Summary Report

JANUARY 2014

I-5 JBLM VICINITY IJR AND ENVIRONMENTAL DOCUMENTATION

PHASE 1 – CORRIDOR FEASIBILITY STUDY

Washington State
Department of Transportation

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WHAT IS CONTRIBUTING TO THE PROBLEMS OF I-5 THROUGH JBLM?

In Washington, Interstate 5 (I-5) links the key population centers of Vancouver, Olympia, Tacoma, Seattle, Everett and Bellingham (**Figure 1**). In the study area, I-5 also serves a function in national defense by providing access to Joint Base Lewis-McChord (JBLM).

Figure 1 *Interstate 5 through Washington.*

Within south Pierce County, I-5 traffic increased 73 percent between 1986 and 2011 to over 118,000 vehicles per day (**Figure 2**). The traffic increase in this corridor study area has been influenced both by population and employment growth, and by increased economic activity including a rapid rise in freight movement. Overall, I-5 has not been widened in the study area since 1975, and is inadequate to meet today's demand.

Between 1970 and 2010, the population of Washington State grew by 97 percent, Pierce County grew by 95 percent and Thurston County grew by 228 percent. Population growth in Pierce and Thurston Counties is projected to continue at a similar pace through 2040, as shown in **Figure 3**. The communities of Lakewood, DuPont and Steilacoom have also grown. These changes have resulted in increased through traffic along the I-5 corridor between Olympia and Seattle.

While there has been substantial population growth affecting the corridor, there has also been significant employment growth. JBLM has evolved into a strategic military base with 62,154 employees, making it the second largest employer in Washington State (**Figure 4**). It should be noted, however, that JBLM is the largest employer in the state with employees situated on a single site. Employment on the base has increased almost 64 percent since 2006, and JBLM is now the fifth fastest growing military installation in the United States. Camp Murray, which houses the headquarters of the Washington Military Department and the

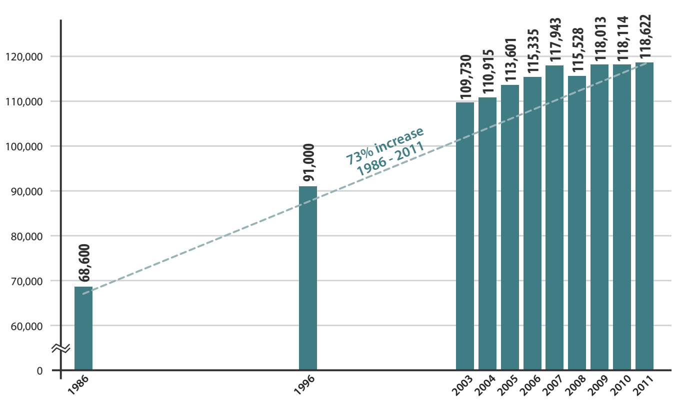


Figure 2 *Average Annual Daily Traffic Volume for 1986-2011, I-5 at DuPont.*

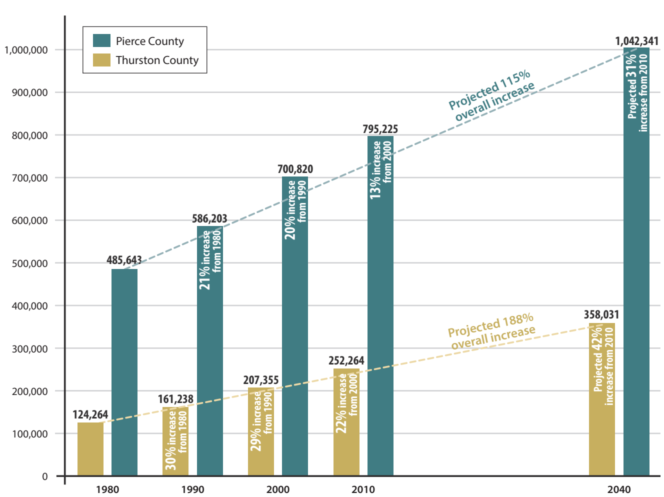


Figure 3 *Population Growth Trends, Pierce and Thurston Counties, 1980-2040.*

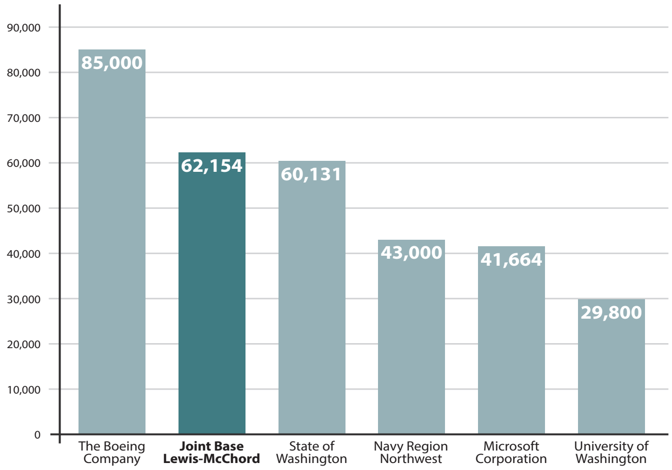


Figure 4 *Largest employers in Washington State, 2013.*

Washington Air National Guard, has also expanded. Additionally, truck traffic along I-5 in the corridor study area has grown from approximately 8,900 vehicles on a typical weekday in 1986, to over 14,000 in 2011.

Like most large employers, JBLM personnel live in a broad range of locations from those with short commute distances to locations demanding a longer drive. Unlike most employers, JBLM offers on-site housing for a portion of the personnel assigned to the installation. This housing accommodates approximately 24 percent of the military personnel and their families, leaving 76 percent of active duty military personnel, as well as the civilians working on JBLM, to find housing in the region surrounding the base. Generally, the highest concentration of off-base military personnel live in Lakewood and Lacey. Similarly, workers living in Thurston County are drawn to employment opportunities to the north. In fact, over 20 percent of employed people living in Thurston County commute to Pierce, King, and Snohomish Counties, and over 8 percent of the jobs in Thurston County are held by people living in Pierce, King and Snohomish Counties. Employment and housing choices made by the general public, as well as military personnel, all put pressure on I-5 and contribute to congestion during peak commuting times.

Because of the presence of secured military bases on both sides of I-5 (JBLM and Camp Murray), there are no existing alternate parallel routes for regional travel through the corridor study area (**Figure 5**). Using roads other than I-5 requires circuitous routes and extended detours. As a result, congestion along I-5 through the JBLM vicinity has become a daily occurrence with heavy through volumes and a large number of vehicles getting on and off the freeway in the study area. Heavy off-ramp traffic backs up along some of the ramps and spills back onto the I-5 mainline. This causes drivers to change lanes to avoid other drivers entering or leaving the highway. All of these lane changes cause traffic to slow, create extended delays, and reduce traffic safety along I-5. Additionally, the narrowing of I-5 at the Thorne Lane interchange constrains traffic movement.

Accommodating traffic growth through the study area is challenging, largely due to the physical constraints along the highway including both the military bases and the presence of an existing rail line paralleling the west side of the freeway.

Figure 5 *Secured military bases on both sides of I-5 restrict the possibility of alternate routes to the freeway.*

WHAT IS THE PURPOSE OF THE PROJECT?

In 2012, the Washington State Department of Transportation (WSDOT) undertook an effort to prepare Interchange Justification Reports (IJRs) for four interchanges on I-5 through the JBLM area. IJRs are required to justify new and/or revised ramps accessing limited access freeways such as I-5. The purpose of these revisions would be to open up opportunities for potential solutions to chronic I-5 congestion in the corridor study area. An IJR includes:

- Identification of the need for proposed interchange improvements
- Evaluation of all other reasonable alternatives (including roadways other than I-5)
- Analysis and evaluation of proposed improvements to meet the need
- Provision of evidence that proposed improvements follow design criteria
- Documentation of consistency with local, regional and state land use and transportation plans
- Provision of environmental documentation for the proposed improvements

Federal law requires Federal Highway Administration (FHWA) approval of all revisions to the interstate system, and the IJR is the document used for this process.

WHAT ARE THE STUDY AREA BOUNDARIES?

The I-5 Corridor Study Area includes nine interchanges running from Mounts Road (Exit 116) on the south to SR 512 (Exit 127) on the north. The corridor study area is illustrated in **Figure 6**. This area encompasses all of the interchanges identified for study by the Washington Legislature for focused analysis, as well as adjacent or nearby interchanges that could potentially be impacted by modifications at the focus interchanges. The focus interchanges will

Figure 6 *Study Area Boundaries for the I-5 JBLM Vicinity IJR & Environmental Documentation Study.*

be addressed more fully in Phase 2 of the study, which may involve developing an IJR, and are highlighted in green in Figure 6. These interchanges include:

- Steilacoom-DuPont Road (Exit 119)
- Main Gate (41st Division Drive/Exit 120)
- Berkeley Avenue (Exit 122)
- Thorne Lane (Exit 123)

Based on IJR requirements, at a minimum the next interchanges north and south of these four interchanges must also be analyzed. These locations are shown in blue in the figure and include the interchanges at Center Drive (Exit 118) on the south and Gravelly Lake Drive (Exit 124) on the north, as well as the freeway mainline between Center Drive and Gravelly Lake Drive. Collectively the minimum study area for an IJR is illustrated in both green and blue.

If impacts extend beyond the minimum study area then the boundaries could be expanded to include the area shown in purple. This area includes the interchanges with Mounts Road (Exit 116) on the south, the interchanges with Bridgeport Way (Exit 125) and SR 512 (Exit 127) on the north, and the freeway mainline segments connecting these interchanges to the minimum IJR study area. The areas shown in purple represent the potential IJR influence area.

WHAT DOES THE STUDY PROCESS INCLUDE?

The planning, preliminary design and environmental work for this project is being completed in two phases. The intent of Phase 1 is to prepare a vision and improvement strategy (framework plan) for the I-5 corridor to meet future (2040) travel demand. The framework plan defines scenarios for reducing congestion and managing demand for travel on I-5.

It provides context for identifying concepts to revise the focus interchanges. Phase 2 will continue analysis of mainline and local street improvements and other travel modes to recommend the improvements needed to improve mobility along I-5, produce an IJR for revised interchange concepts, and prepare the environmental documentation needed to identify and seek funding for a prioritized and phased program of improvements.

Phase 1 creates a framework plan for the future I-5 mainline improvements through the JBLM area. This framework plan is essential because currently there is no corridor plan addressing future capacity or demand management strategies for I-5 in this area to help guide the decision-making process for interchange improvements. Accurately identifying the number and type of lanes needed on I-5 in the corridor study area is necessary to design interchange ramps and bridges. The final report for Phase 1 is called the *I-5 JBLM Area Corridor Plan Feasibility Study* (*Corridor Plan Feasibility Study*), which is summarized in this document.

Phase 2 will continue to analyze and evaluate mobility improvements for I-5 through the JBLM area in a comprehensive multimodal Alternatives Analysis with the appropriate environmental assessment and documentation. This analysis will further investigate the selected I-5 corridor improvement scenarios in conjunction with non-interstate and local roadway improvements, and alternative travel modes to estimate their benefits in reducing travel demand on I-5 and increasing overall corridor mobility. Appropriate environmental documentation will also be prepared leading to selection of a preferred improvement alternative. If the resulting preferred alternative includes modifications to I-5 interchanges, an IJR will be prepared, along with a proposed sequencing of projects that highlights those with the greatest benefits and most reasonable implementation timelines. An extensive public involvement program will also be developed in Phase 2 to support the Alternatives Analysis and environmental documentation process.

WHAT IS THE PURPOSE OF THE CORRIDOR PLAN FEASIBILITY STUDY?

