April 2015

Federal Way Link Extension

Draft Environmental Impact Statement

TRANSPORTATION TECHNICAL REPORT

Appendix G1

SOUNDTRANSIT
Central Puget Sound
Regional Transit Authority

U.S. Department of Transportation
Federal Transit Administration

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SOUNDTRANSIT

Federal Way Link Extension

Transportation Technical Report

Prepared for:
Sound Transit

Prepared by:
CH2M HILL

April 2015

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Acronyms and Abbreviations

ADA	Americans with Disabilities Act
ADT	average daily traffic
CAC	collision analysis corridor
EIS	Environmental Impact Statement
FGTS	Freight Goods Transportation System
FHWA	Federal Highway Administration
FWLE	Federal Way Link Extension
HC	Highline College
HCM	Highway Capacity Manual
HCT	high-capacity transit
HOV	high-occupancy vehicle
HSM	*Highway Safety Manual*
HSS	Highway of Statewide Significance
I-5	Interstate 5
ITE	Institute of Transportation Engineers
LOS	level of service
Metro	King County Metro Transit
MEV	million entering vehicles
MIC	manufacturing and industrial centers
mph	miles per hour
MVMT	million vehicle miles traveled
N/A	not applicable
NHS	National Highway System
PDO	property damage only
PSCR	Puget Sound Regional Council
RPZ	residential parking zones
Sea-Tac Airport	Seattle-Tacoma International Airport

SOV	single-occupant vehicle
SR	State Route
ST	Sound Transit
ST2	Sound Transit 2
TCQSM	Transit Capacity and Quality of Service Manual
TRB	Transportation Research Board
TWSC	two-way stop controlled
v/c	volume to capacity ratio
VHD	vehicle hours of delay
VHT	vehicle hours traveled
VMT	vehicle miles traveled
WSDOT	Washington State Department of Transportation

1.0 Introduction

1.1 Project Background

The Central Puget Sound Regional Transit Authority (Sound Transit) is proposing to expand the regional light rail system south from the city of SeaTac to Federal Way, Washington, as shown in Exhibit 1-1. This project is currently known as the Federal Way Link Extension (FWLE). The FWLE corridor was included in Sound Transit's 1996 *Regional Transit Long-Range Vision* (Sound Transit, 1996a) and in the 2014 *Regional Transit Long-Range Plan* (Sound Transit, 2014b). Sound Move, adopted in 1996 (Sound Transit, 1996b), implemented the first phase of the *Regional Transit Long-Range Vision*. In 2008, the voters approved financing for the Sound Transit 2 Plan (Sound Transit, 2008; "ST2"), which prioritized the second round of regional transit system investments, including the FWLE.

This 7.6-mile extension would connect the future Angle Lake Station at S 200th Street in SeaTac with the Federal Way Transit Center in Federal Way. The FWLE corridor parallels State Route (SR) 99 and Interstate 5 (I-5), and generally follows a topographic ridge between Puget Sound and the Green River Valley.

Major east-west arterials connecting I-5 and SR 99 include Kent-Des Moines Road (SR 516), S 272nd Street, and S 320th Street, which are served by major transit stops, including the Kent-Des Moines Park-and-Ride, Redondo and Star Lake park-and-rides (S 272nd Street), Federal Way Transit Center (S 317th Street), and Federal Way S 320th Street Park-and-Ride. According to the 2010 U.S. Census, the combined population for the cities in the FWLE corridor was approximately 240,000, with SeaTac's population at 26,909, Des Moines' at 29,673, Kent's at 92,411, and Federal Way's at 89,306. Key issues facing the corridor include growth in north-south transit demand, populations that are highly transit-dependent, and lack of reliable and efficient transit service.

1.2 Transportation Elements and Study Area

The analysis of the transportation system considered a number of transportation elements, including regional facilities and travel, transit operations, arterial and local street operations and safety, parking, nonmotorized facilities, and freight mobility and access.

This technical report discusses each transportation element individually. The discussion of each element covers the affected environment for the existing year (2013, when the data were collected), and the expected long-term and short-term environmental impacts for the design year (2035) (comparing the No Build Alternative to the build alternatives), including potential mitigation.

In addition to this Chapter 1, Introduction, this report comprises the following chapters:

- Chapter 2, Methodology and Assumptions, summarizes the analysis methods used to assess the alternatives in this report.
- Chapter 3, Affected Environment, discusses existing transportation conditions.

