVE LANES

Weave lanes between interchanges would reduce collisions on I-5 by providing an additional lane for merging, weaving and storage. They would also increase I-5 throughput. It is likely that weave lanes may impact the built and natural environment. Impacts may include noise, sensitive areas (stream crossings) and increased impervious surfaces. Weave lanes would address some of the worst geometric deficiencies by providing increased acceleration and deceleration at on and off-ramps. Weave lanes would not address interchange spacing and configuration problems. It is more likely that weave lanes could be implemented in stages with immediate benefits.

BRAID HIGH VOLUME RAMPS

"Braided" ramps are elevated on– and off-ramps that separate traffic entering and exiting I-5 from mainline traffic. Braided high volume ramps would reduce collisions on the I-5 mainline and could potentially improve throughput by eliminating weaving movements. However, it would not eliminate back ups on off-ramps, but could provide more ramp storage, minimizing backups onto the I-5 mainline. Braided ramps would also provide opportunities for ramp metering and other operations management of I-5. It is likely that braided ramps would increase noise, affect sensitive areas (stream crossings) and increase impervious surfaces.

REBUILD EXISTING INTERCHANGES

Geometric deficiencies on I-5 could be addressed by fixing ramp deficiencies (short ramps and tight curves) and interchange spacing without rebuilding interchanges. The need to rebuild interchanges is driven by operational difficulties at the ramp intersections (long queues on off-ramps and local street congestion). These conditions occur at seven of the nine interchanges in Bellingham beginning with the Samish Way interchange to the Bakerview Road interchange and all the interchanges in between. Rebuilding existing interchanges would improve I-5 mainline throughput by increasing the capacity of the existing interchanges and reducing backups on the off-ramps. It is likely that rebuilding interchanges would have impacts on the built and natural environment. Rebuilding interchanges would provide opportunities for ramp management (ramp metering) and high occupancy vehicle/managed lane access and for a safer bicycle and pedestrian environment in the interchange area.

ADD NEW INTERCHANGES IN A NEW LOCATION

Adding new interchanges in a new location would potentially have positive and negative effects. Depending upon the selected location, it could reduce volume and congestion at other interchanges and therefore improve safety. However, a

Interstate Improvement	What They Look Like	How They Work	Benefits
Improve Pedestrian and Bicycle Facilities		Improvements to the local street intersections will include sidewalks, crosswalks and push buttons for pedestrians, and bike lanes where needed. New bike and pedestrian over crossings could be built where local plans identify the need.	Improves safety for non-motorized travel and pedestrians. Encourages walking and alternative modes of transportation. Reduces conflicts between bicycles and vehicles.
Add Lanes Crossing I-5		Add vehicular and/or bike lanes to streets that cross I-5.	Improves safety and relieves congestion. Allows vehicles that are not destined to I-5 to cross from one side of I-5 to the other.
Variable Speed Limits		Electronic speed limit signs enable WSDOT to manage the speed of traffic on I-5 during congested periods and when incidents occur that create unsafe conditions such as bad weather and collisions.	Slows traffic when needed to improve safety.
Advanced Traveler Information		Electronic variable message signs provide important information to travelers on I-5.	Improves safety by informing motorists of incidents and unsafe conditions. Enables travelers to use alternate routes to avoid incidents and delays.
Ramp Metering		Signalized on-ramps manage the flow rate onto I-5 during congested periods.	Optimizes traffic flow on I-5 and prevents or prolongs breakdown of the mainline. Maintains a higher throughput on the interstate.

new interchange would introduce new ramp connections to the interstate which could increase collisions and degrade safety. A new interchange is not likely to increase throughput on I-5 but would provide additional opportunities for transit/HOV access and a safer bicycle and pedestrian environment. A fundamental problem with this type of improvement is that there is no space in the corridor for a new interchange unless an existing interchange is removed or relocated.

IMPROVE RAMPS TO FIX GEOMETRIC DEFICIENCIES

Lengthening existing ramps at high collision locations would reduce collisions, improve safety and address some of the existing geometric deficiencies in the corridor. Most of the low cost ramp improvements have been made. Additional ramp improvements are likely to be more costly and involve greater impacts to the natural and built environment (depending upon location). These improvements would not appreciably increase mainline throughput and would not address congestion problems on the local streets or fix the interchange spacing.

ADD TWO GENERAL PURPOSE LANES IN EACH DIRECTION

Our traffic modeling analysis has shown that the addition of two general purpose (GP) lanes (each direction) on the interstate will draw more local traffic off the local street system. Without improvements to the interchanges, adding GP lanes would increase collisions and degrade safety on the interchange ramps as more trips try to utilize I-5. Although additional GP lanes will increase throughput, they will not eliminate congestion on the ramps or at the interchanges. Additional lanes will only increase congestion and backups on the interchange ramps unless significant capacity improvements are also made to the interchanges in the corridor. Likewise, without improvements to the interchanges, widening of I-5 to eight GP lanes could exacerbate existing geometric deficiencies on the ramps (i.e., tight ramp radii would be further tightened). Widening the interstate to eight GP lanes would require substantial right of way, with likely impacts to the natural and built environment.

ADD A MANAGED LANE IN EACH DIRECTION

A managed lane in each direction of travel could be operated as a high-occupancy vehicle (HOV) lane, high-occupancy toll (HOT) lane, a freight-only lane or for other high efficiency modes such as passenger rail. In order to provide incentive for use of the managed lane there must be some congestion on the mainline GP lanes. Our analysis has shown that travel demand management measures to increase HOV use by carpools, vanpools and transit would reduce demand on the GP lanes but would not eliminate congestion on the I-5 mainline and ramps. Decreased volumes and demand on the mainline and ramps would improve safety. The addition of managed lanes would also increase mainline throughput. Adding managed lanes to I-5 would require widening with likely impacts to the natural and built environment.

IMPROVE LOCAL STREET CONNECTIONS

Improving local street connections has many positive benefits to I-5. The local street improvements evaluated in the analysis reduced demand on I-5 between Sunset Drive and the Guide Meridian Road interchanges, and reduced demand at several other interchange ramps. The reduction in demand on I-5 was not high enough to eliminate congestion on the mainline or the interchange ramps. However, when combined with other I-5 improvements, better local street connections could enhance or reduce the intensity of other needed improvements to I-5. Further analysis is needed to determine what combinations of local street improvements yield the greatest benefits.

With improved local street connections, the 2035 volume on arterial streets connecting to existing interchanges was reduced at the following interchanges:

- Bakerview Road
- Guide Meridian Road
- Sunset Drive
- Iowa Street
- Lakeway Drive
- Samish Way

Our traffic modeling results demonstrated that local street improvements would reduce collisions and improve safety on I-5 by reducing demand and congestion on interchange ramps and ramp intersections. It is unlikely that local street improvements alone (without other improvements to I-5) would improve vehicular throughput on I-5. At worst, local street improvements would have a neutral (no degradation) impact on I-5 vehicle throughput.

Additional analysis is needed to isolate the individual benefits of each street improvement. Preliminary analysis indicates that the extension of James Street north across I-5 and improved local street connections around the Guide Meridian Road and Sunset Drive interchanges had the most significant benefits. Improved local street connections provide significant opportunities to improve the bicycle and pedestrian modal network and to increase transit and HOV connections.

PROVIDE RAMP INTERSECTION IMPROVEMENTS

Ramp intersection improvements could include lane channelization, signal timing improvements and access control. These improvements were tested at the Guide Meridian Road northbound off-ramp and included the following:

- Restrict northbound left turns at the Guide Meridian Road/Telegraph Road intersection.
- Re-allocate more green time to the northbound off-ramp and adjust the signal timing on Guide Meridian Road intersections.

Ramp intersection improvements

Traffic routinely backed up the southbound I-5 off-ramp to Old Fairhaven Parkway *(left)*. In May 2007, WSDOT widened the off-ramp to add a new left turn to Old Fairhaven Parkway and installed a new signal. WSDOT also built a new right turn from Old Fairhaven Parkway to the southbound I-5 on-ramp *(right)*. These improvements should reduce collisions and improve safety.

- Close all access to the east leg of the Guide Meridian Road/Telegraph Road intersection.