The *Corridor Plan Feasibility Study* will be the guiding document to achieve the following outcomes:

- Create a plan to provide transitional flexibility and guide preservation of needed right-of-way (ROW).
- Identify program needs for an efficient multi-use/multimodal corridor, such as managed lanes, improved transit and transportation demand management (TDM).
- Identify and evaluate interchange alternatives that support and enhance cross-circulation for JBLM operations and internal base connectivity to improve interchange operations on I-5, while maintaining the flexibility to consider other alternatives.
- Evaluate the need for and strategic sequencing of additional general purpose lanes.
- Incorporate functional design elements to improve efficiency with the potential to reduce serious and fatal collisions.
- Assess local street and on-base roadway options to improve connectivity within local communities as a means of easing demand on I-5.
- Explore transit priority options and enhanced service opportunities along I-5 and to/from JBLM.
- Identify a short-list of I-5 mainline scenarios and interchange improvement concepts to be advanced to Phase 2.

HOW ARE DECISIONS BEING MADE IN THE STUDY?

Decisions about specific freeway, interchange or other improvements are being made within the context of the *Moving Washington* initiative. This initiative provides a framework for making transparent, cost-effective decisions that keep people and goods moving in support of a healthy economy and environment, with stable, vibrant communities.

This initiative establishes transportation priorities through a three-pronged approach that includes:

- **Operating efficiently** using a variety of management tools that get the most out of existing highways.
- **Managing demand** on overburdened routes to encourage the use of other routes or other modes, or traveling during less congested times of day.
- **Adding capacity strategically** by targeting hot spots or filling critical system gaps that fix bottlenecks or add facilities to encourage the use of carpools, vanpools and transit.

Consistent with the *Moving Washington* initiative, the completed Alternatives Analysis and any subsequent IJRs will identify interstate, transit, and TDM improvements, including necessary environmental documentation.

HOW WAS THE FEASIBILITY STUDY PREPARED?

As a starting point, the *Corridor Plan Feasibility Study* considered the findings and recommendations of several prior studies in the area. Key prior studies included:

- I-5 Transportation Alternatives Report (aka Lakewood Study)
- JBLM Joint Coordination Plan (City of Lakewood)
- Point Defiance Bypass Project (WSDOT Rail Division)
- I-5 Lacey Area IJR (WSDOT)
- Cross-Base Highway EIS (WSDOT)
- I-5/Fort Lewis Congestion Study (WSDOT Planning Office)

Additional consideration was given to the effects of recent improvements like the Center Drive Interchange lane channelization modifications and the Camp Murray gate relocation. Consideration was also given to pending changes to Madigan Gate access from I-5 and a variety of projects funded by a TIGER III grant to improve traffic operations reliability and efficiency in the corridor.

In addition to collecting information from previous planning efforts and on-going projects within the study area, Phase 1 included an extensive stakeholder engagement process. This process began with one-on-one briefings and interviews with the cities and towns along the corridor, as well as JBLM, Camp Murray, the Nisqually Tribe and transit agencies. These interviews provided an opportunity to explore in detail the impacts that chronic congestion on I-5 within the study area posed on communities. Information gathered from these meetings provided insight into the particular concerns and interests of the various parties.

Phase 1 – Stakeholder Participants

- *FHWA*
- *WSDOT*
- *JBLM*
- *Camp Murray*
- *Cities of Lakewood, DuPont & Lacey*
- *Town of Steilacoom*
- *Pierce County*
- *Nisqually Tribe*
- *South Sound Military and Communities Partnership*
- *Puget Sound Regional Council*
- *Thurston Regional Planning Council*
- *Intercity Transit*
- *Pierce Transit*
- *Sound Transit*

Following the one-on-one interviews, the project team assembled two Stakeholders groups to help guide the overall study and provide technical feedback. An Executive Committee, comprised of elected officials and senior staff from the adjacent cities and towns, Pierce County, JBLM, Camp Murray, WSDOT, FHWA, Puget Sound Regional Council (PSRC), Thurston Regional Council (TRPC), the Nisqually Tribe, and the South Sound Military and Communities Partnership (SSMCP), was convened four times over the course of Phase 1 (seven months). This committee provided executive level support and feedback on the data and findings.

A Technical Support Team, comprised of staff with expertise in transportation from all of the agencies, as well as staff from Pierce Transit, Intercity Transit and Sound Transit, was also assembled. This team provided review and input on the analysis methods and results. The Technical Support Team met eight times throughout Phase 1 of the project. Each Technical Team meeting was a half day in length and delved

into details behind the analysis, and the mainline and interchange alternatives being considered.

The project team, Executive Committee, and Technical Team were focused on responding to three fundamental questions:

- What is the nature of the problem to be solved, both existing and in the future?
- How can we most effectively manage expected demand?
- Where and when should we add capacity, and of what type?

Each of these questions is addressed in the following sections.

WHAT DID THE STUDY DISCOVER ABOUT EXISTING AND PROJECTED FUTURE TRANSPORTATION PROBLEMS?

The segment of I-5 through the JBLM area is currently experiencing many challenges that must be addressed in the identification, evaluation and recommendation of specific solutions. These challenges include:

- Existing and growing traffic volumes and associated congestion during peak periods of the day
- Change in the number of through lanes along I-5
- Limited alternative routes through the secure military installations
- Heavy on- and off-ramp volumes that mix both local and through trips, and result in significant weaving and merging activity
- Safety and vulnerability to disruptions from collisions or other incidents
- Impacts on transit operations and efficiency
- Growing impacts on freight mobility and reliability along I-5
- Physical limitations and deficiencies
- Issues related to JBLM land use, access and circulation needs

As traffic continues to grow in the future, existing problems will worsen. The following pages provide a short summary of existing and expected future (2040) transportation problems in the study area.

EXISTING AND GROWING TRAFFIC VOLUMES AND CONGESTION

Since the last widening of I-5 through the study area in 1975, there have been significant increases in traffic volumes and accompanying congestion impacts within the corridor study area. This growth is associated with increased through traffic, local community development, and JBLM commute patterns.

Congestion on I-5 in the study area.

Existing weekday travel demand along I-5 exceeds available capacity in several locations, primarily during the PM peak hour. Southbound PM peak speeds through the most congested segments of the study area range between 22 and 36 mph. Northbound speeds range between 29 and 36 mph (**Figure 7**). Existing travel times during the PM peak are significantly longer than during other parts of the day (up to 75 percent longer than the off-peak). PM peak congestion currently spreads over a period of up to three hours on a typical weekday.

Without additional capacity, by 2040 congestion is expected to worsen, becoming more critical during both the AM and PM peaks where travel demand on I-5 is expected to exceed capacity for up to thirteen hours each weekday. Average speeds will drop, in some cases to less than 20 mph, and travel times will increase accordingly (**Figure 8**). Congestion is also expected to extend outside the study area into Thurston County and north of SR 512.

Existing and growing traffic levels:

- Reduce the gap distance between vehicles
- Make it more difficult for drivers to change lanes safely and to recover from traffic collisions
- Cause drivers to slow down or stop and other drivers try to change lanes with smaller gaps

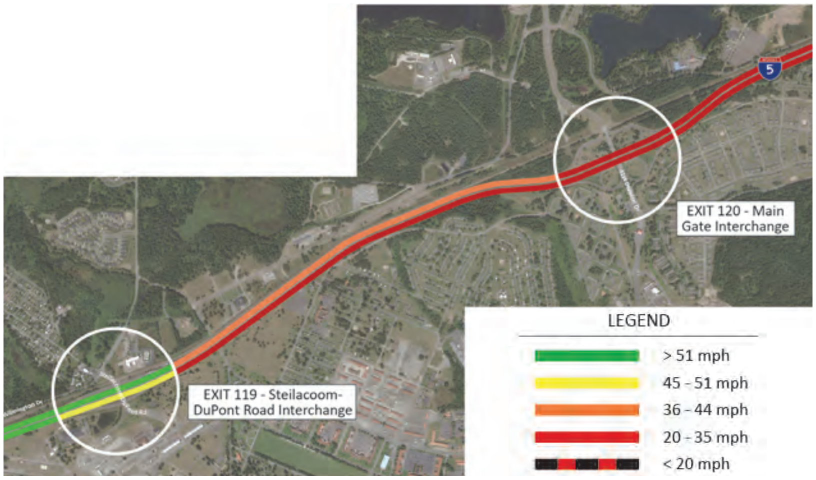


Figure 7 *2013 existing I-5 PM peak mainline speeds.*

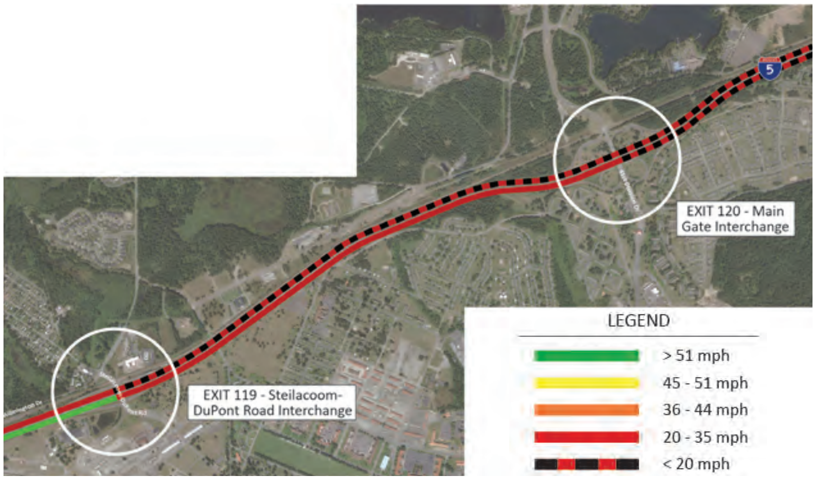


Figure 8 *2040 baseline projected I-5 PM peak mainline speeds.*

CHANGE IN THE NUMBER OF THROUGH LANES

Another contributing factor to existing congestion levels in the study area is the effect of the transition from four through lanes in each direction to three through lanes at the Thorne Lane Interchange. In the southbound direction, the effects of this lane drop can be seen in peak period travel speed reduction between Gravelly Lake Drive and Steilacoom-DuPont Road. These slowing speeds can be partially attributed to the merging of traffic from four lanes to three lanes.

In the northbound direction, the three lane section results in slow travel speeds from Steilacoom-DuPont Road north to Thorne Lane. North of Thorne Lane, where I-5 widens to four lanes, speeds increase.

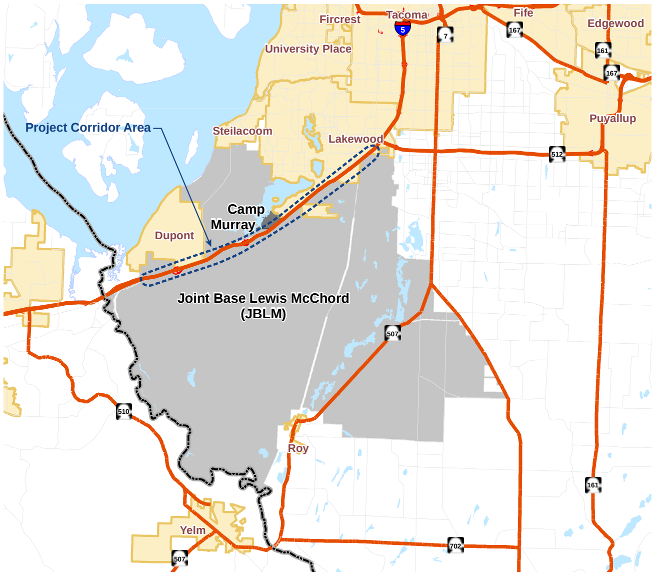


Figure 9 *Limited highway alternatives to using I-5.*

LIMITED ALTERNATIVE ROUTES THROUGH SECURE MILITARY INSTALLATION

Figure 9 shows the key transportation routes in the vicinity of JBLM. As is apparent from this graphic, there are few existing alternatives to using I-5 when traveling north/south between Olympia and the Tacoma/Lakewood area. This lack of alternatives concentrates travel through the I-5 corridor and affects both regional through traffic, as well as traffic between various destinations within the study area.