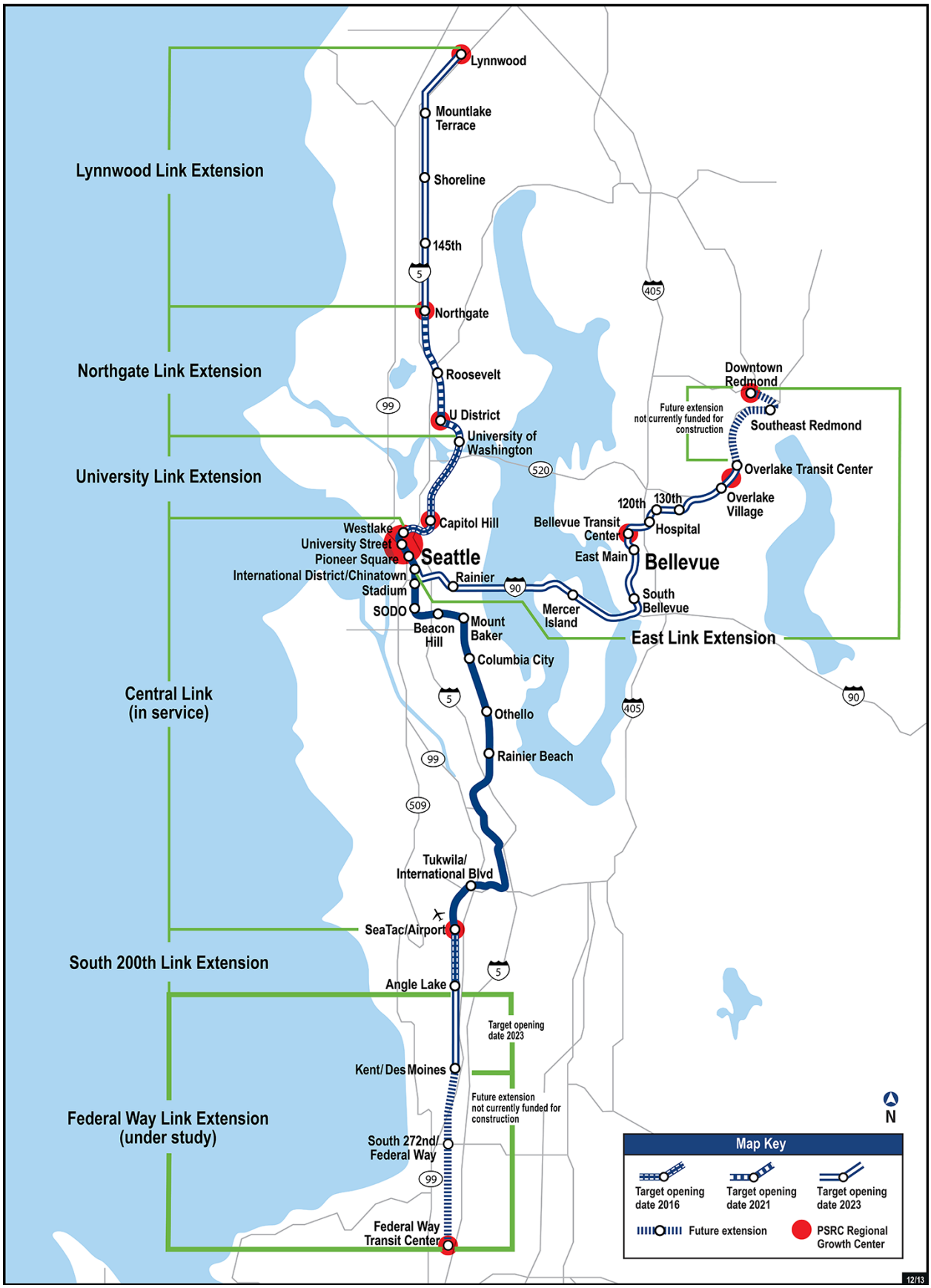


EXHIBIT 1-1
Sound Transit Link Light Rail System and FWLE Location

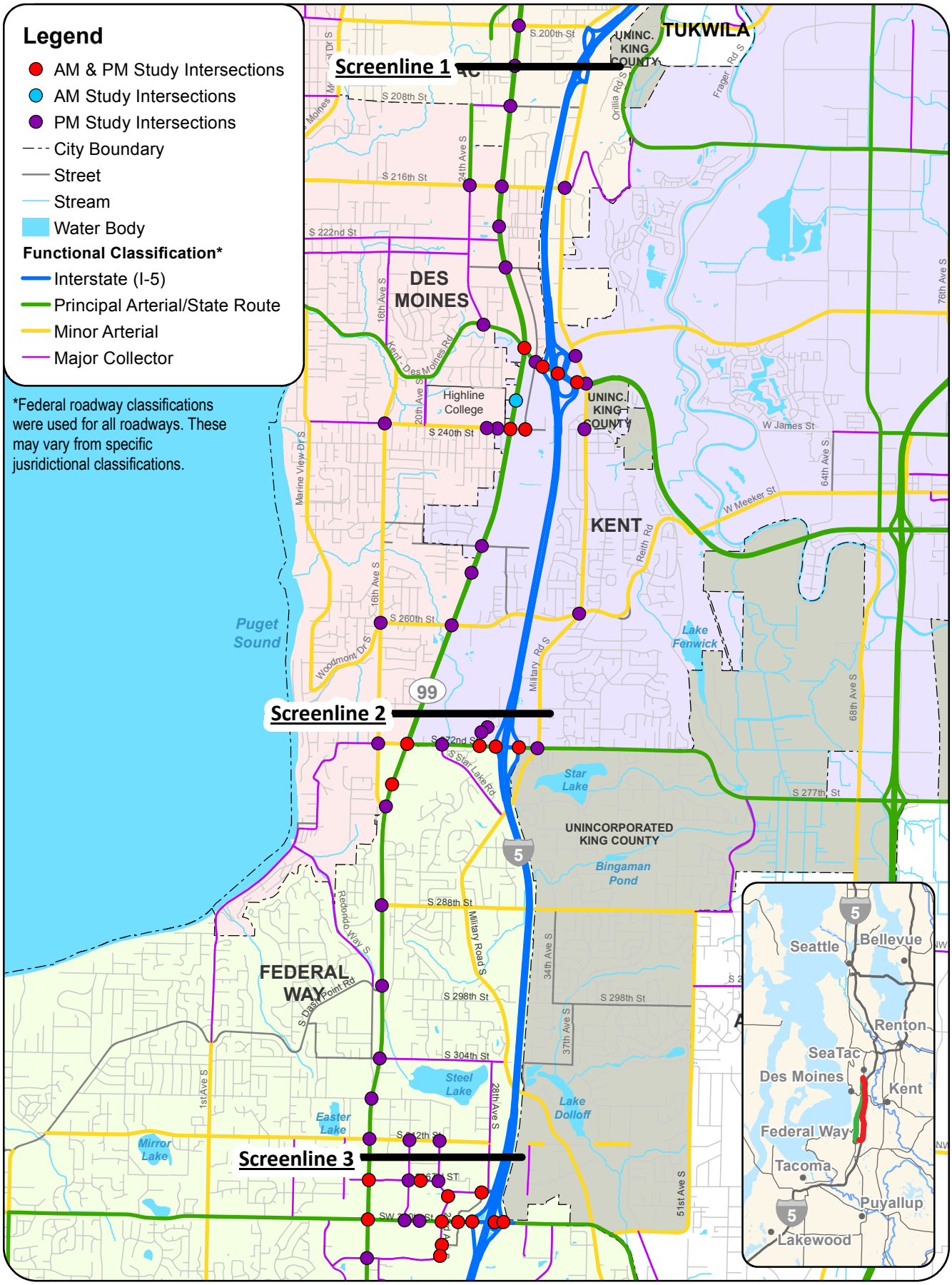
- Chapter 4, Environmental Impacts, describes anticipated impacts in terms of the following:
  - Regional facilities and travel
  - Transit operations
  - Arterial and local street operations
  - Safety
  - Parking
  - Nonmotorized facilities
  - Freight mobility and access
- Chapter 5, Construction Impacts, discusses expected transportation impacts resulting from project construction activities.
- Chapter 6, Indirect Impacts, describes the project impacts that could occur later in time or some distance from the project.
- Chapter 7, Potential Mitigation Measures, describes the potential measures that could be implemented to mitigate effects of the project.
- Chapter 8, Cumulative Impacts, describes the potential additional cumulative transportation effects of other projects that were not included in the traffic and ridership modeling.
- Chapter 9, References, lists the sources used in preparing this report.

The following appendices support information presented in this report:

- Appendix A, Transportation Technical Analysis Methodology
- Appendix B, Level of Service Definitions Used for Federal Way Link Extension Analysis
- Appendix C, Existing and Future Transit Routes and Level of Service
- Appendix D, Existing and Future Intersection Level of Service Results
- Appendix E, I-5 Ramp Terminal Queue Length Results
- Appendix F, Pedestrian Level of Service
- Appendix G, Construction Staging Areas and Haul Route Assumptions
- Appendix H, I-5 Clear Zone Analysis

Highway operations and safety are addressed under Regional Facilities and Travel (screenline performance), Arterial and Local Street Operations (I-5 ramp terminal intersection operations and off-ramp queues), and Safety (crash history and clear zone). Navigable waterways are not evaluated in this analysis because there are no such waterways in the FWLE transportation study area (study area).