Restricting northbound left turns at the Guide Meridian Road/Telegraph Road intersection and adjusting the signal timing on the Guide Meridian Road would reduce delays and queuing on the northbound off-ramp but would not eliminate backups and congestion on mainline I-5 in 2035. The analysis showed that these improvements reduced but did not eliminate backups on the northbound off-ramps that extend onto I-5. However, closure of the east leg of the Guide Meridian Road/Telegraph Road intersection, together with the elimination of the northbound left turn, would eliminate queuing and backups on the northbound off-ramp. These changes would eliminate the northbound weave, and right turn movement from the Guide Meridian Road onto Telegraph Road. Elimination of this movement allows off-ramp traffic from the interstate to exit on to Guide Meridian Road as an add lane (northbound on the Guide Meridian Road) without conflicts. In addition, green time from the split phase on Telegraph Road can be allocated to the northbound movement on the Guide Meridian Road. The end result is significantly higher capacity at the northbound off-ramp terminal intersection.

By eliminating the queuing and backups on the northbound off-ramp to the Guide Meridian Road, safety on the off-ramp and mainline is significantly improved and collisions would be reduced. Because backups from the northbound off-ramp create a key bottleneck on the I-5 mainline, elimination of those backups will increase I-5 mainline throughput. This improvement would not eliminate congestion on I-5 at other locations and would not reduce congestion at other interchanges. Nor would this improvement address ramp and mainline geometric deficiencies.

RAMP METERING

Ramp metering the on-ramps can be an effective way to manage I-5 congestion and improve safety during periods of peak travel demand. Ramp metering of 2035 PM peak volumes on I-5 was tested using the CORSIM no-build model. The CORSIM no-build model assumes no improvements are made to the interstate in 2035 other than those currently funded. The modeling of ramp meters on all the on-ramps from Fairhaven to Slater, with a maximum meter rate of 600 vehicles per hour, demonstrated that congestion on the I-5 mainline could be eliminated with ramp meters. With 50 percent of trips on I-5 originating as local trips in 2035, ramp metering had the effect of significantly reducing the volume of traffic entering I-5 from the local street system. Ramp metering not only reduced the volume at the entry points (on-ramps) to I-5 but also significantly reduced the volume at the exit points (off-ramps). The reduction of volume on I-5 would reduce collisions and improve safety on I-5. Ramp metering could also provide opportunities for transit and HOV bypass lanes on the on-ramps.

However, ramp metering would degrade safety on the local street system unless sufficient ramp meter storage is provided on the ramps. The effects of this improvement without adding additional ramp storage included significant queuing and spill back of traffic onto the local street system and diversion of trips to other routes and corridors. The increased spill back and congestion on the local streets would impact the bicycle and pedestrian environment.

A significant problem with this improvement is the lack of available storage space on existing ramps. Given the existing substandard on-ramp acceleration length at many of the interchanges, it is doubtful that ramp metering could be installed on those ramps without a significant rebuild and lengthening of the on-ramp. The improvements to the existing ramps to accommodate ramp meters may effect the natural and built environment.

ACTIVE TRAFFIC MANAGEMENT

Active traffic management represents a wide range of technologies and strategies that may be used to optimize traffic operations during periods of peak travel demand or when incidents and events occur that affect traffic operations and safety. Active traffic management can be a highly cost effective strategy to improve the efficiency and safety of I-5. Active traffic management could include lane use control signs, variable message signs, variable speed limits, incident management, adaptive ramp metering, adaptive signal systems, and other emerging ITS (intelligent transportation system) technologies. These technologies could be used to improve the efficiency of I-5 and provide travelers with real time information about conditions, congestion, and incidents so they can make better decisions about how and when to use I-5 and when to use alternate routes or other modes of travel.

Active traffic management features could improve safety and reduce collisions with better management of the I-5 ramps and mainline. Variable speed limits would lower speeds when congestion and incidents occur and increase speed when conditions allow. Throughput is increased by improving I-5 efficiency and managing traffic on and off I-5. The analysis indicates that active traffic management would be most effective when combined with other improvements.

Because active traffic management could potentially divert traffic to local streets, especially when there are incidents on I-5, it could impact the local street system. Active traffic management would not address existing geometric deficiencies.

INCREASE TRANSIT SERVICE

Improvements to I-5 that would enable an increase in transit service and an increase in transit ridership were evaluated. The evaluation looked at an additional transit/HOV lane on I-5 in each direction, and assumed that additional transit service would exist in 2035 with a significant shift in the number of work trips using transit. Based upon the analysis, significant increases in transit services and ridership would reduce demand on I-5, improving safety and reducing collisions. However, these improvements would not eliminate congestion on the I-5 ramps and mainline. Improved transit usage would increase person throughput on I-5 if transit utilizes the transit/HOV lanes. Adding an additional transit/HOV lane to I-5 would require widening that could impact the natural and built environment.

IMPLEMENT TRANSPORTATION DEMAND MANAGEMENT MEASURES (TDM)

Transportation demand management promotes a variety of strategies for commute options including the use of carpools, vanpools, buses, bicycling, walking, compressed work hours, or working from home. Using strategies that increase the carrying capacity of the transportation system, such as enabling greater use of HOV, shifting trips out of rush hours, and eliminating the need for the trip altogether, helps us get the most out of our transportation investments. In the I-5 corridor from Fairhaven to Slater, our analysis indicates that TDM strategies would reduce demand on I-5 but would not eliminate congestion and queuing on the I-5 mainline and ramps. However, even small reductions in demand would result in positive safety benefits to I-5. TDM measures would have a positive impact on the built and natural environment and would provide opportunities to increase transit service.

SUMMARY

The project team utilized technical analysis and feedback from the public to evaluate numerous improvement strategies for I-5. The team found that each strategy resolved I-5 problems in a different way, producing benefits but also generating potential impacts on the natural and built environment. The evaluation criteria allowed the team to compare and contrast the improvements, and determine a final set of recommendations to guide future investment on I-5. The recommendations are described in detail in Chapter five.

CHAPTER 5 - RECOMMENDATIONS

The proposed plan, if implemented, would maintain, preserve, and extend the life and utility of prior investments made in the I-5 corridor statewide and in Whatcom County. Regional and local freight and passenger mobility through Whatcom County will be significantly impaired without additional investments. These investments are necessary to improve safety, preserve the economic vitality of the region, and provide for the safe and predictable movement of goods and people through the I-5 corridor. The benefits of these investments flow to local and regional users of the interstate system.

The proposed plan would facilitate freight movement in the corridor and support economic opportunities both north and south of the U.S./Canada border that rely on the I-5 corridor for the movement of goods and people. Statewide environmental objectives are furthered by enhancing the quality of life for residents in Whatcom County and those traveling through the I-5 corridor. Air quality is improved and auto emissions are reduced when vehicles travel at constant speeds on I-5 rather than the stop and go conditions that are projected in 2035. The recommendations for the I-5 corridor include improvements that address deficiencies on I-5 and on the connecting local roadways.

RECOMMENDED I-5 IMPROVEMENTS

- **Implement a C/D system that would connect existing closely spaced interchanges to I-5.**
- **Implement weave lanes to ease weaving and merging.**
- **Rebuild interchanges and lengthen ramps to meet current interstate safety and operational standards.**
- **Provide ramp improvements to ease congestion at local roadways.**
- **Preserve space (one lane in each direction) in the median of I-5 for future transit, carpool, freight, toll lanes or other high efficiency use, to provide flexibility for future regional transportation improvements.**
- **Maintain and preserve the long term health of I-5 infrastructure in the corridor.**
- **Implement active traffic management improvements to better manage congestion and roadway incidents.**

Estimated cost in Year 2008	Estimated cost in Year 2025	Estimated cost in Year 2035
$1.3—$1.6 Billion	$2.1—$2.5 Billion	$2.8—$3.4 Billion

RECOMMENDATION #1 - MAKE I-5 IMPROVEMENTS

Improvements are needed on I-5 to address geometric deficiencies, improve safety, relieve congestion, and provide for the efficient management of I-5 for all users and modes of travel. The following improvements are recommended. Also, see pages 5-7 through 5-9 for graphical display of the recommended I-5 improvements.