HEAVY ON AND OFF-RAMP VOLUMES

Because of the secure military installations along the freeway, I-5 is the main traffic artery through the area. As a result, there are several issues that affect traffic operations, these issues include:

- Heavy on and off-ramp volumes that compete with high through traffic volumes
- High level of merging and weaving activity
- Heavy volume of local trips on I-5

Approximately 50 percent of the traffic on I-5 in the study area is through trips, or vehicles traveling between Thurston County and points north of SR 512 in Pierce County. At the same time, there are heavy on and off-ramp volumes using the various interchanges in the study area. These trips make up the other 50 percent of traffic using I-5, as illustrated in **Figure 10**. Through the area, these vehicles change lanes to enter and exit I-5. At several interchange locations these merging volumes are substantial as illustrated in **Figure 11**.

Within the 1.5 mile distance between the Berkeley Street and Gravelly Lake Drive interchanges, over 3,200 vehicles enter or exit the freeway today. This traffic cannot all be in the outside lanes, so drivers must change lanes. This "side friction" slows traffic, increases congestion, increases the likelihood of collisions, reduces the per lane capacity of I-5 and affects traffic

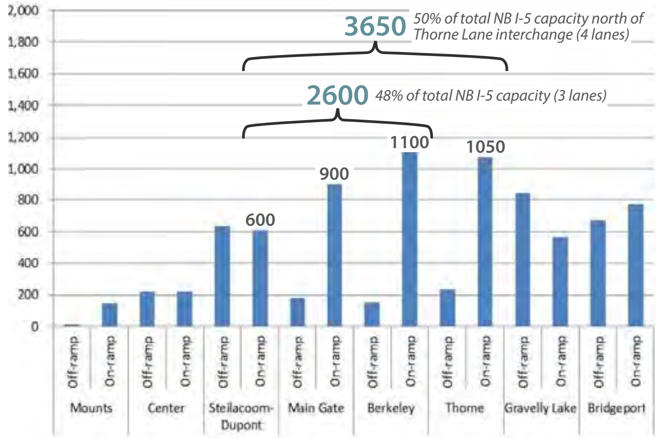


Figure 10 *Existing I-5 northbound on and off volumes by interchange, PM peak hour.*

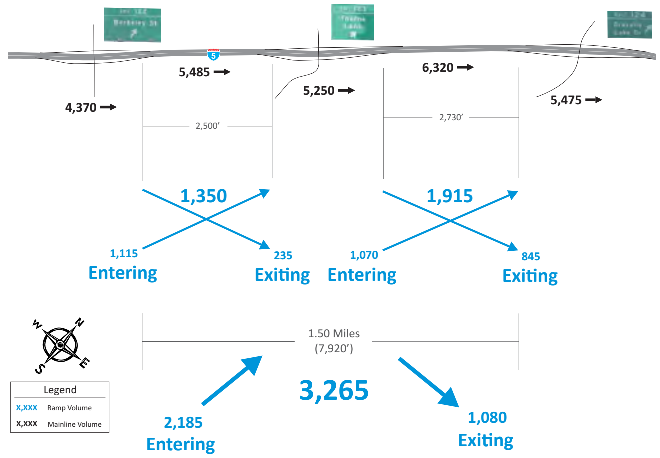


Figure 11 *2013 PM peak hour northbound weaving activity between the Berkeley Street and Gravelly Lake Drive interchanges.*

throughput in all travel lanes. By 2040, nearly 3,600 vehicles will be entering or exiting I-5 in the same area, increasing weaving activity and worsening congestion and safety issues.

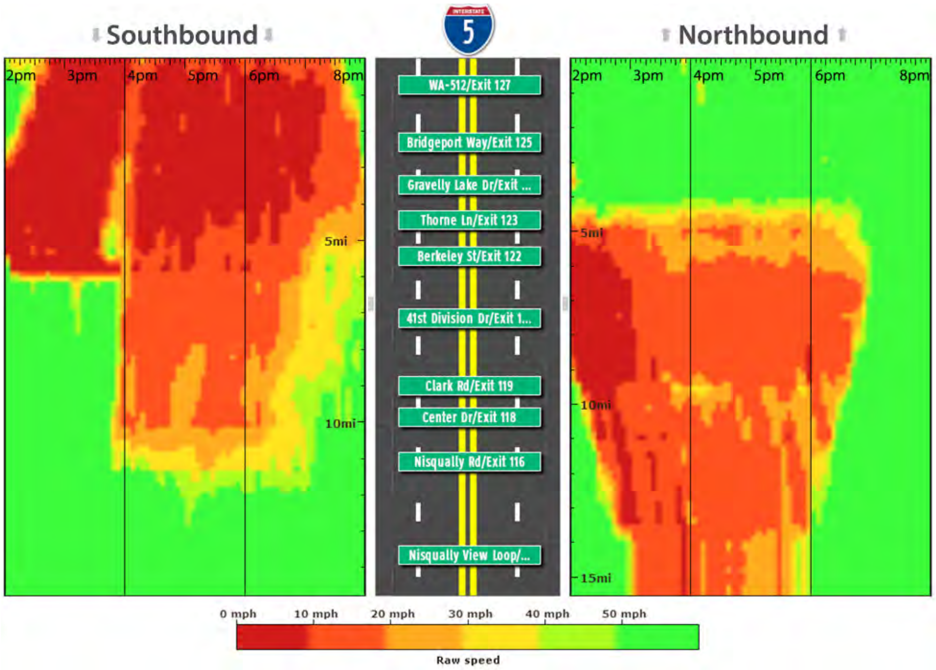


Figure 12 *I-5 speeds between Exits 114 and 127 after 2 PM crash on February 28, 2013; data shown is averaged at 5-minute intervals.*

Another issue affecting traffic flow is a high volume of local trips on the system. These are trips that begin and end within the study area. Many of these local trips are made by military personnel living off-base with their families in DuPont, Steilacoom, Lakewood or other nearby communities who generally use the gates closest to where they are stationed on base. This traffic competes with through traffic and contributes to the congestion and safety problems experienced on the corridor.

SAFETY AND VULNERABILITY TO DISRUPTIONS

Between 2007 and 2011, there were 2,344 recorded collisions on I-5 (mainline, ramps and ramp intersections) in the study area from south of Mounts Road to north of Bridgeport Way. Of this total, approximately 79 percent occurred on the I-5 mainline, with 21 percent occurring at the eight interchanges in this area. Over the five year period, this section of highway averaged over one collision per day with a significant proportion occurring during the PM peak period. Approximately 45 percent of collisions occurred between 3 and 7 PM, with nearly 30 percent during the period of highest traffic congestion from 4 to 6 PM. Slightly less than 20 percent of all collisions occurred during the AM peak period from 5 to 9 AM.

Within the core of the study area (i.e., the minimum IJR study area) over 1,708 collisions were reported during the same five-year time period. Of these collisions, 82 percent occurred on the I-5 mainline and 18 percent at the interchanges. Rear-end crashes accounted for 64 percent of these collisions; sideswipes were involved in 14 percent. Both collision types are indicative of high levels of congestion with frequent lane changes. Most of these collisions (70 percent) involved only property damage, but there were 23 collisions involving serious injury and three fatalities. Collision experience is particularly significant in the vicinity of the Main Gate, Berkeley Street and Thorne Lane interchanges. Along with the interchange at Steilacoom-DuPont Road, these interchanges represent the focus of the study area.

Collisions can have a major impact on freeway operations due to the length of time it can take to clear an incident and resume normal traffic operations. For example, a recent collision occurred on a weekday (February 28, 2013) at approximately 2 PM in the southbound direction. Traffic did not clear and begin to move until 4 PM. Northbound traffic remained slow until 7 PM, and southbound traffic did not resume normal speeds until after 8 PM (**Figure 12**).

IMPACTS ON TRANSIT OPERATIONS AND EFFICIENCY

There are currently three public transit providers operating within the study area: Intercity Transit (IT), Pierce Transit (PT) and Sound Transit (ST). Based in Thurston County, Intercity Transit operates five routes in the study area, and sub-contracts service for a sixth route. All routes provide access close to a JBLM gate, but none operate directly on the base due to strict security regulations prohibiting general public riders from entering the facility. Pierce Transit is responsible for local bus service in Pierce County and operates four routes that provide access to or close to JBLM. Route 206 operates between the Lakewood Transit Center and Madigan Hospital, and Route 300 serves McChord Field, operating between the Tacoma Mall Transit Center and the McChord Commissary. The Central Puget Sound transit provider, Sound Transit operates three express bus routes along the I-5 corridor within the study area. All service is provided during peak periods in the morning and evening. Sound Transit does not provide local bus service to JBLM. The closest stop is located at the Lakewood Sounder Station and park and ride lot. In late 2013, weekday ridership on all of these routes averaged just under 500 persons during the PM peak hour and nearly 1,100 persons during the three-hour PM peak period.

Unlike fixed route bus service, vanpools and carpools that carry base personnel do have ready access to and from JBLM. There are many vanpools sponsored by the major transit providers in the area that are currently connecting JBLM and other major employers with destinations throughout the region. In 2013, these vanpools carried approximately 725 people through the study area during the PM peak hour. Total transit and vanpool ridership equates to over 1,200 persons during the PM peak hour. It is estimated that this level of ridership removes approximately 1,000 vehicles from I-5 in the corridor during the PM peak hour.

Both transit service and vanpools are affected by freeway congestion, with existing PM peak travel times exceeding off-peak travel time by 75 percent. By 2040, travel times and the resulting reliability of transit and vanpool travel will worsen due to the lack of HOV lanes in the study area.

IMPACTS ON FREIGHT MOBILITY

I-5 is the most significant freight corridor in Washington State and is essential to the economic vitality of the Puget Sound region and the State's trade-dependent economy. I-5 is designated as a Class T1 freight highway indicating that it carries over 10,000,000 annual tons of freight, the highest category in the state. Within the study area, trucks currently comprise 12 percent of total daily traffic on I-5 north of the Steilacoom-DuPont Road interchange, of which 7 percent were doubles or triples. Trucks accounted for 10 percent of total daily traffic north of the Bridgeport Way interchange, of which 5 percent were doubles. These high truck volumes both contribute to congestion and are impacted by congestion. Particularly significant is the impact on northbound traffic in the vicinity of Mounts Road where I-5 is on an uphill grade and slow-moving trucks in the right lanes affect the overall movement of traffic through this area. As indicated in research done for the Washington Freight Plan, congestion translates into a direct increase in the cost of doing business for freight-dependent businesses. This cost increase is often passed along to consumers.

PHYSICAL LIMITATIONS AND DEFICIENCIES

There are a number of physical constraints affecting I-5 which limit both its operational effectiveness and its ability to address congestion. Several of the existing bridges along the highway were built during the 1950's and ten are functionally obsolete (i.e., Center Drive, Steilacoom-DuPont Road, Pendleton Avenue, Berkeley Street, Thorne Lane, New York Avenue,

Figure 13 *Many of the existing bridges crossing I-5 in the study area limit the ability to widen the freeway, such as this one at the Berkeley Street interchange.*

Bridgeport Way, 47th Avenue SE, South Tacoma Way, and SR 512). The narrow span of these bridges over the freeway prevents widening I-5, and constrains local cross-freeway traffic circulation (**Figure 13**).

An existing active railroad corridor adjacent to the southbound lanes of I-5 prohibits expansion of I-5 into the railroad right-of-way (**Figure 14**). Additionally, there are military installations on both sides of the freeway. Because of security restrictions, access to these installations is limited and alternative travel routes around JBLM would require long detours.