The study area for this transportation analysis generally includes the SR 99 and I-5 corridors from S 200th Street in SeaTac to approximately S 324th Street in the City of Federal Way. Study intersections were identified at major arterial junctions and near station areas. For nonmotorized and parking facilities, a fixed buffer or radius was defined for analysis purposes. Specific study areas vary by transportation element and are described in following sections. Exhibit 1-2 shows the overall transportation study area and other key transportation study elements.



Data Sources: King County (2013)

N

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EXHIBIT 1-2
FWLE Transportation Study Area

Federal Way Link Extension

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5.0 Construction

This chapter provides an overview of potential construction impacts and mitigation measures for regional transportation facilities and travel, transit, arterials and local streets, parking, nonmotorized facilities, and freight mobility and access that would be caused by construction of the Federal Way Link Extension (FWLE) build alternatives. Construction activities for the FWLE would include civil construction, systems installation, testing, and startup activities. Civil construction includes site preparation as well as the construction of the physical infrastructure. Activities would be most intense in the initial part of construction, with later years involving stations and trench finishing and systems installation.

For all build alternatives, construction would likely be staged and occur in work zones approximately 1/2 mile long. Construction activities expected to have roadway impacts are utility relocation, street reconstruction, foundation and column construction, guideway placement, truck hauling, demolition, and construction staging. The impacts from truck hauling were evaluated based on the number of truck trips and potential haul routes, as discussed in the following subsection.

Construction of the build alternatives would result in temporary impacts on the roadways, transit service, sidewalks, and parking within most construction zones. The overall construction duration would be about 3.5 to 5 years; however, most impacts would occur during the civil construction period, which would range from 1 to 4 years. To reduce the overall project construction period, the contractor may be required to use multiple work crews/work zones along the FWLE corridor at any given time. The general schedule for the construction activities listed above are:

- The utility relocation phase would last approximately 3 to 6 months for all relocations in a 1/2-mile segment.
- Street reconstruction would last approximately 6 months for a 1/2-mile segment of roadway.
- Foundation and column construction would last approximately 6 to 8 months for each 1/2-mile segment. Construction of longer guideway spans would take longer, up to a year and a half.
- The last major construction activity with roadway impacts—guideway placement—would last approximately 6 months for a 1/2-mile segment.

Most of the construction activities listed above may include temporary lane closures and require traffic control plans to maintain circulation and property access.

Key observations and findings related to the construction of the build alternatives include the following:

- Wherever an elevated guideway alignment is constructed over a street, nighttime closures of lanes would be required for portions of the construction period.

- Trenching under S 216th Street, S 240th Street, S 272nd Street, and State Route (SR) 99 would be completed in stages to maintain full access for traffic. Construction could result in the temporary narrowing or closure of lanes, removal of dedicated turn lanes, and roadway re-alignments.
- Trenching under the S 272nd Street and S 320th Street Interstate 5 (I-5) southbound on-/off-ramps would require periodic nighttime or weekend ramp closures.
- Truck access to the guideway construction would be along city arterials leading to streets adjacent to the guideway. Access is not expected directly from the I-5 mainline, although trucks may use I-5 for trips to and from other locations in the region. For these trips, access would be from existing on- and off-ramps.
- Construction of the light rail station at either the S 272nd Redondo Trench Station Option or S 272nd Star Lake Station Option park-and-rides would temporarily reduce or eliminate park-and-ride spaces available for use by transit patrons.
- During construction, where the light rail alignment is parallel to the I-5 mainline (from approximately S 211th Street to S 317th Street), a temporary construction barrier would be placed near the southbound I-5 edge of pavement where barriers are not already present. This could result in an increase of up to four crashes per year.

A Maintenance of Traffic Plan that addresses all modes would be prepared during subsequent FWLE design phases for agency approval. Construction Impacts specific to each alternative and station option are described below.

5.1 Regional Facilities and Travel

State Route (SR) 99 and I-5 are the two key regional facilities that serve the study area. All alternatives along SR 99 would have some impact on travel along SR 99 and could affect short portions of regional travel through the study area. Approval would be needed from the Washington State Department of Transportation (WSDOT) and/or local jurisdictions for traffic control plans on SR 99 and I-5 for all alternatives. Impacts specific to each alternative are described below.

5.1.1 Impacts by Alternative

5.1.1.1 SR 99 Alternative

Under the SR 99 Alternative, the major civil construction within the median of SR 99 would likely occur in 1/2-mile segments over a period of approximately 1 year, including reconstruction of SR 99 (up to 6 months) and guideway construction (6 to 8 months). Construction of the SR 99 Alternative in the median of SR 99 would require the closure of adjacent travel lanes. On SR 99, during peak hours, one travel lane in each direction of travel would likely be closed directly adjacent to the construction area. It is expected that this lane closure would have temporary impacts on traffic operations along SR 99. Therefore, within the construction area, the existing high-occupancy vehicle (HOV) lanes would be converted to allow access for all traffic during the construction.

During peak periods, many intersections along SR 99 operate at level of service (LOS) D or worse, and therefore a reduction in peak direction capacity would increase congestion and travel time through the

construction area. This impact would be less in the non-peak direction because volumes are lower. Converting the HOV lane to allow all vehicles access would provide some congestion relief for the 1/2-mile segment being constructed. In general, during off-peak periods and overnight, a maximum of two lanes in each direction would be closed for construction activities because traffic volumes along SR 99 decrease substantially, especially overnight.

When the guideway transitions to and from the SR 99 median, a direction of SR 99 could be closed or the travel lanes could be realigned when installing box girders. This would be a short-term closure that would likely occur during nights or over a weekend. Once the girders are installed, at least two lanes of traffic would be maintained in each direction during peak periods for the remaining long-term civil construction period. During construction, vertical clearance would be maintained on SR 99. To reduce the overall project construction periods, the contractor may be required to use multiple work crews/work zones along the corridor at any given time. Any changes in SR 99 operations would require approval from WSDOT.

As the guideway transitions from the SR 99 median into the Federal Way Transit Center from approximately S 308th Street to S 316th Street, the construction period would increase and may require short-term closures of SR 99 because the guideway width would be wider through this section. Detour routes may include 14th Avenue S and 18th Avenue S.

At signalized intersections within the construction zone, left-turning vehicles from SR 99 would be restricted and vehicles would be rerouted to a nearby intersection. These vehicles could either turn in advance of the construction zone or make a U-turn after the construction zone. Midblock U-turns would also be closed within the construction area, and vehicles would be rerouted to another intersection.