Collector Distributor (C/D) Roadway System

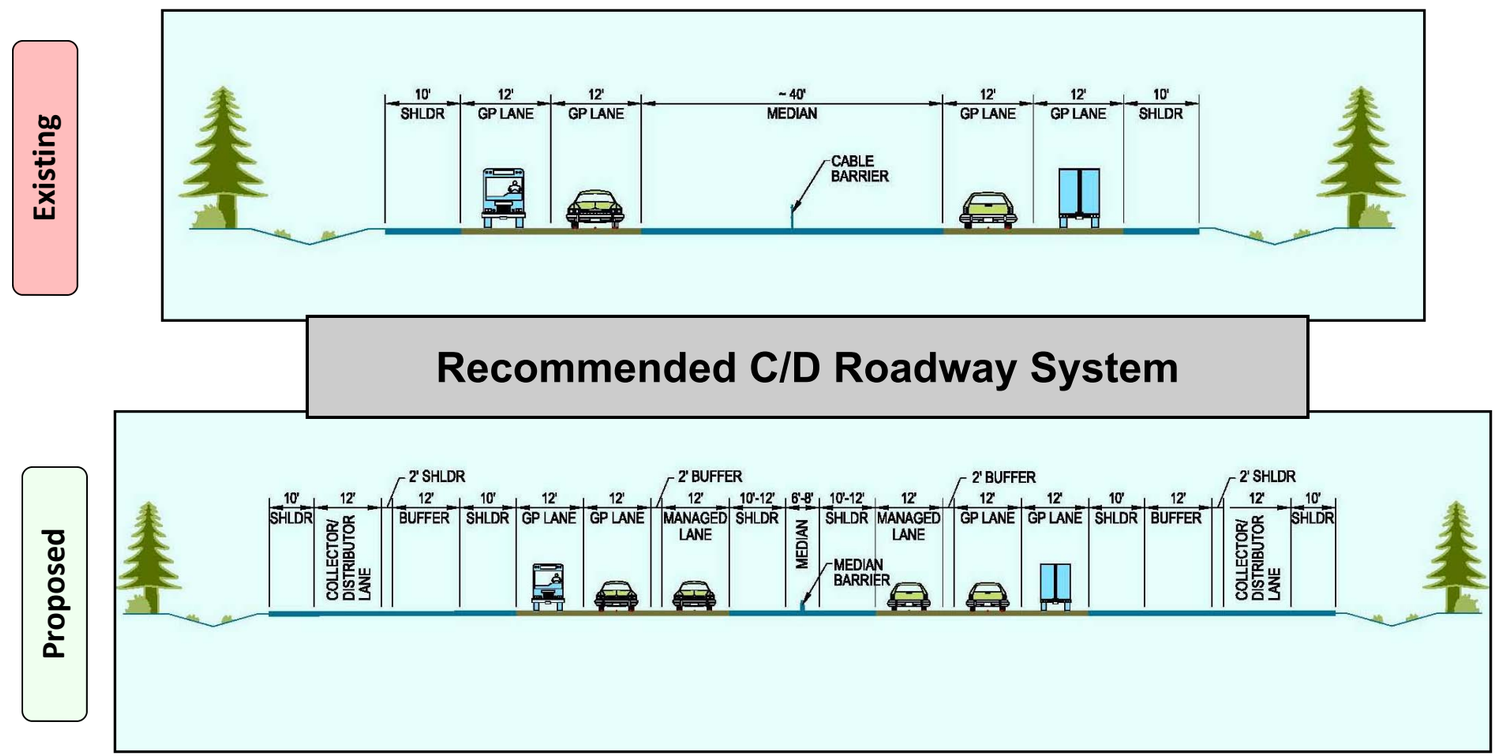
A C/D system is recommended to connect the closely spaced Samish Way, Lakeway Drive and Iowa Street interchanges as one "system" with the middle interchange (Lakeway Drive) connected only to the C/D lanes. The Samish Way and Iowa Street interchange ramps would need to be connected directly to the mainline in order to avoid overloading the C/D lanes. A similar C/D system is recommended to connect the closely spaced interchanges at the Guide Meridian Road, Northwest Avenue and Bakerview Road. Implementation of the C/D system would require rebuilding all six interchanges. A primary benefit of the C/D system is improved safety and better management of local trips by restricting the access between adjacent interchanges (for example, no access for local trips between the Lakeway Drive and Iowa Street, or Lakeway Drive and Samish Way interchanges).

Weave Lanes

Weave lanes are recommended between the Iowa Street and Sunset Drive interchanges, between the Sunset Drive and Guide Meridian interchanges and between the Bakerview Road and Slater Road interchanges. The weave lanes improve safety on the I-5 mainline and are needed to handle the high volumes of traffic entering and exiting I-5 between these interchanges.

Rebuild Interchanges

Rebuilding existing interchanges would fix geometric deficiencies and increase the capacity and efficiency of the interchanges to address the forecasted backups onto the interstate. Based upon the projected 2035 forecasts, the existing



diamond type ramps and interchanges do not have sufficient capacity to handle the 2035 forecasted volume. Single Point Urban Interchanges (SPUI) are recommended to improve the capacity and efficiency of existing interchanges. A SPUI interchange would have the same or smaller footprint as a diamond interchange. By rebuilding existing interchanges, existing ramp and interchange deficiencies would be addressed.

New SPUI interchanges are recommended at the following locations:

- Samish Way
- Lakeway Drive
- Iowa Street
- Sunset Drive
- Guide Meridian Road
- Bakerview Road

The Northwest Avenue interchange could be rebuilt as either a single point urban interchange or a diamond type interchange with roundabouts or signals at the ramp terminals.

Ramp Improvements

Implement ramp and ramp intersection improvements where existing interchanges are not rebuilt. This would include improvements at the Old Fairhaven Parkway and Slater Road interchange ramps. Improvements would include lengthening the ramps to fix existing acceleration and deceleration deficiencies, and improving the traffic control, signal timing and channelization at the ramp terminal intersections with new signals or roundabouts.

Managed Lanes

Preserve the right-of-way to create space in the median of I-5 for future managed lanes (one lane in each direction) and to provide flexibility to accommodate future bus and high capacity transit improvements. Where new permanent structures, overpasses and interchanges are built, they should be built so as to accommodate and not preclude future managed lanes. Future managed lanes could include HOV/transit, HOT lanes, freight, bus rapid transit or other high capacity transportation improvements such as passenger rail. As local agencies such as Whatcom Transit Authority, WCOG, the City of Bellingham and Whatcom County refine their regional plans for future transit improvements, additional details can be added to the plan to accommodate the needs for direct access ramps to support regional facilities such as transit centers and park-and-rides, once the location of these facilities have been identified. The location of direct access ramps, HOV lane access and other transit improvements should be done as part of ongoing regional efforts focused on addressing long term regional transportation needs for Whatcom County.

Active Traffic Management

Implement active traffic management improvements to increase efficiency and provide better management of I-5 for local trips and regional through trips. Active traffic management would include lane use control signs, variable message signs, variable speed limits, more incident management resources, adaptive ramp metering, adaptive signal systems and other emerging ITS technologies.

SAFETY BENEFITS OF I-5 IMPROVEMENTS

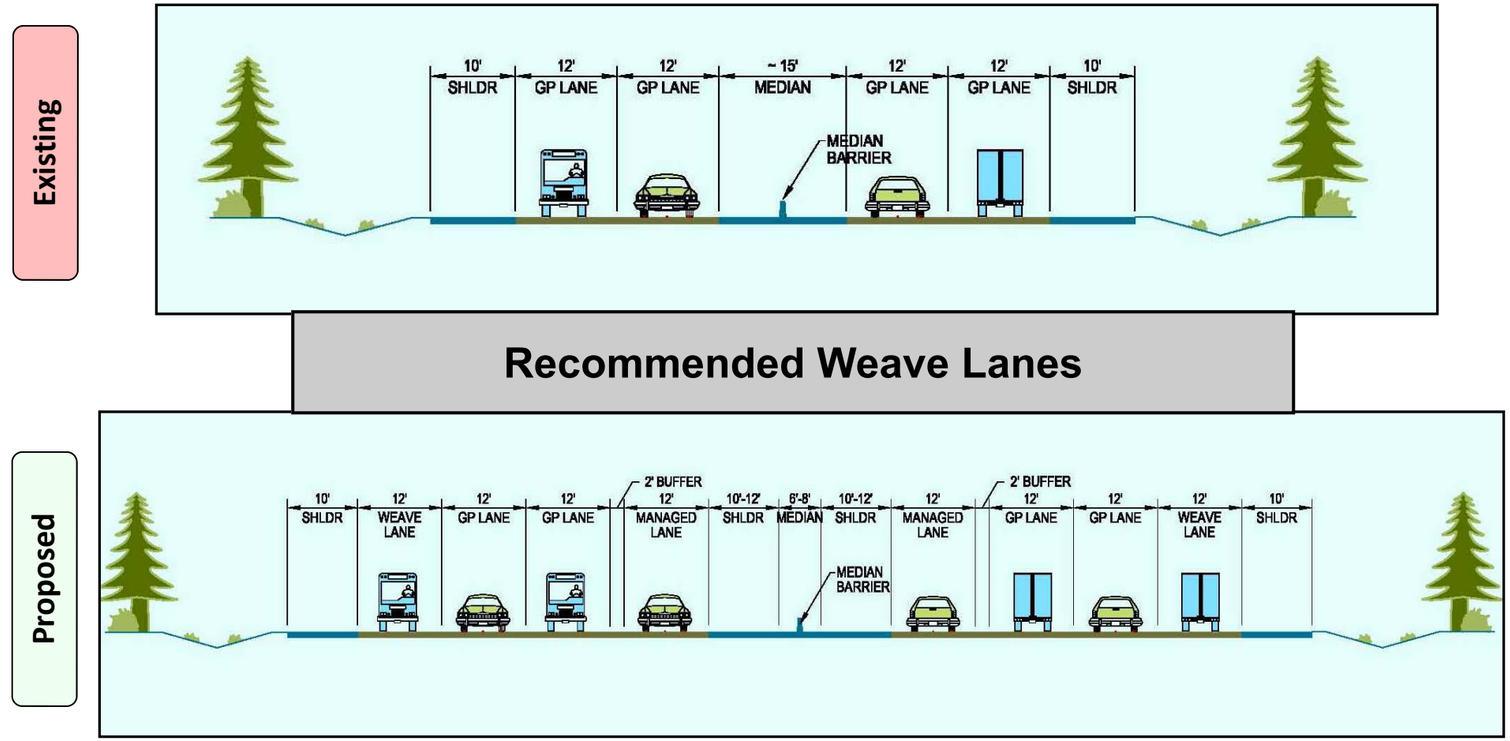
A primary benefit of the recommended I-5 improvements is enhanced highway safety for all roadway users. Interstate highways are high speed, access controlled facilities, with stringent design standards. When collisions occur on these high speed facilities the result may be injuries, property damage and economic loss, and in the worst cases; serious injuries and fatalities.