ISSUES RELATED TO JBLM ACCESS, LAND USE AND CIRCULATION NEEDS

Travel to and from JBLM is a significant contributor to traffic volumes along the I-5 corridor. As of 2011, an average of more than 158,000 vehicles travel through JBLM gates each weekday, with 80 percent using the I-5 corridor. This has significant implications for understanding the impact of JBLM traffic on the freeway, both today and in the future. All vehicles must be processed through one of 17 active security gates located on the controlled perimeter of the base. These gates are illustrated in **Figure 15**. Four of the highest volume JBLM Lewis gates are located within close proximity to the I-5 corridor (DuPont, Liberty/Lewis Main, 41st Street, and Madigan) and so is the high volume JBLM McChord Main Gate (Bridgeport Way). Other gate locations are served by Steilacoom-DuPont Road, 150th Street SW/Perimeter Road, SR 507 and other roads. Some of these roadways are not designed to accommodate high volumes of traffic.

The physical limitations of the freeway interchanges and local streets in the vicinity of JBLM gates occasionally contribute to traffic queues extending back onto the surrounding roadway system. Long queuing has occurred primarily on I-5 off-ramps. Recent changes to gate operations have improved traffic queuing at ramps. However, day-to-day variability in gate traffic levels can occasionally result in queues that negatively impact ramp and/or freeway traffic.

By 2040, average weekday traffic volumes entering and exiting from JBLM on a typical weekday are expected to increase by 16 percent to 181,000. This increase represents an annualized growth rate of 0.5 percent or the equivalent of approximately one additional brigade being located at the installation.

Accommodating this level of traffic growth in the study area is difficult, due to the physical limitations previously discussed. It should be noted that I-5 is

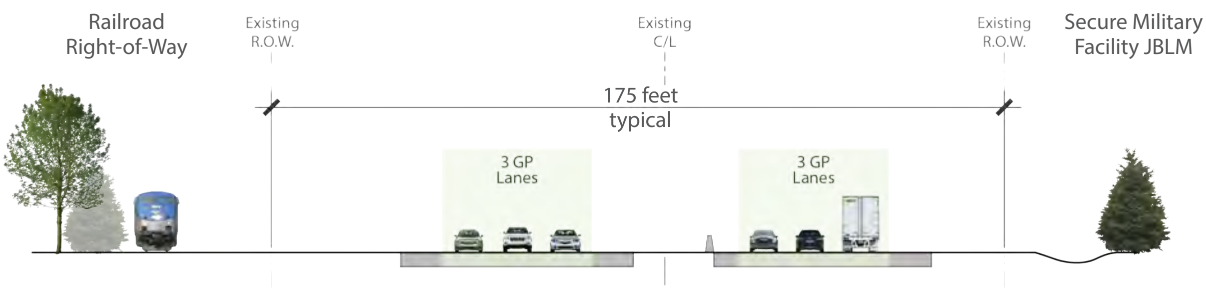


Figure 14 *Typical cross section of existing I-5 corridor through JBLM.*

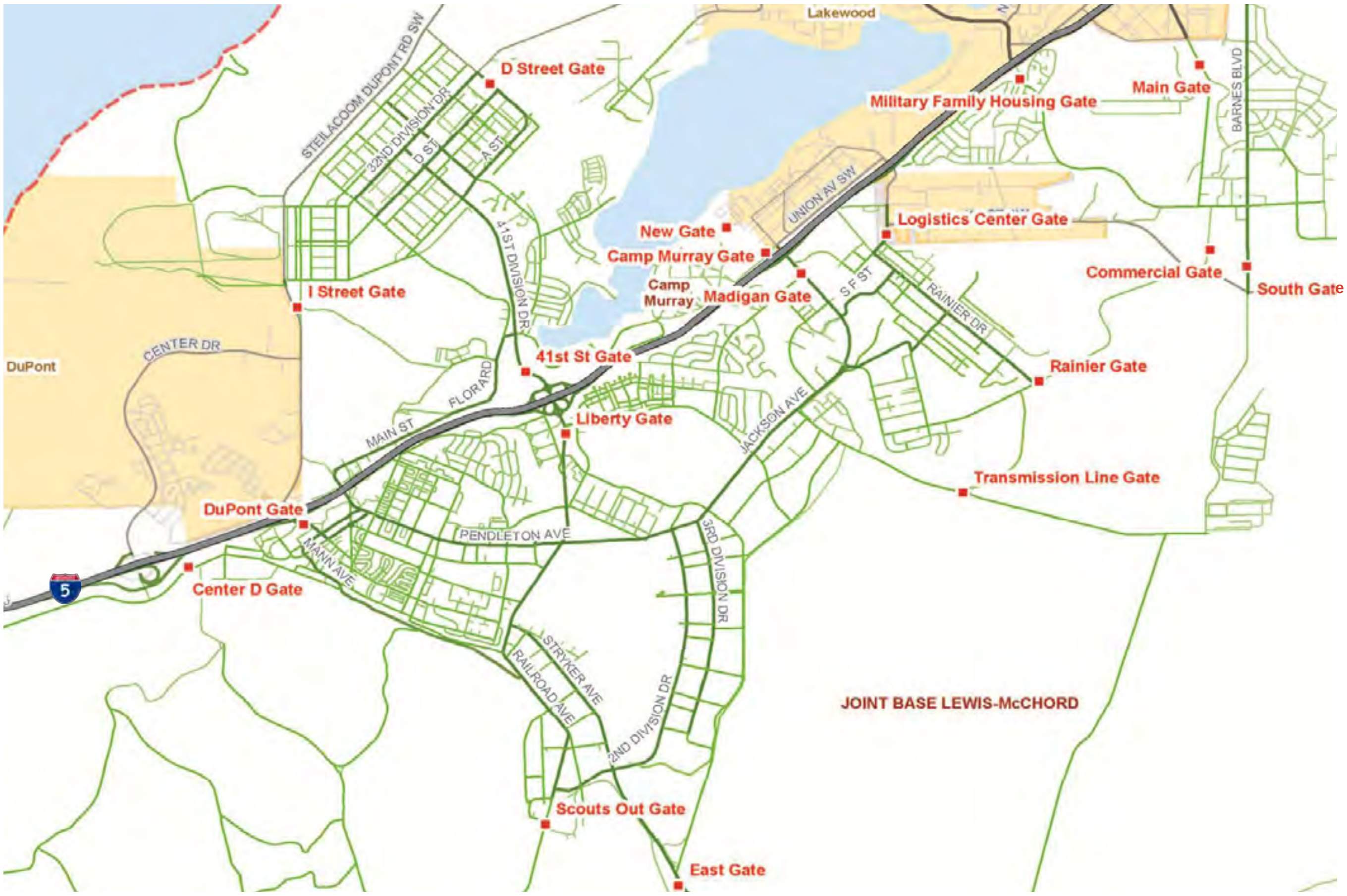


Figure 15 *JBLM gate locations.*

situated partially on an easement from the Department of Defense (DOD). Expansion of the existing easement to accommodate freeway improvements will require approval from DOD. If improvements are proposed that would affect military residential areas, the process to adjust the easement will take up to three years and will involve a private enterprise with a long-term lease on housing facilities within JBLM.

WHAT OPTIONS WERE CONSIDERED TO MANAGE DEMAND MORE EFFECTIVELY?

WSDOT is currently implementing a number of improvements to help manage demand through the study area. These include installation of ramp meters, variable message signs, and new closed circuit TV (CCTV) cameras connected via fiber optic cables. Several of these improvements were installed and made operational in 2010, including several new CCTV cameras and associated cable in the vicinity of Main Gate and Mounts Road. A ramp meter at the Mounts Road Northbound on-ramp was also installed in 2010.

Additional ramp meters, fiber optic cable, CCTVs and variable message signs will be installed within the study area by the end of 2014. These improvements, funded through the TIGER III (federal) grant program, will help manage entering traffic volumes at on ramps, provide opportunities for drivers to evaluate traffic conditions in the corridor before leaving home/office, and obtain information regarding travel conditions while on the highway via the new variable message signs. These improvements are consistent with the *Moving Washington* initiative that stresses effective management of travel demand and operational efficiency. **Figure 16** shows the general location of the new traffic management tools in the corridor.

In addition to the physical improvements mentioned above, Phase 1 included evaluation of the current use of transit and vanpooling through the corridor. Both Intercity Transit (Thurston County) and Pierce Transit offer bus routes and vanpool programs that traverse the corridor, with Intercity Transit providing the most transit service. Many of the buses operate at standing room only during peak commute times. In addition to bus service, Intercity Transit runs a robust vanpool program that provides vans assigned to JBLM and Camp Murray, as well as other employment destinations in Pierce and King Counties.

Pierce Transit also operates routes that serve JBLM and/or use the I-5 corridor, and offers a large vanpool program with over 30 vanpools currently assigned to JBLM. Pierce Transit also has 23 vanpools that use the corridor to serve non-military destinations such as State Farm and employment destinations in downtown Tacoma.

Current I-5 lane types provide no incentives for using transit in the corridor. Without designated HOV lanes, bus riders, vanpoolers and carpoolers all experience the same traffic congestion as drivers of single occupant vehicles. Existing heavy use of buses and vanpools through the study area demonstrates a demand for HOV facilities, as evidenced by the number of riders that choose these modes despite the lack of facilities that provide enhanced travel speeds/times for users.

Transit Service in the Study Area

Intercity Transit:

Weekdays between Tacoma/Lakewood and Olympia

- *28 northbound bus trips*
- *30 southbound bus trips*
- *37 vanpools serving JBLM*

Pierce Transit:

Weekdays between:

Lakewood Transit Center and Madigan Hospital

- *28 bus trips*

Tacoma Mall Transit Center and McChord Commissary

- *29 bus trips*

Weekday vanpool

- *> 30 vanpools serving JBLM*

The current transit programs and services provide a significant benefit to help relieve pressure on I-5. In all, these programs are accommodating more than half a lane's worth of capacity of equivalent vehicle trips that would otherwise be on the freeway.

Figure 16 *Location of new TIGER-III funded traffic management tools on the I-5 corridor .*

WHAT OPTIONS WERE CONSIDERED TO STRATEGICALLY ADD CAPACITY?

The study team worked in conjunction with project Stakeholders to develop a series of improvement scenarios for the I-5 mainline through the study area. Six potential cross-sections were identified and tested to determine their ability to improve traffic operations on the corridor. The three tenets of the *Moving Washington* initiative were used to identify and evaluate the mainline alternatives. A variety of lane types and configurations were considered including:

1. **Managed Lanes/HOV Lanes:** Travel lanes that are restricted to use by transit or ride share vehicles (2+ passengers) only, or require toll payments for use.
2. **General Purpose (GP) Lanes:** Travel lanes that are open to all types of traffic without restriction.
3. **Collector/Distributor (CD) Lanes:** Travel lanes that run parallel to a freeway and are separated by a barrier. These lanes channelize traffic that is entering or exiting and help reduce the number of conflict points associated with traffic getting on or off the mainline.
4. **Auxiliary Lanes:** A lane that is added to a freeway and extended for a short distance, generally connecting two or three interchanges.

Determining the configuration of the I-5 mainline is a key consideration in the development of an overall improvement strategy. Identifying the design year (2040) build-out width of I-5 is critical to assuring that interchanges, when built, are of sufficient width to span the future freeway width. Because overpass structures have a typical design life of 75 years, a primary objective and guiding principle of this study is to maintain flexibility in the design and ultimate configuration of I-5 over the long term. This will require a careful balance between securing the needed right-of-way (ROW) for the project design year of 2040 and allowing for future needs that go beyond the 2040 horizon. This will be more evident as footprints for the new bridges are sized to support the long term width needs of I-5 without requiring reconstruction in later years.