With SR 99 lane closures, some traffic may divert to parallel roads, including I-5, Military Road, 24th Avenue S, 30th Avenue S, and 16th Avenue S to avoid delays on SR 99. If a portion of SR 99 is temporarily closed for nights and/or weekends, the traffic detour routes for SR 99 north of Kent-Des Moines Road would likely include 24th Avenue S west of SR 99 and 30th Avenue S and possibly Military Road east of SR 99. South of Kent Des-Moines Road, 16th Avenue S could serve as a detour route west of SR 99, but there would be limited detour options east of SR 99 and the detour would likely require the use of Military Road S. During off-peak periods and weekends, traffic volumes are generally lower than during peak commute periods, and detour routes would have more capacity to handle increased traffic from SR 99. Traffic impacts on arterials and local streets are discussed further in Section 5.3.2.

Up to 15 trucks per hour would access the construction area along SR 99. For station construction and staging areas, 4 to 15 trucks per hour are estimated from each work area. These trucks include construction material deliveries (steel, concrete, and other miscellaneous materials), haul excavation and backfill vehicles, and contractor vehicles. For elevated guideway construction, peak truck trips are estimated at 4 to 8 trucks per hour for concrete delivery. The increase in trucks could cause a small delay increase at intersections along the haul route.

Station Options

S 216th Station Options

Impacts on regional facilities with the potential additional S 216th West or East station option would be the same as the SR 99 Alternative.

Kent/Des Moines HC Campus Station Option

Impacts on regional facilities with the Kent/Des Moines HC Campus Station Option would be the same as the SR 99 Alternative.

Kent/Des Moines HC from S 216th West Station Option

From S 208th Street to approximately 1/4 mile north of Kent-Des Moines Road, the Kent/Des Moines HC from S 216th West Station Option would not have any impacts on SR 99 because the guideway would be located west of SR 99. This station option would have the same impacts as the SR 99 Alternative south of S 242nd Street.

Kent/Des Moines SR 99 Median Station Option

The Kent/Des Moines SR 99 Median Station option would be constructed in multiple phases and would shift southbound traffic to the east or west of the median, depending on the construction phase. Northbound traffic would be rerouted to 30th Avenue S at S 240th Street and rerouted back on to SR 99 at S 236th Lane. Additional rerouting is discussed in Section 5.3.2.1. This station option would have the same impacts as the SR 99 Alternative north of Kent-Des Moines Road and south of S 242nd Street.

Kent/Des Moines SR 99 East Station Option

Impacts on regional facilities with the Kent/Des Moines SR 99 East Station Option would be the same as the SR 99 Alternative.

S 260th Station Options

Impacts on regional facilities from the potential additional S 260th West or East station option would be the same as the SR 99 Alternative.

S 272nd Redondo Trench Station Option

Construction activities for the trench under SR 99 south of S 279th Street for the S 272nd Redondo Trench Station Option would likely be completed in stages in order to maintain traffic on SR 99 in all directions during trench construction. Construction would likely require the narrowing of lanes and the median to shift traffic through the construction zone in order to maintain two lanes in each direction during peak periods. Plates over the guideway construction area may be required on SR 99. The trenching under SR 99 would likely occur over a period of up to 1 year.

From 16th Avenue S to S 308th Street, this station option would not impact SR 99 because the guideway is located to the west of SR 99.

Federal Way SR 99 Station Option

Impacts on regional facilities with the Federal Way SR 99 Station Option would be the same as the SR 99 Alternative, except south of S 312th Street. Impacts on this segment of SR 99 would be minimized

because the guideway would transition out of the SR 99 median at this location and would not require any substantial closures of SR 99 besides occasional nights or weekends.

5.1.1.2 I-5 Alternative

Construction for the I-5 Alternative would have minimal impacts on highway operations on the I-5 mainline or shoulders. All of the construction activities would occur west of the I-5 mainline. The I-5 southbound ramps at the Kent-Des Moines Road interchange would require closure or temporary realignment of the ramps during the installation of the girders for the guideway bridges across Kent-Des Moines Road. These short-term closures would occur during nights or over a weekend.

Construction of the I-5 Alternative guideway over SR 99 near S 208th Street would require periodic nighttime or weekend closures of SR 99 and lane reductions during other hours. The inside southbound travel lane would be closed during construction of a column in the median. The existing southbound SR 99 HOV lane in this construction area would be converted to allow access for all traffic during construction. Full night and weekend closures of all northbound lanes or southbound lanes (at different times) would be required when guideway construction is occurring over these lanes.

The roundabout at S 317th Street and 28th Avenue S. would require reconstruction where the guideway crosses under the intersection. The temporary conversion of this intersection from a roundabout to a stop-controlled intersection during construction is not expected to result in impacts on the I-5 317th direct-access ramps or the I-5 mainline because this intersection has low traffic volumes.

Up to 15 trucks per hour would access the construction area via arterials, local streets, and I-5 interchanges. This increase in trucks could cause a small increase in delay at the ramp terminal intersections.

Station and Alignment Options

Kent/Des Moines At-Grade Station Option

The Kent/Des Moines At-Grade Station Option would have the same regional facilities impacts as the I-5 Alternative.

Kent/Des Moines SR 99 East Station Option

The Kent/Des Moines SR 99 East Station Option would have similar impacts to regional facilities as the I-5 Alternative, although no impacts would occur at the I-5 southbound ramps at Kent-Des Moines Road.

Landfill Median Alignment Option

Construction of the guideway within the I-5 median for the Landfill Median Alignment Option would require the closure of the inside shoulder for approximately 1/2 mile between S 240th Street and S 259th Place in each direction on I-5 during the guideway construction, which could take approximately 4 to 6 months. Closing the I-5 inside shoulder would reduce the I-5 mainline capacity through this ½-mile work zone.

Construction over the southbound lanes of I-5 would have impacts on I-5 traffic operations during installation of the girders for the guideway bridges. Cast-in-place construction methods, if used, could

require a shoring tower within southbound I-5 mainline to support the straddle bents while they are being constructed. To maintain safe operations of I-5, either closing one to two lanes for up to 2 months or restriping the southbound I-5 mainline travel lanes around the construction area would be coordinated with and subject to a separate agreement with WSDOT. Even if the southbound I-5 travel lanes were able to be fully accommodated and re-striped around the construction area during this construction period, capacity on I-5 southbound would be reduced. Using precast cap beams across southbound I-5 would avoid the need for shoring towers but would require the full closure of southbound I-5 for multiple overnight and/or weekends for each span. If I-5 southbound is closed, the likely detour route would use the Kent/Des Moines interchange to SR 99 and/or Military Road, with traffic rerouted back to I-5 at S 272nd Street. During off-peak periods and weekends, traffic volumes along these routes are generally lower than during peak commute periods, and detour routes would have additional capacity to accommodate some traffic from I-5. Either of these revisions to I-5 southbound mainline would require advanced signage and restriping to ensure safe operations through this construction area. Construction vehicle access to the median construction area would be provided directly from the northbound and/or southbound I-5 mainline. Construction access points, closures, and changes in I-5 operations would require approval from WSDOT. Vertical clearance would be maintained on I-5.