Contributing factors for collisions on I-5 in Bellingham include:

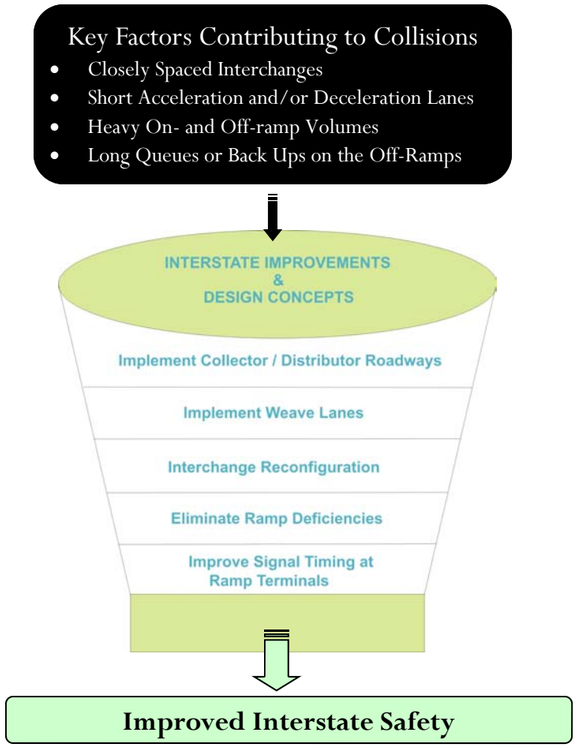
- Closely spaced interchanges (less than one-mile spacing)
- Short acceleration and deceleration lanes on ramps
- Heavy on and/or off-ramp volume
- Long queues or back ups on the off-ramp

The recommended improvements address all of the roadway factors that contribute to collisions on I-5. The recommended improvements would reduce the frequency and severity of traffic collisions through the use of collector distributor lanes and weave lanes that separate and/or eliminate merging and weaving movements on the I-5 mainline. Without improvements, heavy on- and off-ramp volumes, in combination with limited capacity at the ramp terminals, will cause long queues on the off-ramps and mainline. Off-ramp traffic queues that spill back onto I-5 create unsafe conditions for mainline travelers. A critical goal of the IMP is to reduce or eliminate back ups from off-ramps on to I-5. Consequently, the plan recommends SPUI interchanges at critical interchange locations to reduce conflicts, increase capacity and reduce queuing on the off-ramps and arterial streets.

It is important to recognize that driver behavior, in varying degrees, is a factor in most collisions. Continuing our emphasis on driver education and enforcement, in conjunction with the improvements recommended in this plan, are also key to improving the safety for travelers on I-5.



Safety Benefits



TRAFFIC OPERATIONS AND LEVEL OF SERVICE (LOS) BENEFITS

With the recommended improvements, in 2035, mainline I-5 operates at LOS D or better, while the C/D roadway operates in the range of LOS C to LOS F. The C/D lanes experience higher densities with high volumes of traffic merging and weaving on and off, but they continue to operate efficiently and safely while separating those movements from the I-5 mainline. With the improved interchange spacing, C/D lanes, weave lanes, and interchange capacity improvements, mainline I-5 traffic flows at or greater than 45 mph throughout the corridor during peak hour traffic periods. With most of the weaving and merging movements occurring on the C/D roadway, vehicle safety and throughput are significantly improved. Interchange and ramp terminal improvements eliminate backups from the local street system onto the mainline with greatly improved safety and operations.

The 2035 PM peak LOS on the local street system does not change significantly with the recommended improvements except at the interchanges where ramp and intersection improvements are proposed. A comparison of these changes is summarized on the right.

Several ramp intersection improvements are critical to maintaining I-5 mainline operations by reducing and/or eliminating backups from the off-ramps onto the mainline. These improvements include:

- Dual left turn movements at the new SPUI interchanges.
- Free right turn and an eastbound "add" lane from the northbound off-ramp at the Sunset Drive interchange.
- Dual right turn and "add" lane for the northbound off-ramp at the Guide Meridian Road interchange.
- Elimination of the NB left turn on Guide Meridian Road at Telegraph Road.
- Signals or roundabouts at the ramp terminal intersections at Slater Road.

Recommended Improvements	Safety Benefits
Managed Lanes	Moves more people and freight safely and efficiently in separate or dedicated lanes.
Weave Lanes	Improves safety in high congestion areas. Weave lanes provide more room for merging on and off the I-5 mainline and reduces vehicle conflicts where ramp volumes are highest.
Collector Distributor Lanes (C/D)	Improves safety by separating lower speed local traffic exiting and entering I-5 from regional traffic passing through the corridor. C/D lanes reduce vehicle conflicts that occur at merge points and where on- and off-ramps are spaced too close together.
Single Point Urban Interchange (SPUI)	Improves safety by reducing the number of conflict points at ramp terminal intersections and moves more traffic through the interchange which reduces backups on the ramps, on the I-5 mainline, and on local arterial streets.
Lengthened Ramps / Widened Ramp Curves	Improves safety by providing longer ramps and more gradual curves for acceleration on, and deceleration off, the I-5 mainline .
Ramp Terminal Improvements	Improves ramp and arterial street intersection safety with improved geometry, sight distance and traffic control, and reduces dangerous backups at off-ramps.
Managed Lanes	Provides dedicated facilities for transit and high occupancy vehicles which reduces the congestion, weaving and merging that is a factor in many collisions.
Active Traffic Management	Using integrated systems and a coordinated response, both recurrent and non-recurrent congestion can be managed to improve roadway safety and traffic flow.

Ramp Intersection 2035 PM Peak Level of Service

Intersection	No Build	Build
Old Fairhaven Pkwy & NB I-5 On/Off-Ramps	F	F
Old Fairhaven Pkwy & SB I-5 On/Off-Ramps	F	F
S Samish Way & 36th St	F	D
S Samish Way & Elwood Ave	F	D
S Samish Way & NB I-5 Off Ramp	F	-
Lincoln St & NB I-5 On Ramp	F	-
Fielding Ave & 36th St	F	-
Samish Way SPUI	-	B
Lakeway Dr & SB I-5 On/Off-Ramps	F	-
Potter St & King St/NB I-5 On/Off-Ramps	F	A
Iowa St & Moore St	F	B
Ohio St & King St	F	-
Sunset Dr & James St	F	F
Sunset Dr & NB I-5 On/Off-Ramps	F	-
Sunset Dr & Barkley Blvd	F	F
Sunset Dr SPUI	-	F
Guide Meridian Rd & Mcleod Rd	F	-
Mcleod Rd & SB I-5 On-Ramp	A	-
Mcleod Rd & SB I-5 Off-Ramp	E	-
Guide Meridian Rd & NB I-5 On/Off-Ramps	F	-
Guide Meridian Rd SPUI	-	E
Guide Meridian Rd & Telegraph Rd	F	F
Bellis Fair Rd & NB I-5 Off-Ramp	C	B
Guide Meridian Rd & E Bellis Fair Pkwy	F	E
Guide Meridian Rd & Bakerview Rd	F	F
Guide Meridian Rd & Westerly Rd	F	E
Guide Meridian Rd & Kellogg Rd	F	F
Guide Meridian Rd & Stuart Rd	E	E
Guide Meridian Rd & Horton Rd	F	F
Northwest Ave & NB I-5 Off-Ramp	F	-
Northwest Ave & NB I-5 On-Ramp	F	-
Northwest Ave & SB I-5 Off-Ramp	F	-
Northwest Ave & Mcleod Rd	F	-
Mcleod Rd & SB I-5 On-Ramp	A	-
Northwest Ave SPUI	-	C
Bakerview Rd & NB I-5 Off-Ramp	F	-
Bakerview Rd & SB I-5 On-Ramp	E	-
Bakerview Rd SPUI	-	B
Bakerview Rd & Maplewood Ave	F	E
Slater Rd & NB I-5 On/Off-Ramps	F	B
Slater Rd & SB I-5 On/Off-Ramps	F	B