To achieve this objective, the team used a "layering" approach to develop mainline alternatives. Each mainline scenario was created by adding lanes of various types (HOV, general purpose, collector/distributor, and/or auxiliary) and testing to determine effectiveness in addressing congestion, improving safety, increasing transit and ride share opportunities, decreasing friction, and balancing travel lanes through the area. Six scenarios were developed as illustrated in **Figure 17** and described below:

- **Scenario 1a:** Adds a managed lane/HOV lane in each direction, maintains three general purpose lanes through the study area.
- **Scenario 1b:** Adds a combination of CD roads and auxiliary lanes at strategic locations, maintains three general purpose lanes through the study area.
- **Scenario 2:** Adds a GP lane in each direction.
- **Scenario 3:** Adds a managed lane/HOV lane in each direction and a combination of CD roads and auxiliary lanes at strategic locations along I-5.
- **Scenario 4:** Adds a managed lane/HOV lane and a fourth GP lane in each direction.
- **Scenario 5:** Adds a managed lane/HOV lane and a fourth GP lane in each direction, as well as a combination of CD roads and auxiliary lanes at strategic locations.

Figure 17 *Mainline existing cross-section (2040 No-Build Condition) and alternative scenario cross-sections (Scenarios 1a – 5).*

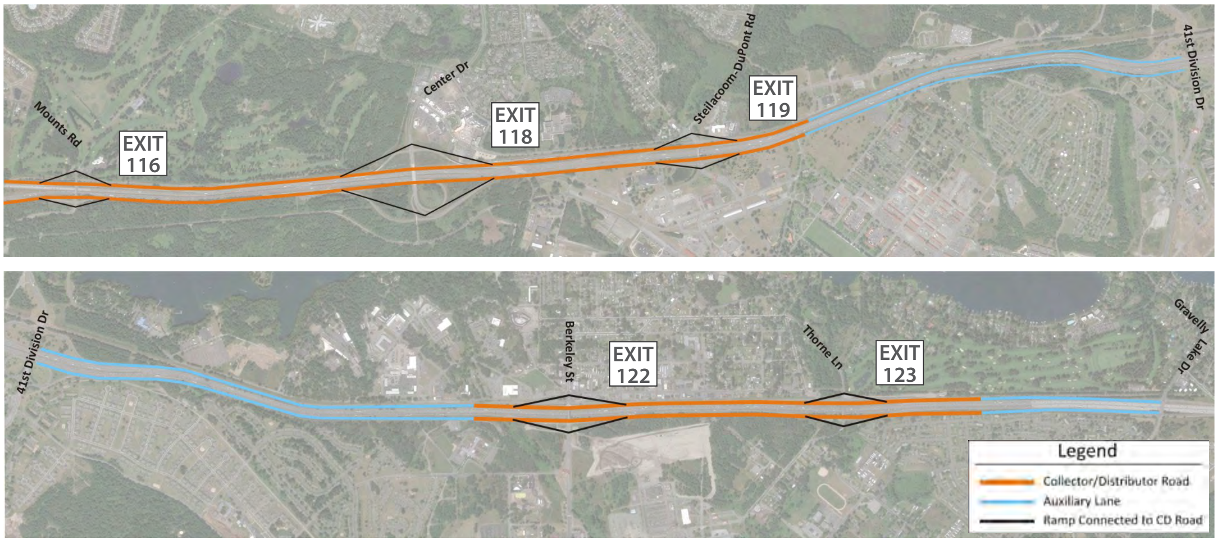


Figure 18 *Location of CD roads and auxiliary lanes.*

Several of the scenarios include CD roads and auxiliary lanes. These lanes are under consideration due to the constraints along the corridor associated with the secure military installations and railroad line. **These constraints complicate the use of local connections or frontage roads which are typically the first choice in improvements that can relieve pressure on freeway systems.** The CD roads and auxiliary lanes would be integrated into the I-5 mainline where they would provide the most operational benefit. Because the two types of lanes function differently, they are not both needed in the same segments of the corridor. **Figure 18** shows the general locations for the CD roads and auxiliary lanes for the scenarios that include them.

WHAT PROCESS WAS USED TO EVALUATE THE I-5 MAINLINE SCENARIOS?

In order to determine which I-5 mainline scenario, or scenarios, to carry forward into Phase 2, an evaluation framework was created to score each scenario across several metrics. The specific metrics were selected for their representation of freeway performance as determined in several different ways:

- **Speed:** This data provides a measure of operational performance for the single highest travel hour during both the morning and evening commute periods. The evaluation used a weighted average of AM and PM peak hour speeds on all segments of I-5 through the study area in both the northbound and southbound directions.

  > 50 mph
  45 to 50 mph
  36 to 44 mph
  20 to 35 mph
  < 20 mph

- **Hours of Congestion:** This metric provides a second operational performance measure that focuses on congestion throughout the day, versus speed which captures only

  0 hours
  1 hour
  2 hours
  3-4 hours
  5+ hours

the peak morning and evening travel hours. The evaluation used the worst case segment for each of the 12 hour AM and PM time periods in both northbound and southbound directions.

- **Person Trips:** The total number of people anticipated to travel through the corridor in both directions during the morning and evening peak hours. This metric is important because it captures the benefit of enhanced transit in the corridor. The study used the weighted average of AM and PM peak hour person trips on all segments of I-5 through the study area in both the northbound and southbound directions.

  - > 9,600 person trips
  - 8,400 - 9,599 person trips
  - 7,200 - 8,399 person trips
  - 6,000 - 7,199 person trips
  - < 6,000 person trips

- **Friction/Conflict Relief:** The high number of vehicles entering and exiting the freeway through the study area has been identified as a significant cause of the congestion experienced today. CD roads in appropriate locations would address this issue by reducing the number of conflict points. Added capacity in the form of general purpose lanes will also provide some friction relief, but less than a CD road. No scenario will remove all conflict; accordingly, the highest score (excellent) was not given to any of the scenarios.

  - excellent: removes all friction/conflict points
  - very good: removes several friction/conflict points
  - good: provides some friction/conflict point relief
  - fair: provides minimal friction/conflict point relief
  - poor: removes zero friction/conflict points

- **Environmental:** Scores represent the anticipated impacts to the built and natural environment typically evaluated under NEPA using the qualitative information gathered during Phase 1. The scoring was categorized as noted on the right, and is a comparative analysis of how each of the alternatives performs in relation to the others.

  - lowest impact
  - moderately low impact
  - moderate impact
  - moderately high impact
  - highest impact

- **Cost:** The cost of each scenario was not quantitatively calculated in Phase 1. Instead, the general magnitude of construction cost was compared among the scenarios, assuming that the No Build alternative would have the lowest cost and Scenario 5 would have the highest cost.

  - excellent: lowest magnitude of capital cost
  - very good: second lowest magnitude of capital cost
  - good: middle range of capital cost
  - fair: second highest capital cost
  - poor: highest magnitude of capital cost

SCORING RANGE

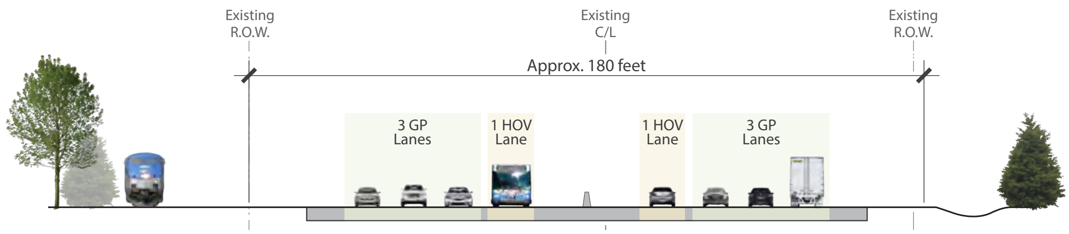
Each color ball was assigned a point value as shown to the right. The scores for each evaluation category were then calculated to determine which mainline scenario(s) performed the best overall. The full results of the analysis can be found in the *Corridor Plan Feasibility Study* document.

- 5 points
- 4 points
- 3 points
- 2 points
- 1 point

Following identification of the mainline I-5 scenarios, the cross-sections were input into a transportation model to analyze how they would accommodate the anticipated 2040 traffic volumes. The model provided input to calculate traffic speeds and volumes. This information was then used to calculate hours of congestion and number of people who were expected to travel through the corridor in the peak period.

The key findings for each of the scenarios are noted on the following pages.

Scenario 1a – 3 General Purpose Lanes and 1 HOV Lane



AM Peak Hour													
	Criteria												
Location	Speed (mph) GP Lanes		Speed (mph) HOV Lane		Hours of Congestion* GP Lanes		Hours of Congestion* HOV Lane		Person Trips		Friction/Conflict Relief	Environmental	Cost
	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB			
Overall - AM	34	52	56	59	3	1	0	0	8,400	6,850	See Below		

PM Peak Hour													
	Criteria												
Location	Speed (mph) GP Lanes		Speed (mph) HOV Lane		Hours of Congestion* GP Lanes		Hours of Congestion* HOV Lane		Person Trips		Friction/Conflict Relief	Environmental	Cost
	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB			
Overall - PM	29	20	53	52	5	7	0	0	7,970	8,780	See Below		

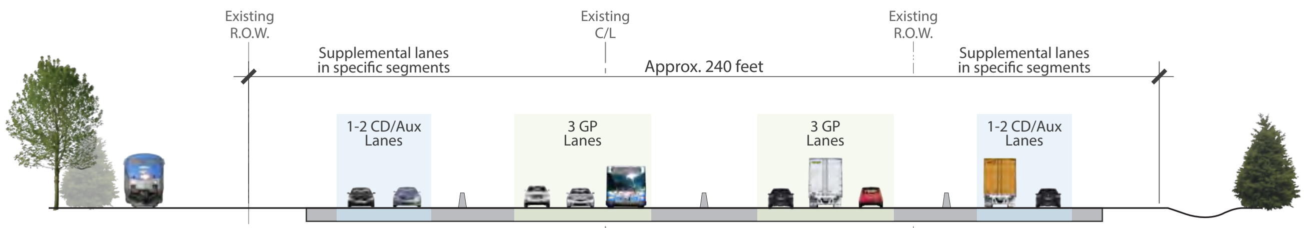
Scoring Summary													
	Criteria												
Location	Speed GP Lanes		Speed HOV Lane		Hours of Congestion GP Lanes		Hours of Congestion HOV Lane		Person Trips		Friction/Conflict Relief	Environmental	Cost
	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB			
	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score
Scenario 1A	2	3.5	5	5	1.5	2.5	5	5	3.5	3	2	3	4

*Hours of Congestion represents the total number of congested hours for a 12-hour period (12am - 12pm or 12pm - 12am) and is not specific to a peak hour

In 2040:

- Corridor remains highly congested
- Speeds:
  - General Purpose Lanes:
    - AM peak northbound = 34 mph, southbound = 52 mph
    - PM peak northbound = 29 mph, southbound = 20 mph
  - HOV Lanes:
    - AM peak northbound = 56 mph, southbound = 59 mph
    - PM peak northbound = 53 mph, southbound = 52 mph
- Congestion:
  - PM – long durations of congestion especially northbound between Steilacoom-DuPont and Berkeley, and southbound south of Steilacoom-DuPont in General Purpose lanes; free flowing in HOV lanes
  - AM – moderate durations, especially northbound between Mounts and Berkeley in General Purpose lanes; free flowing in HOV lanes

Scenario 1b – 3 General Purpose Lanes with CD/Auxiliary Roads



AM Peak Hour

Location	Speed (mph) GP Lanes NB	Speed (mph) GP Lanes SB	Speed (mph) HOV Lane NB	Speed (mph) HOV Lane SB	Hours of Congestion* GP Lanes NB	Hours of Congestion* GP Lanes SB	Hours of Congestion* HOV Lane NB	Hours of Congestion* HOV Lane SB	Person Trips NB	Person Trips SB	Friction/Conflict Relief	Environmental	Cost
Overall - AM	48	54			6	1			8,680	7,490	**See Below**		