Federal Way I-5 Station Option

The Federal Way I-5 Station Option would have the same regional facilities impacts as the I-5 Alternative.

Federal Way S 320th Park-and-Ride Station Option

The Federal Way S 320th Park-and-Ride Station Option would have similar impacts to regional facilities as the I-5 Alternative, except the S 320th Street southbound ramps would require night and weekend closures for guideway construction. The two-lane off-ramp would also need to be reconfigured in two phases during construction and would have a long-term construction impact that would reduce the southbound off-ramp, right-turn pocket storage length by approximately 250 feet for a substantial portion of the construction period. The off-ramp would be restored to existing conditions after construction is complete. The temporary reduction in the right turn pocket length would not likely cause traffic to back up onto the I-5 mainline.

5.1.1.3 SR 99 to I-5 Alternative

North of Kent-Des Moines Road, where the SR 99 to I-5 Alternative would be located on SR 99, impacts would be similar to those described for the SR 99 Alternative. South of S 240th Street, where the alternative would be within the I-5 right-of-way, impacts would be the same as with the I-5 Alternative, including for the Landfill Median Alignment Option. There would be no additional impacts to regional facilities between Kent-Des Moines Road and S 240th Street where the alternative transitions from SR 99 to I-5.

5.1.1.4 I-5 to SR 99 Alternative

North of Kent-Des Moines Road, where the I-5 to SR 99 Alternative would be the same as the I-5 Alternative, impacts would be the same as with the I-5 Alternative. South of S 240th Street, where the

SR 99 to I-5 Alternative is located on SR 99, impacts would be similar to those described for the SR 99 Alternative. There would be no additional impacts to regional facilities between Kent-Des Moines Road and S 240th Street where the alternative transitions from SR 99 to I-5.

5.1.2 Potential Mitigation Measures

During FWLE construction, Sound Transit would work with WSDOT and the local agencies to develop a construction plan. This plan would coordinate construction activities, such as incident management, construction staging, and traffic control where the light rail construction might affect either I-5 or SR 99. Sound Transit would also coordinate with WSDOT to disseminate construction closure information to the public as needed.

5.2 Transit Operations

5.2.1 Impacts Common to All Alternatives

All alternatives would involve some level of lane closures, bus stop relocations, partial or full temporary closures of park-and-ride facilities, and sidewalk impacts that would have some impact on the transit operations within the FWLE study area during construction. Impacts of each alternative are described in this section.

5.2.2 Impacts by Alternative

5.2.2.1 SR 99 Alternative

Bus operations and transit riders traveling on SR 99 would be affected in the construction areas by the decrease in road capacity and increase in delay that would result from the reduced number of lanes within the 1/2-mile construction area. Bus stops along SR 99 would be maintained where feasible but may need to be temporarily relocated during construction in some instances. The use of the existing HOV lane for all traffic would affect the speed and reliability of buses in these construction areas and would make bus schedules less reliable as congestion and delay increase, in particular in the northbound direction during the morning weekday commute and southbound during the evening weekday commute. Some bus routes may require rerouting when left-turn restrictions are in place at intersections or when side streets are closed.

Service at the Redondo Park-and-Ride lot would be disrupted during construction of the S 272nd Redondo Station; however, bus routes serving this transit center could be relocated to the Star Lake Park-and-Ride during the station construction period. Bus service at the existing Federal Way Transit Center is not expected to be disrupted with construction of the Federal Way Transit Center Station.

Station Options

S 216th Station Options

Impacts on transit with the potential additional S 216th West or East station option would be similar to the SR 99 Alternative.

Kent/Des Moines HC Campus Station Option

Impacts on transit with the Kent/Des Moines HC Campus Station Option would be similar to the SR 99 Alternative.

Kent/Des Moines HC from S 216th West Station Option
Impacts on transit with the Kent/Des Moines HC from S 216th West Station Option would be less than the SR 99 Alternative. No impacts on transit would occur along SR 99 between S 216th Street and Kent-Des Moines Road because the guideway would be located west of SR 99.

Kent/Des Moines SR 99 Median Station Option
The Kent/Des Moines SR 99 Median Station Option would be constructed in multiple phases and would shift southbound traffic to the east or west of the median, depending on the construction phase. Northbound traffic, including transit, would be rerouted to 30th Avenue S at S 240th Street and rerouted back on to SR 99 at S 236th Lane. This would result in longer transit travel times and the relocation of transit stops along SR 99 in this area.

Kent/Des Moines SR 99 East Station Option
Impacts on transit with the Kent/Des Moines SR 99 East Station Option would be similar to the SR 99 Alternative.

S 260th Station Options
Impacts on transit with the potential additional S 260th West or East station option would be similar to the SR 99 Alternative.

S 272nd Redondo Trench Station Option
Impacts on transit would be more isolated than the SR 99 Alternative with the S 272nd Redondo Trench Station Option because the guideway would be located west of SR 99 between S 279th Street and S 304th Street, and no impacts on transit would occur through this segment. However, impacts on transit where the trench alignment crosses under SR 99 near 16th Avenue S would be longer in duration (up to a year) compared to the SR 99 Alternative.

Federal Way SR 99 Station Option
Impacts on transit with the Federal Way SR 99 Station Option would be similar to the SR 99 Alternative.

5.2.2.2 I-5 Alternative

Nearly all the construction for the I-5 Alternative would have minimal impacts on transit service because the guideway would be located west of the I-5 southbound mainline, with the exception of the Star Lake Park-and-Ride. It is likely parking would be lost at the Star Lake Park-and-Ride lot during construction and generally would not be avoidable because of site constraints around the station. Temporary parking would be provided as needed and where feasible to mitigate the impacts. Transit service could be relocated to the Redondo Heights Park-and-Ride and/or the Kent-Des Moines Park-and-Ride during the station construction. The additional travel time for buses serving the Redondo Heights location could lead to longer transit travel times for riders accessing transit service at this station location.

Trenching under the S 317th Street roundabout would be conducted in stages. As the guideway is constructed under the existing roundabout, the S 317th Street and 28th Avenue S intersection would be converted into a stop-controlled intersection, which could result in an increase in bus travel times.

Station Options

Kent/Des Moines At-Grade Station Option

The Kent/Des Moines At-Grade Station Option would have the same impacts as the I-5 Alternative.

Kent/Des Moines SR 99 East Station Option

The Kent/Des Moines SR 99 East Station Option would have similar impacts as the I-5 Alternative.