TRAFFIC OPERATIONS AND LEVEL OF SERVICE (LOS) BENEFITS (CONTINUED)

I-5 Mainline 2035 PM Peak Level of Service

2035	No Build		Build	
Interstate Segment	Northbound	Southbound	Northbound	Southbound
Old Fairhaven Pkwy to Samish Way	F	F	C	C
Samish Way to Lakeway Dr	E	E	C	C
Lakeway Dr to Iowa/Ohio St	F	A/B*	C	C
Iowa/Ohio St to Sunset Dr	F	C	C	C
Sunset Dr to Guide Meridian Rd	F	F	A/B	C
Guide Meridian Rd to Northwest Ave	F	F	C	C
Northwest Ave to Bakerview Rd	F	F	C	C
Bakerview Rd to Slater Rd	A/B*	D	C	C

* Improved LOS results from upstream bottlenecks.

TRAFFIC OPERATIONS AND LOS BENEFITS SUMMARY

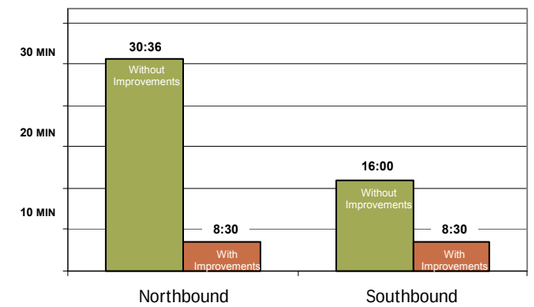
With the recommended improvements, mainline I-5 will operate at acceptable levels of service (LOS D or better) while maintaining an average speed of 45 mph or more. Congestion (LOS E or F) will occur at some locations on the C/D lanes where high volumes exit and enter the C/D. These locations include southbound at Lakeway Drive, southbound at Iowa Street, southbound at the Guide Meridian Road and northbound at Bakerview Road. Congestion can cause temporary slow downs and backups on the C/D but they continue to operate efficiently and safely. Several improvements are critical to the operation of the I-5 mainline. These include:

- Configuration of the entry of the C/D roadway with mainline I-5.
- Northbound and southbound weave lanes between the Iowa Street and Sunset Drive interchanges.
- Northbound and southbound weave lanes between the Sunset Drive and Guide Meridian Road interchanges.
- Two-lane southbound off-ramp to Sunset Drive.
- Two-lane northbound off-ramp to the Guide Meridian Road.
- Rebuilding the interchanges at Sunset Drive and the Guide Meridian Road into a SPUI configuration.

TRAVEL TIME BENEFITS

The PM peak travel times on I-5 from the Samish Way to Slater Road interchanges were measured for 2035 traffic conditions with and without the recommended improvements. The results are summarized in the chart to the right. The times shown represent the average travel time on mainline I-5. The improved mainline travel time with the recommended improvements is a result of improved operating conditions and the separation of merging and weaving movements onto the C/D lanes.

I-5 PM Peak Travel Times (2035)



THROUGHPUT BENEFITS

Throughput represents the total number of vehicles traveling across a given section of I-5 in the peak hour. The table below summarizes total throughput at various locations on I-5, comparing the throughput with and without the recommended improvements. With the recommended improvements, significantly more vehicles are moved through the I-5 corridor in both the northbound and southbound directions versus the throughput without I-5 improvements. In the section of I-5 where congestion is the highest (Iowa Street to Bakerview Road interchanges), the southbound throughput increases by 48 percent or more, with an increase of 87 percent between the Guide Meridian Road and Northwest Avenue interchanges. At critical locations such as between Sunset Drive and Guide Meridian Road interchanges (65 percent increase), and between Northwest Avenue and Bakerview Road interchanges (62 percent increase) significant improvement in throughput is realized with the recommended improvements, improving mobility for both local and regional traffic. A similar result is seen in the northbound direction, with a 76 percent increase between the Guide Meridian Road and Northwest Avenue interchanges and 56 percent increase between Sunset Drive and the Guide Meridian Road interchanges.

FREIGHT BENEFITS

I-5 is a highly strategic and important element of the freight transportation system, serving a major role in supporting local, state, national and international commerce. Congestion and safety problems on I-5 have a significant affect on the movement of freight by

2035 PM Peak Throughput

Location	2035 Throughput (vph) with Proposed Improvements					
	Southbound		Northbound		% Change	
	No build	Proposed	No build	Proposed	SB	NB
Before Exit 250 (Old Fairhaven Pkwy)	2030	2216	2234	2350	9 %	5 %
Exit 250 (Old Fairhaven Pkwy) - Exit 252 (Samish Way)	2480	2850	2516	2794	15 %	11 %
Exit 252 (Samish Way) - Exit 253 (Lakeway Dr)	2770	3383	2652	3087	22 %	16 %
Exit 253 (Lakeway Dr) - Exit 254 (Iowa/Ohio St)	2686	3595	2698	3362	34 %	25 %
Exit 254 (Iowa/Ohio St) - Exit 255 (Sunset Dr)	2397	3540	2938	3967	48 %	35 %
Exit 255 (Sunset Dr) - Exit 256 (Guide Meridian Rd)	2192	3620	2690	4191	65 %	56 %
Exit 256 (Guide Meridian Rd) - Exit 257 (Northwest Ave)	1686	3146	1965	3462	87 %	76 %
Exit 257 (Northwest Ave) - Exit 258 (Bakerview Rd)	2101	3411	1851	2711	62 %	46 %
Exit 258 (Bakerview Rd) - Exit 260 (Slater Rd)	2760	3259	2241	3313	18 %	48 %
				AVERAGE	40 %	35 %

increasing the duration and unpredictability of travel times. Over time, higher freight costs drive up the cost of goods transported, purchased, and sold which affects local, regional, and state economies. Addressing existing and future congestion and safety problems will provide significant benefits to the freight industry, to its customers, and to the economic vitality of the region and state.

RECOMMENDATION #2 - MAKE LOCAL STREET IMPROVEMENTS

Implement local street improvements that directly benefit I-5 by reducing demand on the mainline, ramps or connecting arterials. The IMP acknowledges the need for local street improvements and the benefits that flow to I-5 and the surrounding street system. Local street improvements alone will not address the safety, geometric, and congestion problems on I-5 but they could enhance the effectiveness or reduce the intensity of other recommended improvements. Based upon the preliminary analysis completed for the IMP, some of the improvements that provided the greatest benefits to I-5 include the extension of James Street north across I-5, connecting Birchwood Avenue east to James Street, East Bellis Fair Parkway improvements, Eliza Street connector, McLeod Road connections and other improvements that enhance local street routes as an alternative to local travel on I-5.

Completion of the SPUI interchanges at Sunset Drive, Guide Meridian Road and Bakerview Road provide opportunities to improve local street connections. At Sunset Drive, a new interchange opens the door for extending James Street north across I-5 which has the potential to significantly reduce the volume of traffic on Sunset Drive.

At the Guide Meridian Road interchange, modeling has shown that the SPUI interchange can handle the forecasted 2035 volumes when coupled with some modifications on the Guide Meridian Road such as the elimination of the northbound left turn at the Guide Meridian Road/Telegraph Road intersection. The project team discussed the need for additional access control with City staff, such as the closure of the east leg of the Guide Meridian Road/Telegraph Road intersection. More stringent access control will likely be needed in the interim (before a new interchange is built) to address queuing and traffic spill backs to the mainline that occur on the northbound off-ramp today. More analysis is needed to evaluate potential interim improvements and to determine if additional access control is needed by 2035. Additional access control may be needed if the land uses adjacent to the interchange are different than the forecast model's 2035 land use assumptions used in the IMP.