PM Peak Hour

Location	Speed (mph) GP Lanes NB	Speed (mph) GP Lanes SB	Speed (mph) HOV Lane NB	Speed (mph) HOV Lane SB	Hours of Congestion* GP Lanes NB	Hours of Congestion* GP Lanes SB	Hours of Congestion* HOV Lane NB	Hours of Congestion* HOV Lane SB	Person Trips NB	Person Trips SB	Friction/Conflict Relief	Environmental	Cost
Overall - PM	31	22			4	5			8,110	8,630	**See Below**		

Scoring Summary

Location	Speed GP Lanes NB Score	Speed GP Lanes SB Score	Speed HOV Lane NB Score	Speed HOV Lane SB Score	Hours of Congestion GP Lanes NB Score	Hours of Congestion GP Lanes SB Score	Hours of Congestion HOV Lane NB Score	Hours of Congestion HOV Lane SB Score	Person Trips NB Score	Person Trips SB Score	Friction/Conflict Relief Score	Environmental Score	Cost Score
Scenario 1B	**3**	**3.5**			**1.5**	**2.5**			**3.5**	**3.5**	**4**	**3**	**3**

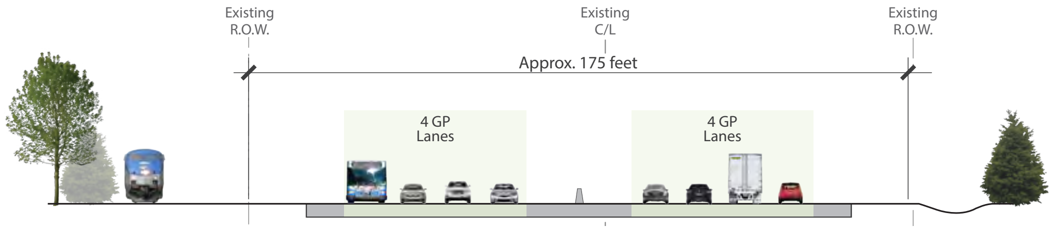
*Hours of Congestion represents the total number of congested hours for a 12-hour period (12am - 12pm or 12pm - 12am) and is not specific to a peak hour

= Not applicable

In 2040:

- Corridor remains congested, especially in PM peak
- Speeds:
  - AM peak northbound = 48 mph, southbound = 54 mph
  - PM peak northbound = 31 mph, southbound = 22 mph
- Congestion:
  - PM – moderate to high durations, significant congestion northbound north of Berkeley, and southbound south of Thorne to Berkeley and south of Steilacoom-DuPont
  - AM – moderate to high durations, significant congestion northbound between Berkeley and Thorne
- Capacity provided by CD roads is filled back up by latent demand; volumes especially high on CD roads northbound in the AM peak
- Does not provide HOV facilities to encourage non-Single Occupant Vehicle (SOV) modes

Scenario 2 – 4 General Purpose Lanes



AM Peak Hour													
	Criteria												
Location	Speed (mph) GP Lanes		Speed (mph) HOV Lane		Hours of Congestion* GP Lanes		Hours of Congestion* HOV Lane		Person Trips		Friction/Conflict Relief	Environmental	Cost
	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB			
Overall - AM	37	55			2	1			8,810	7430	**See Below**		

PM Peak Hour													
	Criteria												
Location	Speed (mph) GP Lanes		Speed (mph) HOV Lane		Hours of Congestion* GP Lanes		Hours of Congestion* HOV Lane		Person Trips		Friction/Conflict Relief	Environmental	Cost
	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB			
Overall - PM	42	26			3	4			8,700	7950	**See Below**		

Scoring Summary													
	Criteria												
Location	Speed GP Lanes		Speed HOV Lane		Hours of Congestion GP Lanes		Hours of Congestion HOV Lane		Person Trips		Friction/Conflict Relief	Environmental	Cost
	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB			
	Score	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**
Scenario 2	**3**	**3.5**			**2.5**	**3**			**4**	**3**	**2**	**3**	**4**

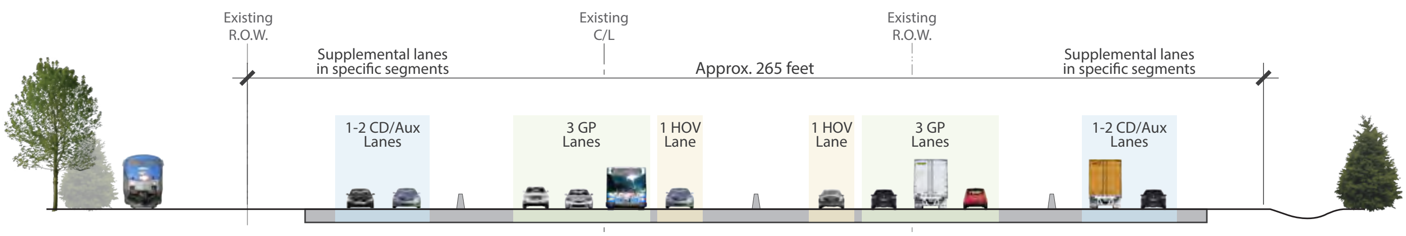
*Hours of Congestion represents the total number of congested hours for a 12-hour period (12am - 12pm or 12pm - 12am) and is not specific to a peak hour

= Not applicable

In 2040:

- Corridor remains moderately congested overall, especially in PM peak
- Speeds:
  - AM peak northbound = 37 mph, southbound = 55 mph
  - PM peak northbound = 42 mph, southbound = 26 mph
- Congestion:
  - PM – moderate durations southbound south of Steilacoom-DuPont, and northbound north of Berkeley
  - AM – moderate durations throughout corridor
- Person trips increase compared to Scenarios 1a and 1b
- Does not provide HOV facilities to encourage non-SOV modes
- Does not mitigate friction/conflict areas due to high on and off ramp movements

Scenario 3 – 3 General Purpose Lanes, 1 HOV Lane, and CD/Auxiliary Roads



AM Peak Hour

Location	Speed (mph) GP Lanes NB	Speed (mph) GP Lanes SB	Speed (mph) HOV Lane NB	Speed (mph) HOV Lane SB	Hours of Congestion* GP Lanes NB	Hours of Congestion* GP Lanes SB	Hours of Congestion* HOV Lane NB	Hours of Congestion* HOV Lane SB	Person Trips NB	Person Trips SB	Friction/Conflict Relief	Environmental	Cost
Overall - AM	55	56	56	59	3	1	0	0	9,320	7,280	**See Below**		

PM Peak Hour

Location	Speed (mph) GP Lanes NB	Speed (mph) GP Lanes SB	Speed (mph) HOV Lane NB	Speed (mph) HOV Lane SB	Hours of Congestion* GP Lanes NB	Hours of Congestion* GP Lanes SB	Hours of Congestion* HOV Lane NB	Hours of Congestion* HOV Lane SB	Person Trips NB	Person Trips SB	Friction/Conflict Relief	Environmental	Cost
Overall - PM	39	31	53	50	3	2	0	0	8,730	9,710	**See Below**		

Scoring Summary

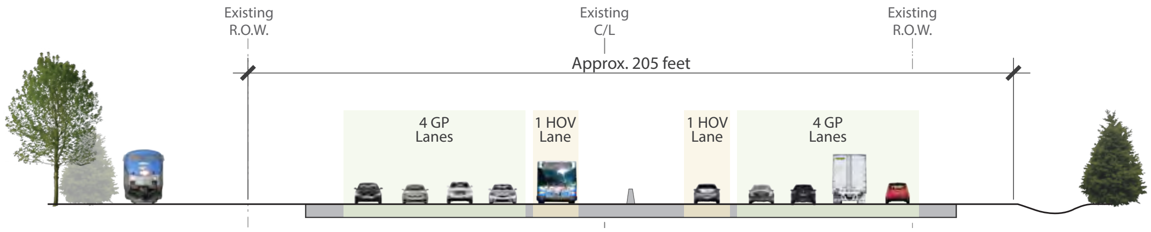
Location	Speed GP Lanes NB Score	Speed GP Lanes SB Score	Speed HOV Lane NB Score	Speed HOV Lane SB Score	Hours of Congestion GP Lanes NB Score	Hours of Congestion GP Lanes SB Score	Hours of Congestion HOV Lane NB Score	Hours of Congestion HOV Lane SB Score	Person Trips NB Score	Person Trips SB Score	Friction/Conflict Relief Score	Environmental Score	Cost Score
Scenario 3	4	3.5	5	4.5	2	3.5	5	5	4	4	4	2	2

*Hours of Congestion represents the total number of congested hours for a 12-hour period (12am - 12pm or 12pm - 12am) and is not specific to a peak hour

In 2040:

- Corridor congestion improved compared to preceding scenarios
- Speeds:
  - General Purpose Lanes:
    - AM peak northbound = 55 mph, southbound = 56 mph
    - PM peak northbound = 39 mph, southbound = 31 mph
  - HOV Lane:
    - AM peak northbound = 56 mph, southbound = 59 mph
    - PM peak northbound = 53 mph, southbound = 50 mph
- Congestion:
  - PM – moderate durations north and southbound in General Purpose lanes; HOV lane experiences no congestion during PM peak
  - AM – moderate durations northbound, and low durations southbound; HOV lane experiences no congestion during AM peak
- Person trips is second highest among all the alternatives
- HOV lane runs at 90% capacity during peak periods
- CD road close to capacity northbound north of Berkeley in the PM and northbound north of Mounts Road in the AM; may need 2 lane CD configuration due to demand

Scenario 4 – 4 General Purpose Lanes and 1 HOV Lane



AM Peak Hour													
	Criteria												
Location	Speed (mph) GP Lanes		Speed (mph) HOV Lane		Hours of Congestion* GP Lanes		Hours of Congestion* HOV Lane		Person Trips		Friction/Conflict Relief	Environmental	Cost
	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB			
Overall - AM	45	57	56	58	2	0	0	0	9,260	7,250	See Below		

PM Peak Hour													
	Criteria												
Location	Speed (mph) GP Lanes		Speed (mph) HOV Lane		Hours of Congestion* GP Lanes		Hours of Congestion* HOV Lane		Person Trips		Friction/Conflict Relief	Environmental	Cost
	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB			
Overall - PM	53	29	52	52	2	4	0	0	8,510	9,640	See Below		

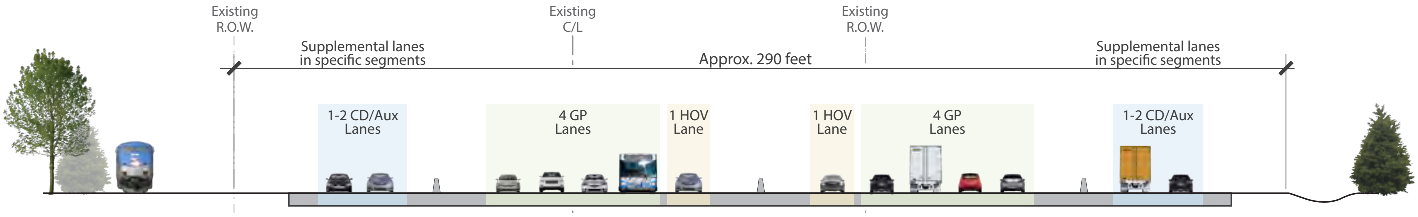
Scoring Summary													
	Criteria												
Location	Speed GP Lanes		Speed HOV Lane		Hours of Congestion GP Lanes		Hours of Congestion HOV Lane		Person Trips		Friction/Conflict Relief	Environmental	Cost
	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB			
	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score
Scenario 4	4.5	3.5	5	5	3	3.5	5	5	4	4	3	3	3

*Hours of Congestion represents the total number of congested hours for a 12-hour period (12am - 12pm or 12pm - 12am) and is not specific to a peak hour