Landfill Median Alignment Option

The closure of the inside shoulder of I-5 between S 240th Street and S 259th Place with the Landfill Median Alignment Option may result in slightly slower speeds in the HOV lane through this 1/2-mile segment. Night and weekend closures of I-5 southbound for guideway girder placement across I-5 southbound would also require transit to use a detour route, resulting in longer transit travel times.

Federal Way I-5 Station Option

The Federal Way I-5 Station Option requires the S 317th Street and 28th Avenue S roundabout to be removed temporarily during construction. A phased long-term closure of both 28th Avenue S and S 317th Street would be required, resulting in a transit reroute to S 312th Street or S 320th Street or other roads and an increase in transit travel times.

Federal Way S 320th Park-and-Ride Station Option

The Federal Way S 320th Park-and-Ride Station Option could potentially construct the guideway under the roundabout at S 317th Street in fewer stages compared to the I-5 Alternative, resulting in fewer impacts on transit through this area.

At the S 320th Street Park-and-Ride, construction of the light rail station would require the temporary closure of the park-and-ride and transit service would be rerouted to other transit centers, such as the Federal Way Transit Center. Bus routes that currently only serve the S 320th Park-and-Ride may have a longer travel time if they are rerouted to the Federal Way Transit Center or another location.

5.2.2.3 SR 99 to I-5 Alternative

North of Kent-Des Moines Road, where the SR 99 to I-5 Alternative would be located on SR 99, impacts would be similar to those described for the SR 99 Alternative. South of S 240th Street, where the alternative would be within the I-5 right-of-way, impacts would be the same as with the I-5 Alternative. There would be no additional transit impacts between Kent-Des Moines Road and S 240th Street.

5.2.2.4 I-5 to SR 99 Alternative

North of Kent-Des Moines Road, where the I-5 to SR 99 Alternative would be the same as the I-5 Alternative, impacts would be the same as with the I-5 Alternative. South of S 240th Street, where the SR 99 to I-5 Alternative is located on SR 99, impacts would be similar to those described for the SR 99 Alternative. There would be no additional transit impacts between Kent-Des Moines Road and S 240th Street.

5.2.3 Potential Mitigation Measures

During construction of alternatives within street rights-of-way, buses would either continue service on the street or would be rerouted to nearby roadways, where appropriate, to maintain transit service. Bus stops would be maintained in their existing location where possible, but in construction areas may

need to be relocated. Access between the surrounding land uses and the bus stops would be maintained to the extent feasible. Transit service modifications would be coordinated with Metro, Pierce Transit, and Sound Transit to minimize impacts and disruptions to bus facilities and service during construction. These measures could include posting informative signage before construction at existing transit stops that would be affected by construction activities and developing modified service plans to accommodate park-and-ride closures during construction of stations at those locations.

5.3 Arterials and Local Streets Operations

5.3.1 Impacts Common to All Alternatives

With each of the FWLE alternatives, construction would require local road closures, lane closures, traffic detours, and property access modifications to maintain traffic flow. Streets that intersect the alternatives would require full and/or partial closures for short durations to construct the guideway or other associated features. If driveway closures are required, then temporary alternate property access to these properties would be provided to the extent possible. If alternative access is not available, then the specific construction activity would be reviewed to determine whether it could occur during non-business hours. Specific construction activities, including long term roadway closures, would be reviewed in coordination with local jurisdictions, WSDOT, and Sound Transit during the final design and permitting phases of the project and would be agreed upon prior to implementing any long-term road closures.

Appendix G, Construction Staging Areas and Haul Routes, shows the proposed construction staging areas and truck haul routes for each FWLE alternative and option. In general, the potential construction staging areas and truck haul routes would be adjacent to where alignment construction would occur, and the staging areas would generally be located in the vicinity of the station areas. For the elevated guideway construction, peak truck trips are estimated at 10 to 15 trucks per hour for concrete delivery, or between 80 and 240 trips per day, assuming 8 to 16 hours per day of active construction. A similar level of truck activity is expected for earthwork activities, but this would be focused on trucks hauling material during excavation. Construction impacts along SR 99 or I-5 for all FWLE alternatives and station options are discussed in Section 5.1, Regional Facilities and Travel.

Generally, construction truck traffic would use SR 99 and, if required, other arterials to access the construction areas. There would be no direct access via the I-5 mainline except for the I-5 Landfill Median Alignment Option, although it is expected that trucks would use I-5 for a portion of their trip between the construction area and other locations in the region

5.3.2 Impacts by Alternative

5.3.2.1 SR 99 Alternative

Construction of the guideway over-crossings would create impacts at the arterial and local cross streets that intersect SR 99 between S 200th Street and S 316th Street. Street crossings of note would occur at S 208th Street, S 216th Street, Kent-Des Moines Road, S 240th Street, S 260th Street, S 272nd Street, S 288th Street, S 304th Street, S 312th Street, and S 316th Street.

Depending on the type and length of guideway, construction over arterials, local streets, and driveways along SR 99 might require temporary nighttime and weekend closures and detours for local traffic to other nearby arterials during the installation of the girders for the guideway bridges. Detours would result in impacts on traffic, buses, bicyclists, and pedestrians. Construction activities might also reduce or restrict property access during construction; however, the contractor would need to maintain access during construction when possible and could minimize impacts on access via nighttime and weekend closures where allowed. Highline College access would be provided from SR 99, either via S 240th Street, or from completion of the S 236th Street Lane extension.

Local roads along the guideway between S 308th Street and S 316th Street may have closures or access modifications that would extend for a longer duration because of the larger construction area required for this segment of the guideway. Construction of the guideway and station near the Federal Way Transit Center would require temporary nighttime closures of S 316th Street and 20th Avenue S during guideway construction. 21st Avenue S, south of the existing transit center, would likely require temporary nighttime or weekend closures during construction of the station and guideway.

Construction vehicle access for the SR 99 Alternative and station options would be located along SR 99. Generally, construction truck traffic to the construction and staging areas would use arterials and local streets. Up to 15 trucks per hour could use SR 99, arterials, and local streets, and intersection delays may increase slightly. Haul routes to and from SR 99 would include I-5 and the three major east-west streets with I-5 interchanges—Kent-Des Moines Road, S 272nd Street, and S 320th Street. Potential construction staging areas would be located at the three station areas—Kent/Des Moines, S 272nd Redondo, and Federal Way Transit Center.

The potential temporary closure of the Redondo Heights Park-and-Ride during construction would change traffic circulation patterns around S 272nd Street. Vehicle trips would likely relocate to the Star Lake Park-and-Ride, and some intersections near these two park-and-rides may have increased congestion. However, the current transit demand at the Redondo Heights Park-and-Ride is relatively low, so any traffic impacts caused by this closure would likely be minimal.