Completion of the Bakerview Road SPUI interchange opens the door for other improvements on Bakerview Road and improved connections across I-5 to the airport and east to the Cordata Development and Guide Meridian Road.

Improving local street connections has many positive benefits to I-5. Local street improvements would reduced demand on I-5 between Sunset Drive and the Guide Meridian Road interchanges. The reduction in demand on I-5 was not

LOCAL STREET IMPROVEMENTS ANALYZED

- Eliza Connector: Extend Eliza Street to connect with Bellis Fair Parkway.
- East Bellis Fair Parkway Improvements: Improve East Bellis Fair Parkway between the Guide Meridian Road and Deemer Road.
- Birchwood Connector: Extend Birchwood Avenue from the Guide Meridian Road, under I-5 to connect to James Street.
- James Street Extension: Extend James Street north from Sunset Drive across I-5, connecting with James Street north of I-5.
- Improve connection from James Street to Lincoln Street.
- Yew Street/Woburn Street Improvements as an improved north-south arterial route.
- St. Joseph Hospital connections.
- Provide connection between Iowa Street and Lakeway Drive west of Woburn Street but east of I-5. (Puget Street to Pacific Street through East side of Haskell Business Park)
- Sterling Drive connection to Bellis Fair Parkway.
- Sterling Drive connection to Eliza Avenue.
- Pacific Highway at West Bakerview Road– realign with Fred Meyer Signalized intersection.
- Slater Road Extension: Extend Slater east from Northwest Road to Aldrich Road (part of east/west connector between I-5 and Guide Meridian)
- Horton Road Extension: Extend Horton west to Aldrich Road (part of east/west connector between I-5 and Guide Meridian)
- McLeod Road: Reconnect McLeod Road from Telegraph Road to James Street (Packaged connectivity improvements with Birchwood Connector).
- East Orchard Drive: Connect to Division Street in Irongate Industrial Park (Packaged connectivity improvements with Birchwood Connector).
- New Road: Connect Kellogg Road and Horton Road with new north/south connector on West side of King Mountain, to the East of Guide Meridian.
- Kope Road/Mitchell Way connection to provide north/south route connecting Bakerview to Slater west of, and parallel to, I-5.

high enough to eliminate congestion on the mainline or the interchange ramps but when combined with other I-5 improvements, improved local street connections could enhance or reduce the intensity of other needed I-5 improvements. Further analysis is needed to determine what combinations of improvements yield the greatest benefits.

The modeling results demonstrated that a number of local street improvements will improve safety on I-5 by reducing traffic demand and congestion at the interchange ramps and ramp intersections. Additional analysis is needed to isolate the individual benefits of each street improvement. Preliminary analysis shows that the extension of James Street north across I-5 and improved local street connections around the Guide Meridian Road and Sunset Drive interchanges had the most significant benefits.

RECOMMENDATION #3 - MAKE NON MOTORIZED IMPROVEMENTS

A multimodal strategy, that significantly reduces single-occupant vehicle trips in the I-5 corridor during peak travel demand periods, may delay or reduce the need for some of the improvements identified in this plan. Improving bicycle and pedestrian connections across and along the I-5 corridor is part of a multimodal strategy to encourage greater non-motorized mode share, while simultaneously reducing demand for vehicle trips on I-5 and local streets.

State and Federal policies require that the new or improved non-motorized facilities be considered in all new highway construction and reconstruction, including I-5 interchanges and crossings. Factors to be considered in establishing non-motorized facilities are:

- Public Safety
- The cost of the non-motorized improvement compared to the need or probable use.
- Inclusion of the non-motorized facility in a plan for a comprehensive non-motorized system adopted by a city or county in a state or federal plan.

When constructing non-motorized facilities, they must be designed to be accessible to and usable by people with disabilities.

The IMP recommends the following improvements to non-motorized facilities in the I-5 corridor:

- Maintain existing non-motorized crossings when I-5 improvements are made.
- Include non-motorized facilities when new interchanges and new crossings are designed and constructed.
- Partner with local agencies to create, improve and/or expand non-motorized connections across I-5, including pedestrian/bicycle only crossings that link local designated non-motorized transportation routes with employment, housing, educational, retail, and recreational centers.

RECOMMENDATION #4 - PLAN FOR FUTURE TRANSPORTATION OPTIONS

The recommended improvements should provide flexibility for future regional transportation improvements by preserving space in the median of I-5 for transit, carpool, freight, toll lanes (one lane in each direction) or other high occupancy modes such as passenger rail. Throughout this report we have referred to this space in the median as "*managed lanes*". Where new permanent structures such as bridges, overpasses and interchanges are built, they should be built so as to accommodate, and not preclude, future construction of managed lanes for transportation modal options that will be needed beyond the IMP forecast year of 2035.

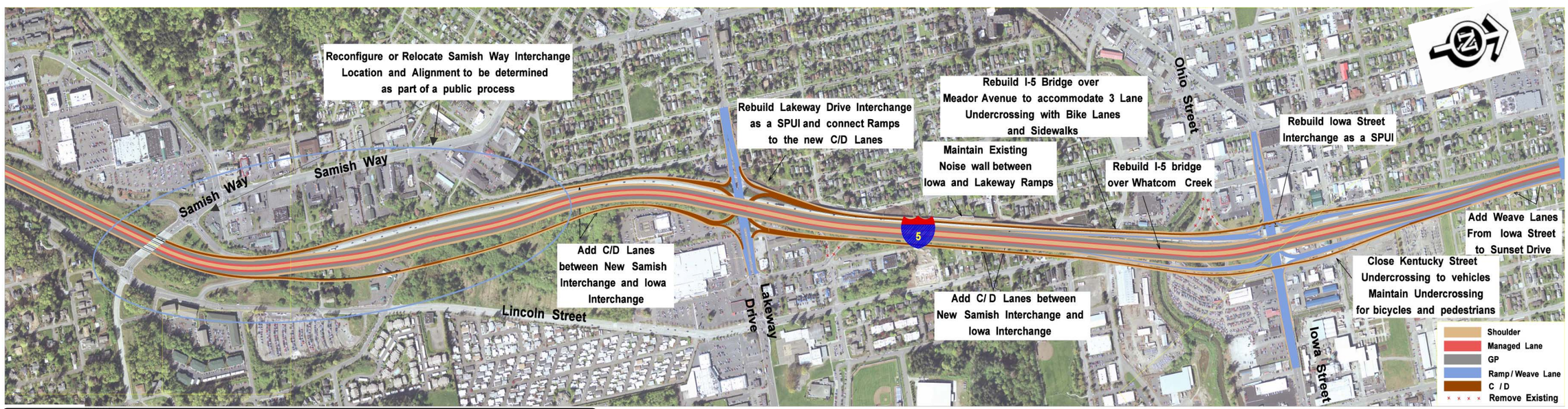
RECOMMENDATION #5 - ADOPT THE IMP INTO STATE, REGIONAL, TRIBAL, AND LOCAL PLANS

The IMP was developed by WSDOT in partnership with local governments and the Whatcom Council of Governments. The recommended improvements establish a vision for I-5 that feeds into state, regional, tribal, and local transportation planning processes. In order to begin implementation of the recommended improvements the following actions need to occur:

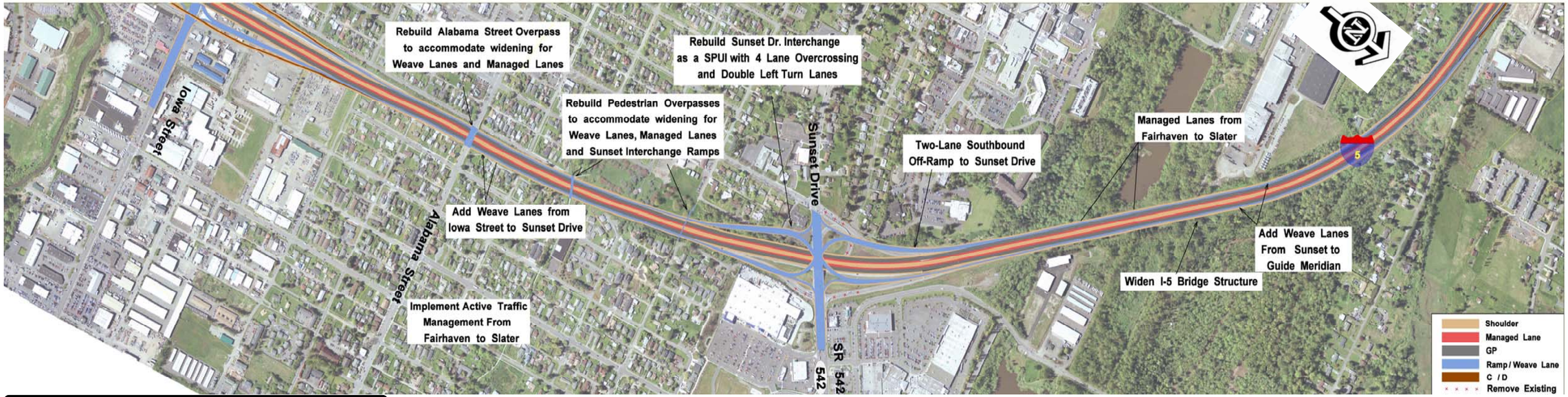
- Inclusion of the IMP into the State Highway System Plan, consistent with the Washington State Transportation Plan.
- Adoption of the IMP into the WCOG Metropolitan and Regional Transportation Plans.
- Local, regional, and tribal governments should consider the IMP recommended improvements in the development of their transportation plans and policies.