In 2040:

- Corridor congestion improved compared to preceding scenarios
- Speeds:
  - General Purpose Lanes:
    - AM peak northbound = 45 mph, southbound = 57 mph
    - PM peak northbound = 53 mph, southbound = 29 mph
  - HOV Lane:
    - AM peak northbound = 56 mph, southbound = 58 mph
    - PM peak northbound = 52 mph, southbound = 52 mph
- Congestion:
  - PM – moderate durations northbound and more extended for southbound in General Purpose lanes; free flowing both directions in HOV lane
  - AM – moderate durations northbound, low southbound in General Purpose lanes; free flowing both directions in HOV lane
- HOV lane runs at approximately 90% of capacity in PM peak and 70% of capacity in AM peak

Scenario 5 – 4 General Purpose Lanes, 1 HOV Lane, and CD/Auxiliary Roads



AM Peak Hour

Location	Speed (mph) GP Lanes NB	Speed (mph) GP Lanes SB	Speed (mph) HOV Lane NB	Speed (mph) HOV Lane SB	Hours of Congestion* GP Lanes NB	Hours of Congestion* GP Lanes SB	Hours of Congestion* HOV Lane NB	Hours of Congestion* HOV Lane SB	Person Trips NB	Person Trips SB	Friction/Conflict Relief	Environmental	Cost
Overall - AM	60	60	56	59	0	0	0	0	9,440	7,290	See Below		

PM Peak Hour

Location	Speed (mph) GP Lanes NB	Speed (mph) GP Lanes SB	Speed (mph) HOV Lane NB	Speed (mph) HOV Lane SB	Hours of Congestion* GP Lanes NB	Hours of Congestion* GP Lanes SB	Hours of Congestion* HOV Lane NB	Hours of Congestion* HOV Lane SB	Person Trips NB	Person Trips SB	Friction/Conflict Relief	Environmental	Cost
Overall - PM	60	52	54	52	2	0	0	0	8,690	10,060	See Below		

Scoring Summary

Location	Speed GP Lanes NB Score	Speed GP Lanes SB Score	Speed HOV Lane NB Score	Speed HOV Lane SB Score	Hours of Congestion GP Lanes NB Score	Hours of Congestion GP Lanes SB Score	Hours of Congestion HOV Lane NB Score	Hours of Congestion HOV Lane SB Score	Person Trips NB Score	Person Trips SB Score	Friction/Conflict Relief Score	Environmental Score	Cost Score
Scenario 5	5	5	5	5	4	5	5	5	4	4	4	2	1

*Hours of Congestion represents the total number of congested hours for a 12-hour period (12am - 12pm or 12pm - 12am) and is not specific to a peak hour

In 2040:

- Most of corridor free flowing, with exception of moderate congestion northbound in the PM peak
- Speeds:
  - General Purpose Lanes:
    - AM peak northbound and southbound = 60 mph
    - PM peak northbound = 60 mph, southbound = 52 mph
  - HOV Lane:
    - AM peak northbound = 56 mph, southbound = 59 mph
    - PM peak northbound = 54 mph, southbound = 52 mph
- CD roads run at or slightly over capacity, need 2 CD lanes to handle AM peak
- Over builds the facility and may lose the benefit of an HOV lane (no incentive to use it)
- Widest footprint and greatest right-of-way impact of all scenarios

The table below (**Figure 19**) shows summarized results for all scenarios. The existing congestion commonly experienced by regular users of study roadways was confirmed and defined by this study. Additionally, as the study progressed, it was determined that the combination of improvements in Scenario 5 provided a level of performance that could not be justified on the basis of cost-efficiency. However, the 2040 No-Build Condition and Scenario 5 were retained to serve as low and high "bookends" that could be used to evaluate the relative performance of the remaining viable scenarios. When the scores related to all metrics for each of the scenarios were compiled, Scenarios 1a through 4 had scores that ranged from 24.4 to 37.4. The scenarios with the most consistent high performance and point totals were Scenario 3 and Scenario 4. These two scenarios will be advanced to Phase 2 for additional analysis prior to selecting the preferred future mainline configuration.

Summary

Scenario	Speed GP Lanes	Speed HOV Lanes	Hours of Congestion GP Lanes	Hours of Congestion HOV Lanes	Person Trips	Friction/Conflict Relief	Environmental	Cost	Score
Category Weight	*1.00*	*1.00*	*1.50*	*1.00*	*2.00*	*1.50*	*1.00*	*1.00*	*10.00*
	Score	Score	Score	Score	Score	Score	Score	Score	
2040 Base Condition	**2.25**		**1.5**		**2.75**	**1**	**5**	**5**	**21.50**
Scenario 1A	**2.75**	**5**	**2**	**5**	**3.25**	**2**	**3**	**4**	**32.25**
Scenario 1B	**3.25**		**2**		**3.5**	**4**	**3**	**3**	**25.25**
Scenario 2	**3.25**		**2.75**		**3.5**	**2**	**3**	**4**	**24.38**
Scenario 3	**3.75**	**4.75**	**2.75**	**5**	**4**	**4**	**2**	**2**	**35.63**
Scenario 4	**4**	**5**	**3.25**	**5**	**4**	**3**	**3**	**3**	**37.38**
Scenario 5	**5**	**5**	**4.5**	**5**	**4**	**4**	**2**	**1**	**38.75**

LEGEND

4.5 - 5 points | 3.5 - 4.49 points | 2.5 - 3.49 points | 1.5 - 2.49 points | 0 - 1.49 points

Figure 19 *Scoring summary of mainline alternative scenarios; the 2040 No-Build Condition and Scenario 5 represent bookend scenarios that were used to qualitatively score the other scenarios and were not under consideration as viable solutions.*

WHAT INTERCHANGE OPTIONS WERE CONSIDERED TO SUPPORT THE MAINLINE ALTERNATIVES?

Many improvement concepts were considered at the four focus interchanges: Steilacoom-DuPont Road, 41st Division/Main Gate, Berkeley Street and Thorne Lane. Only the most promising concepts were advanced for further consideration and refinement.

Four types of interchanges were determined to be the most appropriate in the study area. These concepts are illustrated and briefly described in **Figure 20**:

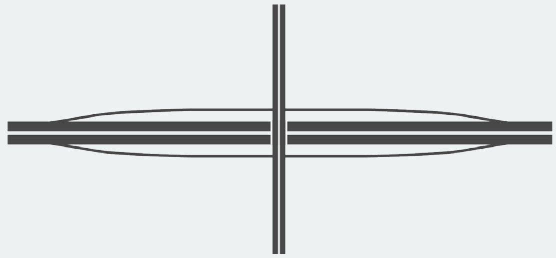
- Tight Diamond Interchange
- Single Point Urban Interchange (SPUI)
- Full Cloverleaf Interchange
- Diverging Diamond Interchange (DDI)

PREFERRED INTERCHANGE CONCEPTS

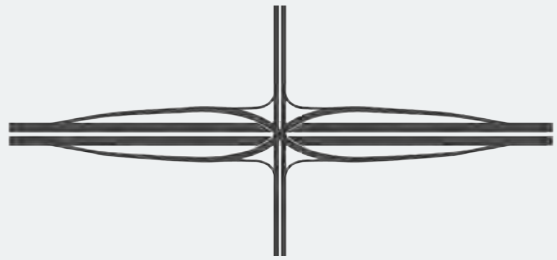
At each of the focused area interchanges one or more of these four concepts were evaluated to determine their respective benefits and opportunities, and to identify any potential issues or impacts. An evaluation matrix was prepared to compare the various options for each interchange and included the following considerations:

- Mobility and Operations
- Environmental Factors
- JBLM Access and Circulation

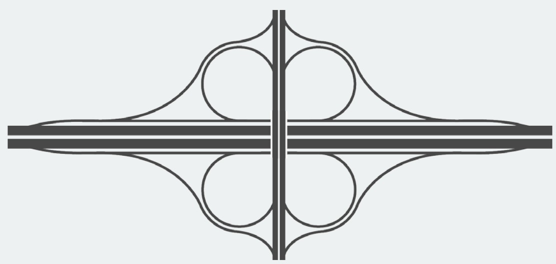
Based on this initial evaluation, it was determined that at least two to three improvement concepts would be advanced and further refined during Phase 2. The refinement process will ensure that the chosen interchange concept will fit with the preferred mainline highway improvement concept. Final interchange recommendations for each location will be made as part of this process and identified in the project IJR document.



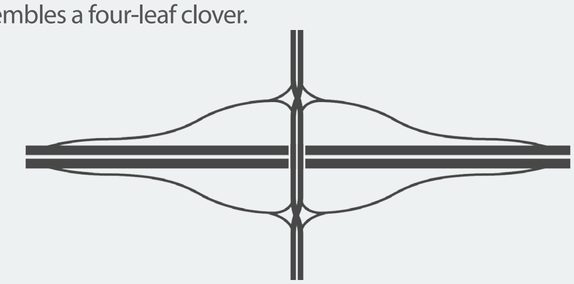
TIGHT DIAMOND INTERCHANGE – The simplest and most common type of interchange. This interchange has two on-ramps and two off-ramps.



SINGLE POINT URBAN INTERCHANGE (SPUI) – This interchange improves operations at high traffic interchanges by requiring all left-turning traffic to pass through a single and more efficient intersection.



FULL CLOVERLEAF INTERCHANGE – A two-level interchange where left turns are made on physically-separated, free-flowing ramps. When viewed from the air this interchange resembles a four-leaf clover.



DIVERGING DIAMOND INTERCHANGE (DDI) – Type of diamond interchange in which traffic on the arterial crosses to the opposite side of the road so all left turns can be made without conflicts. Usually has 2 signalized intersections that operate more efficiently than traditional diamonds.

Figure 20 *Interchange types appropriate to the study area.*

Improvement concepts for each focus area interchange are described below. For more detailed information, see the *I-5 JBLM Corridor Plan Feasibility Study*.

Steilacoom-DuPont Road Interchange (Exit 119)

The Steilacoom-DuPont Road interchange serves the City of DuPont, the Town of Steilacoom and JBLM including both Lewis North and Lewis Main areas. To the east of I-5, Steilacoom-DuPont Road becomes Clark Road and accesses JBLM through the DuPont Gate. Interchange improvement concepts identified for further study include:

CONCEPT A – DIVERGING DIAMOND INTERCHANGE (DDI)

Pros

- Provides railroad grade separation and increases spacing from Barksdale intersection
- Addresses northbound off-ramp queue to JBLM and increases spacing from Center Drive interchange
- Consolidates ramp signals to two locations with only two signal phases, allows free left and right turns
- Relocates DuPont gate and provides more spacing from freeway ramps

Cons

- Changes local street connections including access to commercial properties that may require adjustment
- May impact wetlands and/or JBLM historic resources

CONCEPT B – OFFSET TIGHT DIAMOND INTERCHANGE

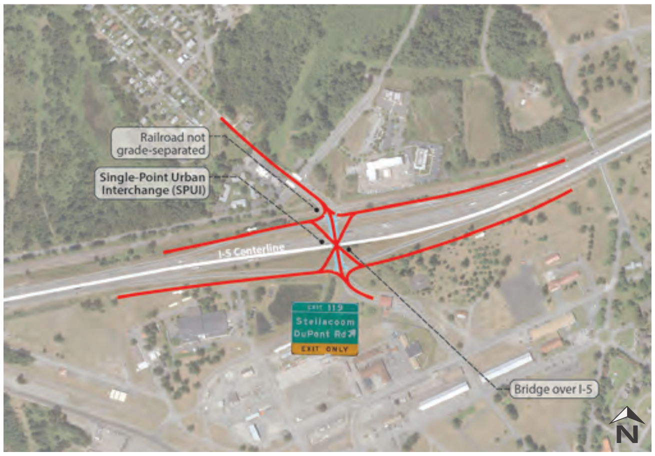
Pros

- Provides railroad grade separation and increases spacing from Barksdale intersection
- Addresses northbound off-ramp queue to JBLM and increases spacing from Center Drive interchange
- Relocates DuPont gate and provides more spacing from freeway ramps