Station Options

For station options that have portions of the guideway located in a trench, the use of temporary plates and lane reductions would be required to maintain traffic flow on cross streets over the trench for up to a year. For roads that have two or more lanes in each direction, at least one lane in each direction would be kept open during construction. For some station options, roads that have only one lane in each direction may be closed for certain periods during construction.

S 216th Station Options

Generally, the construction of the potential additional S 216th West Station Option or S 216th East Station Option would have minimal impacts on traffic in the station vicinity and would occur over a period of 18 to 30 months. Construction of the trench under S 216th Street for the S 216th Street West Station Option would likely require narrowing of the travel lanes, removal of dedicated turn lanes, and/or the closure of one through lane in each direction. Some nighttime and weekend closures of S 216th Street may be required for placement of plates. Local traffic could be detoured along S 220th

Street to avoid delays through the construction area. Congestion on S 220th Street could increase during construction.

Kent/Des Moines HC Campus Station Option

Impacts on local streets with the Kent/Des Moines HC Campus Station Option would be the same as the SR 99 Alternative except across S 240th Street. To maintain traffic flow, plates would be required on 240th Street for a period up to 1 year, and may require turn restrictions and lane closures. However, access to Highline College would be provided from SR 99, either via S 240th Street, or from the completion of the S 236th Street Lane extension.

Kent/Des Moines HC from S 216th West Station Option

With the Kent/Des Moines HC from S 216th West Station Option, trenching would be required across several roads, including S 216th Street, S 220th Street, S 222nd Street, S 224th Street, and S 226th Street. For S 216th Street, at least one lane in each direction would be kept open during construction, which may occur for up to a year. The remaining roads could be closed during construction; however, construction would be phased to maintain reasonable detour routes. For example, S 220th Street may be closed during construction; however, S 224th Street could remain open and would be signed as a detour route. Then when construction is complete on S 220th Street, it could be used as a detour route when S 224th Street is closed.

Construction of this station option would also require trenching adjacent to properties, and the use of plates over the guideway would be temporarily required to maintain business access. Night and weekend closures may be required for placement of plates. If alternative access to a business is not available, then the specific construction activity would be reviewed to determine if it could occur during nonbusiness hours. Highline College access would be provided from SR 99, either via S 240th Street, or from the completion of the S 236th Street Lane extension.

Kent/Des Moines SR 99 Median Station Option

Construction of the Kent/Des Moines SR 99 Median Station Option would occur over a period of 18 to 30 months and would require completely reconstructing SR 99 in each direction. This would result in a wider roadway and would require part of the SR 99 reconstruction to occur within existing private property outside of the existing right-of-way. During the construction period, there would be lane reductions in each direction of SR 99 as lanes are shifted, and speed reductions would likely be required. Northbound SR 99 would also be closed during a portion of station construction. 30th Avenue S, a low-volume road, would be used as the main detour route. Traffic would be routed from SR 99 to 30th Avenue S via S 240th Street. S 236th Lane between SR 99 and 30th Avenue S would be constructed and completed prior to closing northbound SR 99, and traffic would be rerouted back onto SR 99 via this new road connection. Some of the SR 99 northbound traffic would likely continue north on 30th Avenue S to eastbound Kent-Des Moines Road and I-5. During the peak period, traffic volumes on this detour route could increase by over 1,000 vehicles per hour, and without temporary widening of 30th Avenue S, traffic congestion would be expected. Drivers could potentially avoid this area by using other roads in the area, which could increase congestion on those streets.

Kent/Des Moines SR 99 East Station Option

The Kent/Des Moines SR 99 East Station Option would likely require the closure of 30th Avenue S between S 236th Lane and S 240th Street during station construction. 30th Avenue S is currently a low-volume facility, and traffic would likely be detoured to SR 99. During the closure, local business access would be provided.

S 260th Station Options

The arterial and local street impacts with these station options would be the same as the SR 99 Alternative except at S 260th Street for the S 260th East Station Option. Construction of the station would require the closure of S 260th Street. S 260th Street provides access across I-5, and the nearest detour route with access across I-5 would be at S 272nd Street. Local traffic would likely be detoured via S 252nd Street, S 272nd Street, and Military Road, and congestion on these roads would likely increase.

S 272nd Redondo Trench Station Option

With the S 272nd Redondo Trench Station Option, construction activities for the trench under S 272nd Street just east of SR 99 would likely be completed with cut-and-cover construction in order to maintain traffic lanes on a portion of the existing roadway. South 272nd Street is currently two lanes in each direction, with dual westbound left turn lanes at the intersection of SR 99. Removal of one westbound left turn lane at SR 99 and S 272nd Street would likely be required to allow for two lanes in each direction during construction. The reduction in left-turn capacity would result in increased vehicle queues and delays. Specific impacts on SR 99 are discussed above in Section 5.1.1.1.

Construction activities might reduce or restrict property access during construction; however, the contractor would need to maintain access during construction where possible and could minimize access impacts via nighttime and weekend closures.

Federal Way SR 99 Station Option

The Federal Way SR 99 Station Option would span S 316th Street west of 20th Avenue S. During station construction, S 316th Street between SR 99 and 20th Avenue would likely require a full closure during construction of the station. The likely detour route for traffic traveling to and from the north on SR 99 would be via S 312th Street to 20th Avenue S.

5.3.2.2 I-5 Alternative

Construction of the guideway over local streets and arterials would be more limited with the I-5 Alternative but would still occur at S 208th Street, S 216th Street, Kent-Des Moines Road, S 259th Street, S 272nd Street, Military Road (two locations), S 288th Street, S 317th Street, and 23rd Avenue S. In general, construction activities would require weekend and nighttime road and lane closures of these street with detour routes provided except at S 216th Street and S 272nd Street. S 216th Street would require construction of a temporary bridge approach to maintain traffic across I-5 and may result in lane closures and detours for up to 6 months. At 272nd Street, plates would be required where the guideway crosses under the road and one lane in each direction would be closed for up to one year. Because of the limited number of crossings along I-5, detour routes for weekend or nighttime

closures could be circuitous and would likely use SR 99 or Military Road. The I-5 Alternative would not go over or under the I-5 travel lanes.

The roundabout at S 317th Street and 28th Avenue S would require reconstruction where the guideway crosses under the intersection. The intersection would be temporarily modified. Construction would be in three phases and would convert the existing roundabout into a stop-controlled intersection. The temporary conversion of this intersection from a roundabout to a stop-controlled intersection would likely increase vehicle delay. When the guideway construction is completed, the roundabout would be reconstructed in its current location. Construction of the guideway and station near the Federal Way Transit Center would require temporary nighttime closures of 21st Avenue S and 23rd Avenue S during guideway construction.