WSDOT will maintain the IMP and keep it current by revisiting the assumptions and recommendations in the IMP as local, regional, and tribal plans are updated.

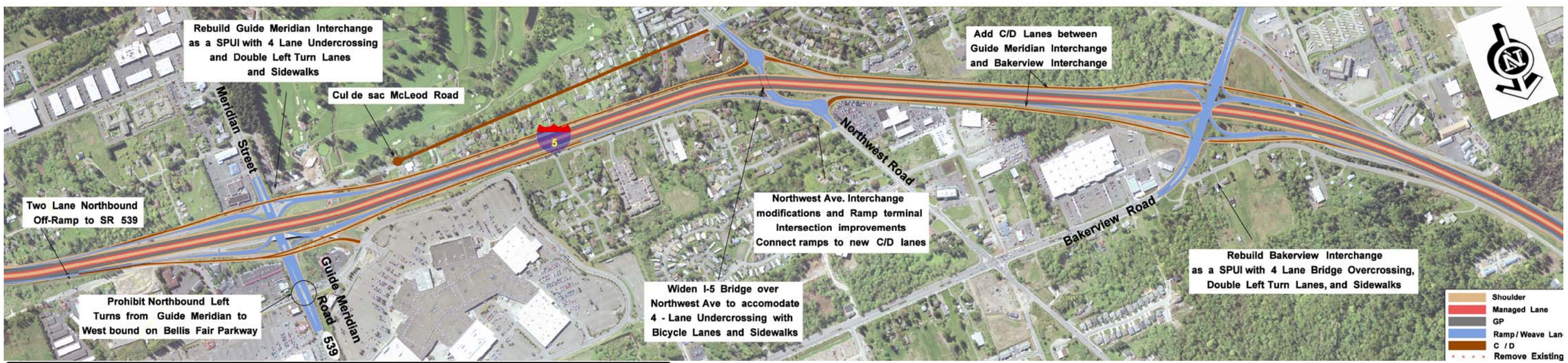
Recommended Improvements from Old Fairhaven Parkway Interchange to Samish Way Interchange



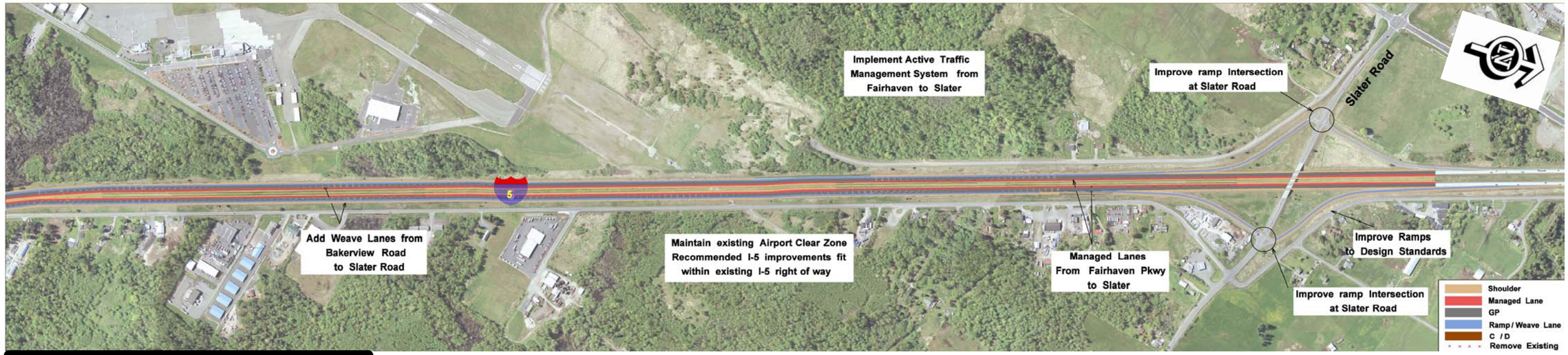
Recommended Improvements from Samish Way Interchange to Iowa / Ohio Street Interchange



Recommended Improvements at Sunset Drive Interchange



Recommended Improvements from Guide Meridian Road Interchange to Bakerview Interchange



Recommended Improvements at Slater Road Interchange

CHAPTER 6 - IMPLEMENTATION

The completed IMP sets a direction for future improvement of I-5 through Bellingham and serves as the first step in obtaining funding for improvements. The plan identifies over one billion dollars of needed improvements that cannot be met within the limits of existing funding. The next step is to develop an implementation strategy that will facilitate project prioritization and delivery.

Transportation partners – including WSDOT, stakeholder groups and local agencies – must work together to be successful in implementing improvements for I-5. To be successful, regional partners should focus on a targeted set of improvements that provide strategic, cost effective benefits.

The Interstate Master Plan identifies over a billion of dollars of needed improvements that cannot be met within the limits of existing funding sources.

WSDOT will utilize the technical analysis and public comments generated in development of the Interstate Master Plan to:

- Define short-, mid- and long-term improvements.
- Estimate cost/benefit ratio for identified improvements.
- Identify funding opportunities.
- Determine partnerships and actions needed to implement the Interstate Master Plan.

As funding becomes available, WSDOT will work with our partners to move forward with design and construction of high-priority improvements.

DISCRETE PROJECTS - BUILDING BLOCKS TO IMPROVE I-5

Many of the improvements identified in the IMP are costly and some will require many years and hundreds of millions of dollars to construct. So where do we begin? While the plan identifies several large and costly projects, our technical analysis revealed how implementation of discrete projects, scaled to more realistic funding levels, could be completed and still provide significant benefits to I-5 stakeholders. When designed and sequenced properly, smaller scale projects can serve as short-, mid- and long-term building blocks that will eventually integrate together into a much more significant set of improvements. The scale and timing of discrete projects is ultimately determined by available funding, which is currently unknown. The following list of discrete projects (in no particular order of implementation) emerged from the IMP analysis. The list will be further refined with additional evaluation of the timing, scale and operational performance of individual elements.

Attendees at a public stakeholder meeting

I-5 Interchanges:

- Construct a new SPUI interchange at Bakerview Road.
- Construct a new SPUI interchange at Guide Meridian Road with associated local street modifications.
- Construct a new SPUI interchange at Sunset Drive.
- Construct a new SPUI interchange at Iowa Street (includes replacement of several bridges; converting Kentucky Street to non-motorized use only; and local street modifications).

Other improvements:

- Weave lanes.
- Ramp terminal improvements at Slater Road and Fairhaven Parkway.
- Replace pedestrian overpasses to accommodate I-5 widening.
- Implement elements of active traffic management.

South End C/D System improvement package:

- Reconfigure or relocate the Samish Way interchange that connects to the C/D lanes.
- Construct a SPUI interchange at Lakeway Drive that connects to the C/D lanes.
- Construct C/D lanes connecting the Samish Way, Lakeway Drive and Iowa/Ohio Street interchanges.

North End C/D System improvement package:

- Rebuild Northwest Avenue interchange that connects to the C/D lanes.
- Construct C/D lanes connecting the Guide Meridian Road, Northwest Avenue and Bakerview Road interchanges.

IDENTIFYING AND ASSESSING RISK

"Risks" are red flags indicating problems that may develop that could negatively affect completion of projects on-time and on-budget. Identifying these risks is a critical component of early project planning and scoping, contributing to more reliable preliminary designs and cost estimates. Assessing risk provides decision makers with a realistic view of the costs of construction and challenges likely to affect the project.