Cons

- Changes local street connections including access to commercial properties that may require adjustment
- May impact wetlands and/or JBLM historic resources
- Requires adding a fifth lane on bridge over I-5 to provide left turn vehicle storage at ramps, compared to four lanes with Concept A

CONCEPT C – SINGLE POINT URBAN INTERCHANGE (SPUI)



Pros

- Consolidates ramp signals to one location
- Traffic operates with greater efficiency than tight diamond
- Slightly increases spacing from Barksdale intersection

Cons

- Does not grade-separate road from railroad or improve interchange spacing along I-5
- Does not improve queuing at JBLM gate and ramp junctions
- Complicated construction (on existing footprint)
- May impact JBLM memorial groves

41st Division Drive/Main Gate Interchange (Exit 120)

The 41st Division/Main Gate Interchange serves as the primary access to Lewis Main on the east side of I-5 and to Lewis North on the west side. Interchange improvement concepts identified for further study include:

CONCEPT A – MODIFIED CLOVERLEAF INTERCHANGE WITH GRADE-SEPARATED SOUTHBOUND OFF-RAMP TO LEWIS NORTH

Pros

- Realigns northbound loop ramps to provide more space for mainline widening and more weaving distance between northbound exit and entry on loop ramps
- Grade separates southbound off-ramp to Lewis North from railroad
- Reduces morning peak period traffic queues for southbound traffic exiting to Lewis North gate
- Does not separate 41st Division Drive from the railroad, but reduces traffic volumes crossing the railroad
- Improves access to Lewis North, but reduces space for Main Gate queue

Cons

- Would impact JBLM leased housing area and does not improve gate operations or on-base traffic movement

CONCEPT B – DIVERGING DIAMOND INTERCHANGE (DDI) WITH REALIGNED I-5 AND NEW INTER-BASE CONNECTION

Pros

- Eliminates cloverleaf ramps and at-grade railroad crossing
- Realigns I-5, shifting the mainline west and removing the existing S-curve
- Improves southbound off-ramp queuing and removes inter-base traffic from interchange by providing alternative secure route via new bridge over I-5 between Lewis North and Lewis Main
- Consolidates ramp signals to two locations with only two signal phases, allows free left and right turns
- Improves on-base traffic circulation and eliminates 41st Division gate
- Increases distance of freeway from base housing, avoids impacting leased housing area
- Opportunity for transit drop-off area outside Liberty Gate

Cons

- May require modifications to Main Gate (more capacity)
- Increases local inter-base traffic adjacent to JBLM housing
- New inter-base connection may impact Lewis Park

CONCEPT C – TIGHT DIAMOND INTERCHANGE WITH REALIGNED I-5 AND NEW INTER-BASE CONNECTION

Pros and Cons

- Same as Concept B except less efficient traffic signal operations

CONCEPT D – TIGHT DIAMOND INTERCHANGE WITH REALIGNED I-5 AND NEW INTER-BASE CONNECTION

Pros

- Similar to Concepts B and C, but maintains 41st Division gate and extends 41st Division Drive over the railroad from the interchange to the gate, allowing for secure internal connection between Lewis North and Lewis Main
- Inter-base connector shifted south to provide clearance for southbound ramps from higher 41st Division Drive bridge over railroad

Cons

- Requires two grade-separations to eliminate the at-grade railroad crossing
- Does not address southbound ramp queuing, including access to Lewis North

Berkeley Street Interchange (Exit 122)

The Berkeley Street Interchange accesses the Tillicum neighborhood in the southwestern portion of the City of Lakewood on the west side of I-5. East of I-5, Berkeley Street becomes Jackson Avenue and accesses the Madigan Gate to JBLM. Interchange improvement concepts identified for further study include:

CONCEPT A – TIGHT DIAMOND INTERCHANGE

Pros

- Simplifies bridge structure and may reduce construction costs
- Potentially improves vertical clearance over I-5 with new bridge type

Cons

- Impacts queue area at Madigan Gate
- Does not grade-separate the railroad
- May impact Murray Creek

CONCEPT B – SINGLE POINT URBAN INTERCHANGE (SPUI)

Pros

- Consolidates ramp signals to one location for greater efficiency
- Slightly improves spacing to the Union Avenue intersection
- Potentially improves vertical clearance over I-5 with new bridge type

Cons

- Does not grade-separate the railroad
- Complicates bridge design and increases bridge costs
- May impact Murray Creek

Thorne Lane Interchange (Exit 123)

On the west of I-5, Thorne Lane accesses the Tillicum neighborhood of the City of Lakewood. East of I-5, Thorne Lane becomes Murray Road and accesses a small portion of Lakewood and the Logistics Gate to JBLM. Interchange improvement concepts identified for further study include:

CONCEPT A – OFFSET DIVERGING DIAMOND INTERCHANGE (DDI)

Pros

- Creates a grade separation from the railroad
- Simplifies construction (built offset) and reduces bridge structure costs

Cons

- Requires a loop-back road to connect with Union Avenue
- Impacts wetlands and may increase noise impacts due to higher bridge structure
- Requires realignment of Murray Road

CONCEPT B – OFFSET TIGHT DIAMOND INTERCHANGE

Pros and Cons

- Similar to Concept A but maintains tight diamond configuration, which operates less efficiently than a diverging diamond and requires a five-lane bridge over I-5 to accommodate left turn lanes

CONCEPT C – OFFSET SINGLE POINT URBAN INTERCHANGE (SPUI)

Pros

- Effects similar to Concept A except also consolidates ramp signals to one location for greater efficiency

Cons

- Similar to Concept A except more complicated bridge design with increased costs compared to Concept A

HOW WILL THE CORRIDOR FEASIBILITY STUDY HELP GUIDE FUTURE DECISIONS?

As noted in the beginning of the Summary Report, this Study represents the first phase of a two-phased effort to address existing and expected future congestion and safety problems along I-5 through JBLM. The purpose of Phase 1 is to recommend a focused range of improvement options that can be further explored in the Phase 2 study effort, including a multimodal Alternatives Analysis and NEPA/SEPA environmental documentation. If interchange modifications are included in the preferred alternative, an IJR will be prepared. Through the Alternatives Analysis and environmental processes, the Phase 2 work will recommend phased improvement projects to reduce congestion along the I-5 corridor. This priority array will be used to assist policy makers in endorsing the initial set of improvements for funding and implementation, as well as overall project sequencing.

This framework plan will also validate and support prioritization of those improvements in the Puget Sound Regional Council (PSRC) 2040 Plan, as well as on-going planning and future programming by JBLM and the partnering agencies. The public acceptance and awareness of a strategic plan to improve I-5 through the JBLM area will provide significant momentum as the process advances into the next phase of development.

Phase 2 of the project will identify a preferred alternative that may include I-5 mainline enhancements, a recommended interchange configuration for each of the I-5 focus interchanges, a list of local highway improvements, and/or alternative travel modes. It will define the highest priority projects (those with the most benefit and reasonable implementation timelines), and prepare the necessary environmental documentation with supporting engineering for the project.

WHAT ACTIONS AND IMPROVEMENTS DOES THE STUDY RECOMMEND AND WHY?

The guidance provided by Phase 1 includes the following specific actions and I-5 improvement recommendations that will be further explored and developed in Phase 2, along with other local highway improvements and alternative travel modes:

RECOMMENDED I-5 MAINLINE SCENARIOS

From the traffic operational analyses and mainline evaluations presented previously, Scenario 3 and Scenario 4 have demonstrated the most benefit to achieve the project's objectives in the 2040 Design Year. Elements of the I-5 mainline facility would be added over time as warranted by demand. If advances in technology allowed for higher capacity and throughput with fewer lanes, the phased implementation over time would be adjusted accordingly.

- Scenario 3 would add an HOV lane and CD road or auxiliary lanes in each direction along the corridor.
- Scenario 4 would add a fourth general purpose lane and an HOV lane in each direction along the corridor.

The combination of CD roads or auxiliary lanes, coupled with through lane capacity in these scenarios, exhibit the following benefits that will be further evaluated in Phase 2:

- **Multimodal Benefits** – Both scenarios include HOV lanes to encourage non-SOV travel by providing faster speeds and reduced travel time in HOV/managed lanes.

- **Reduce Side Friction** – Both of these scenarios provide additional lanes to reduce the side friction effect of traffic merging and weaving across several lanes. Scenario 3 includes CD road and/or auxiliary lanes, while Scenario 4 adds a fourth general purpose lane through the entire corridor.
- **Maintain Flexibility** – These scenarios provide long-term flexibility in implementing each component of the preferred mainline improvement plan as the corridor evolves over time.

Phase 2 will also evaluate off-mainline alternatives to the CD road concept (i.e. local road improvement options).

RECOMMEND INTERCHANGE CONCEPTS FOR FURTHER ANALYSIS

Together with the Technical Support Team, the study team reviewed various interchange concepts from previous studies and developed several others based on the congestion issues and JBLM gate operations at the four focus interchanges. Each interchange location was analyzed to determine the most appropriate configurations to be carried forward for consideration in Phase 2. Based on the review of various interchange types, the Technical Support Team selected four types of interchanges for consideration.

- Tight Diamond Interchange
- Diverging Diamond Interchange (DDI)
- Full Cloverleaf Interchange
- Single Point Urban Interchange (SPUI)

As discussed earlier in this summary report, two to four interchange concepts were recommended at each of the four focus area interchanges including Steilacoom-DuPont Road, 41st Division/Main Gate, Berkeley Street and Thorne Lane. The ability of these options to improve traffic cross-circulation and internal connectivity for JBLM and to reduce impacts from JBLM gate operations will also be considered. These concepts will be further refined during Phase 2 and a final recommendation will be made when the IJR document is approved. The refinement process will ensure that the chosen interchange configuration fits with the selected mainline improvement scenario.

IDENTIFY MULTIMODAL IMPROVEMENTS FOR FURTHER STUDY

There are substantial benefits to implementing a multimodal improvement strategy that includes managed lanes, improved transit service and enhanced TDM activities. As the second largest employer in Washington State, JBLM offers significant potential to benefit from improved transit and TDM services, and specific improvement strategies will be developed. However, improved service must also adequately address base security needs. Transit priority options and flyer-stop opportunities will also be explored as a part of Phase 2.

ASSESS LOCAL STREET IMPROVEMENT OPTIONS

Local street improvements can also help reduce demand at the interchanges and along the I-5 mainline. These local improvement projects can reduce the traffic volume getting on I-5 for short trips in the study area, provide better connectivity within local communities, provide alternative routes to using I-5, and reduce congestion at interchange ramp intersections. Local street options, including within JBLM, will be considered within the context of the mainline and interchange improvement options that are carried forward.

CONDUCT ENVIRONMENTAL STUDIES NEEDED FOR NEPA/SEPA COMPLIANCE

Building on the initial environmental scan conducted for Phase 1, more in-depth evaluation of the environmental consequences and benefits associated with a preferred improvement alternative will be conducted. Early in Phase 2, an environmental scoping Notice of Intent will be prepared and released for public comment. This Notice starts the formal NEPA/SEPA process that will ultimately lead to appropriate environmental clearance and an impact mitigation strategy.

DEVELOP AN IMPLEMENTATION STRATEGY

With the selection of a recommended set of improvement projects within the study area, a strategy to accomplish the timely and appropriate sequencing of construction along the corridor will be developed. This strategy will be based on the evaluation process conducted during Phase 2. It will include:

- A list of recommended improvements for inclusion in local, regional and state plans.
- A prioritized array of projects for use in identification of funding needs over time.