The IMP includes a preliminary risk analysis that addresses corridor-wide issues that may affect project implementation. This analysis is just the first step. WSDOT will revisit these issues in more detail during the scoping and design of individual improvement projects.

RISK EVALUATION SUMMARY

Flood Plains

- Approximately, 9.3 acres of the project area is within the floodplain at the Whatcom and Squalicum Creek crossings.

Stream Crossings and Aquatic Resources

- Special considerations to the preservation and enhancement of sensitive fish and other aquatic habitat will be required.
- Winter Steelhead and Fall Chinook are identified to dwell in the project area.

Wetlands

- Approximately 10.4 acres of wetlands located within Whatcom County and City of Bellingham will be affected.

Wildlife Habitat

- It does not appear that I-5 improvements would significantly affect wildlife habitat.

Geotechnical/Physical Resources

- Seismic induced liquefaction and soil settlement should be expected when handling heavy machinery during construction.

Land Use/Socio Economics

- An estimated 100 parcels covering approximately 36 acres would be affected.
  - 19.25 acres of residential property
  - 17.25 acres of commercial property
- It does not appear that low income or minority populations would be affected disproportionately

Historic and Cultural Resources/Parks and Public Lands

- Two pedestrian bridges would be temporarily unavailable during construction of I-5 improvements.
- Encroachment into Memorial Park is likely.

RISK EVALUATION

The purpose of this preliminary environmental analysis is to identify whether major hurdles or fatal flaws exist for constructing the recommended improvements from an environmental or permitting aspect, based on a review of existing sources of data and current regulatory requirements. This review evaluates the environmental risks associated with each improvement and the potential for impacts to floodplains, streams, wetlands, wildlife habitat, endangered species, and major geological features. The environmental review also evaluates the potential for impacts to existing land use, socio-economic elements, and known historic and cultural resources. As recommended IMP improvement projects are funded in the future, detailed environmental analysis will be required. Measures to avoid, minimize and mitigate for potential impacts will be an element in future project scoping, design and construction. The following findings relate to the degree of impact to the environment if the proposed IMP improvements in the I-5 Fairhaven to Slater corridor are constructed.

Please refer to the technical appendix for the full preliminary environmental analysis report.

Flood Plains

Approximately 9.3 acres of the proposed project footprint lies within currently mapped floodplains at the I-5 crossing of Whatcom Creek (Iowa Street interchange) and at the I-5 crossing of Squalicum Creek north of the Sunset Drive interchange. None of the 100-year floodplain in the project area is a designated floodway or flood hazard area, therefore Bellingham and Whatcom County regulations for protecting flood hazard areas do not apply. Mitigation is not required for floodplain fill, however Bellingham's stormwater code would require a project to evaluate total impacts including the loss of natural storage if roadway fill is placed within the mapped floodplain.

Stream Crossings and Aquatic Resources

There are numerous stream crossings within the I-5 corridor between the Old Fairhaven Parkway and Slater Road interchanges. Several of these streams contain known or historic populations of sensitive and anadromous fish species. These streams include a tributary to Silver Creek, three unnamed tributaries to Bear Creek, Whatcom Creek, Squalicum Creek, and Spring Creek (a tributary to Squalicum Creek). In addition, Lincoln Creek, east of I-5, and Padden Creek, just south of the Fairhaven Interchange, could be impacted by the proposed improvements. Fish species, listed under the federal Endangered Species Act, are present in the streams and creeks that cross I-5. Project improvements in or near any of the streams and creeks that support these species will require consultation with the National Marine Fisheries Service and/or the U.S. Fish & Wildlife Service.

Wetlands

Major wetlands crossed by the I-5 corridor include wetlands associated with Squalicum Creek and wetlands between the Bakerview Road and Slater Road interchanges. In addition, there are several smaller wetlands and wetland complexes throughout the corridor close to the highway. Wetlands in the Squalicum Creek riparian corridor consist of seasonally flooded forested, shrub, and emergent freshwater wetlands. Bug Lake and Sunset Pond are open water areas within these wetlands and have unconsolidated (muddy) substrate. The wetland complex east of the Bellingham International Airport is composed of seasonally flooded forested, shrub, and freshwater wetlands, associated with tributaries of Bear Creek, which flows to Silver Creek, and ultimately to the Nooksack River Delta.

Based on the analysis of existing wetland conditions, the recommended improvements are likely to impact approximately 10.4 acres of wetlands located within Whatcom County and the city of Bellingham. Wetland impacts should be avoided or minimized at every opportunity and any unavoidable impacts must be compensated. Standard mitigation requirements for unavoidable wetland impacts, as provided in federal, state and critical area ordinances, must be accomplished.

Wildlife Habitat

Wildlife habitat identified in proximity to recommended I-5 improvements include:

- Riparian zones.
- Turkey vulture habitat.

Over time, the presence and location of wildlife habitat will change. As recommended IMP improvement projects are funded in the future for scoping and design, detailed environmental analysis will be required, including consultation with the Washington Department of Fish and Wildlife.

Geological Conditions

A significant area along the I-5 corridor between Old Fairhaven Parkway and Slater Road interchanges is identified by the city of Bellingham and Whatcom County to be very sensitive to seismic shaking. The sensitive area covers surface deposits of man-made fill or partially decomposed organic material at least five feet deep, filled wetlands, and areas of alluvial deposits that are subject to liquefaction. These areas are susceptible to severe damage as a result of tremors induced by ground shaking, slope failure, settlement, soil liquefaction, lateral spreading and surface faulting. Therefore, it is cautioned that the nature of the geology in the project area is sensitive and construction activities should be exercised with extreme caution.

Land Use and Socio-Economic Elements

The Fairhaven to Slater corridor includes approximately, 40 percent residential, 26 percent commercial, 24 percent Industrial, 8 percent airport operations, and 2 percent public/institutional types of land use. Between the Slater Road and Bakerview Road interchanges, land use adjacent to I-5 is mostly industrial and airport operations. Between the Bakerview Road and Guide Meridian Road interchanges, land use is dominated by single and multi-family residential. Between the Guide Meridian Road and Sunset Drive interchanges, land use is industrial and commercial except for the public open space around Sunset Pond and Bug Lake. Between the Sunset Drive and Samish Way interchanges land use is a mix of single and multi-family residential, commercial, and industrial. South of the Samish Way interchange land use is mostly single family residential.

An estimated 100 parcels, encompassing approximately 36 acres, would be affected as a result of implementing the recommended improvements. This includes approximately 19.25 acres of residential property and 17.25 acres of commercial property. Some parcels would be needed in their entirety, and only a portion of others would be needed. The analysis of environmental justice determined impacts to residents would not disproportionately affect minority or low-income populations. There is no evidence, from U.S. 2008 census data of the areas potentially affected by the recommended I-5 improvements, that there is a predominance of any low-income or minority populations that would be disproportionately affected.

Historic and Cultural Resources/Parks and Public Lands

Historic and cultural sites in the Fairhaven to Slater corridor include Sehome Hill historic district, Bug Lake public open space, Bay to Baker trail, Memorial Park, Rock Hill Park with a small playground and half court basketball area, railroad trail, and pedestrian bridges. Among the identified sites of historical and cultural importance, two pedestrian bridges in the vicinity of Memorial Park would be temporarily unavailable during a portion of project construction, and some encroachments are likely in Memorial Park.

SETTING PRIORITIES

Prioritization of the improvements identified in the I-5 Master Plan will be an ongoing effort requiring participation from numerous stakeholders. Priorities will be based on a range of criteria such as safety and congestion benefits, multi-modal benefits, and connections to local plans. WSDOT's preservation and replacement schedules for bridges and other infrastructure in the corridor will also be considered. The availability of funding to design and construct improvements will be a major driver in setting project delivery priorities.

High-priority projects will exhibit:

- High ratio of benefits to costs.
- Low total cost.
- Financial partnership between WSDOT, local governments and/or developers.
- Regional and local support.
- Significant safety and operational improvements.
- A clearly defined improvement concept.

Benefit/cost ratio

Benefit-cost analysis is used to compare projects. This analysis weighs the positive outcomes generated by a project against the financial impact of constructing and maintaining the improvement over time. A benefit-cost ratio of 1 or more indicates that an improvement creates value that equals or exceeds its cost. Inputs to benefit-cost analysis include:

- Traffic throughput
- Level-of-service
- Total societal impact of traffic collisions (in dollars)
- Project costs (design, right of way, construction and maintenance)

Detailed analysis is required to conduct a credible benefit-cost analysis. The information and level of detail provided by the Interstate Master Plan will enable this work. WSDOT will initiate benefit-cost analysis when the plan is completed, as part of our effort to develop an implementation strategy.