Construction vehicle access for the I-5 Alternative and station options would be provided via a temporary construction road adjacent to the guideway. This road may be up to 30 feet wide to allow for two-way traffic. The temporary construction road would be located west of the light rail alignment between S 204th Street and Kent-Des Moines Road and to the east of the alignment from Kent-Des Moines Road south to S 317th Street. Access to the construction road would only be provided from arterials, local streets, and/or I-5 interchange areas. No direct access would be provided from the I-5 mainline. Potential primary access points to the temporary construction road include the following roads:

- S 204th Street
- S 208th Street
- S 211th Street
- S 216th Street
- I-5 Kent-Des Moines Road Southbound ramps
- 30th Avenue S
- S 259th Place
- S 272nd Street
- Military Road (two locations)
- S 288th Street
- S 317th Street

Secondary access points may be provided via local roads to allow 1/2 mile spacing between access points. While these access points would primarily be intended to provide emergency access to the site, some truck traffic may use these locations. If these access locations were problematic for larger construction vehicles, these vehicles would be rerouted to primary access points. The contractor may propose modifications to the construction road and its access during the development of the Maintenance of Traffic plan.

The potential closure of the Star Lake Park-and-Ride during construction would change traffic circulation patterns around S 272nd Street. Vehicle trips would likely relocate to the Redondo Heights Park-and-Ride, and some intersections near this park-and-ride could have additional congestion.

Station and Alignment Options

Kent/Des Moines At-Grade Station Option

The Kent/Des Moines At-Grade Station Option would have the same local street and arterial impacts as the I-5 Alternative.

Kent/Des Moines SR 99 East Station Option

The Kent/Des Moines SR 99 East Station Option would have the same local street and arterial impacts as the I-5 Alternative.

Landfill Median Alignment Option

The Landfill Median Alignment Option would have the same local street and arterial impacts as the I-5 Alternative. Impacts on the I-5 mainline are discussed in Section 5.1.1.2.

Federal Way I-5 Station Option

The roundabout at S 317th Street and 28th Avenue S would require reconstruction where the guideway crosses under the intersection. The intersection would be reconstructed in two phases and would convert the existing roundabout into a through street. The first phase would close S 317th Street and traffic would reroute to S 312th Street or S 320th Street, increasing vehicle delays on these facilities. The second phase would require the closure of 28th Avenue S. Both phases would last between 6 and 9 months. During construction of the roundabout modification, both the I-5 mainline and the S 317th Street direct access ramps would not likely experience any impacts. With this option, guideway construction would impact 23rd Avenue S. Once the guideway construction is complete, the roundabout would be reconstructed in its current location.

Federal Way S 320th Park-and-Ride Station Option

The Federal Way S 320th Park-and-Ride Station Option would have the same local street and arterial impacts as the I-5 Alternative except construction of the guideway under the roundabout at S 317th Street may be completed in fewer stages compared with the I-5 Alternative. Completion in fewer stages would occur because the impacts would be farther east of the roundabout under the S 317th Street direct access ramp, thus resulting in less impacts than the I-5 Alternative because guideway construction would not affect 23rd Avenue S and 28th Avenue S.

5.3.2.3 SR 99 to I-5 Alternative

Impacts with the SR 99 to I-5 Alternative north of Kent-Des Moines Road would be the same as under the SR 99 Alternative. South of S 240th Street, impacts would be similar to the I-5 Alternative. Between Kent-Des Moines Road and S 240th Street, construction would have impacts on 30th Avenue S and would likely require its temporary closure north of the proposed S 236th Lane. The local traffic using this road would be detoured to SR 99, with local property access maintained.

5.3.2.4 I-5 to SR 99 Alternative

Impacts with the I-5 to SR 99 Alternative north of Kent-Des Moines Road would be the same as under the I-5 Alternative. South of S 240th Street, impacts would be similar to the SR 99 Alternative. Between Kent-Des Moines Road and S 240th Street, construction would have impacts on 30th Avenue S and would likely require its temporary closure north of the proposed S 236th Lane. The local traffic using this road would be detoured to SR 99, with local property access maintained.

5.3.3 Potential Mitigation Measures

All mitigation measures associated with constructing the FWLE would comply with local regulations governing construction traffic control and construction truck routing. Sound Transit would finalize detailed construction plans in close coordination with local jurisdictions and WSDOT during the final design and permitting phases of the project. Mitigation measures for traffic impacts caused by light rail construction could include the following practices:

- Conform to the *Manual on Uniform Traffic Control Devices* (FHWA, 2009) and jurisdictional agency requirements for all traffic plan maintenance.
- Clearly sign and provide reasonable detour routes when cross streets are closed for trench construction. The contractor would be required to keep nearby parallel facilities open to facilitate access and mobility.
- Use lighted or reflective signage to direct drivers to truck haul routes to ensure visibility during nighttime work hours.
- Communicate public information through tools such as print, radio, posted signs, web sites, and email to provide information regarding street closures, hours of construction, business access, and parking impacts. Sound Transit would provide this plan.
- Coordinate access closures with affected businesses and residents. The contractor would be required to perform this task in coordination with Sound Transit staff. If access closures are required, property access to residences and businesses would be maintained to the extent possible. If access to the property cannot be maintained, the specific construction activity would be reviewed to determine if it could occur during non-business hours, or if the parking spaces and users of this access (for example, deliveries) could be provided at an alternative location.
- Post advance notice signs prior to construction in areas where construction activities would affect access to surrounding businesses.
- Provide regular updates to schools, emergency service providers, local agencies, solid waste utilities, and postal services, and assist public school officials in providing advance and ongoing notice to students and parents concerning construction activity near schools.
- Schedule traffic lane closures and high volumes of construction truck traffic during off-peak hours to minimize delays during periods of higher traffic volumes as much as possible.
- Cover potholes and open trenches, where possible, and use protective barriers to protect drivers from open trenches.
- For the Kent/Des Moines SR 99 Median Station Option, improve 30th Avenue S and S 236th Lane prior to the station construction to accommodate increased traffic from SR 99 when lanes are closed.

5.4 Safety

5.4.1 Impacts Common to All Alternatives

With each of the FWLE alternatives, traffic diversion and detours caused by light rail guideway construction would lead to additional traffic increases on those facilities. The additional traffic volumes could lead to a potential increase in collision frequency; however, crash rates should remain similar to existing conditions. In locations where there is no physical change to the roadway, the types of crashes could also remain similar to existing conditions. Currently, the majority of crashes in the study area are property damage only.

5.4.2 Impacts by Alternative

5.4.2.1 SR 99 Alternative

Access modifications (such as right-in, right-out) and left-turn restrictions at intersections along SR 99 would occur in FWLE construction areas. This would eliminate some vehicle conflicts at these locations. Detour routes would change the traffic circulation and could lead to driver confusion and a possible increase in the potential for crashes. Signing and advanced communication of these changes to travel patterns and detours would minimize the potential safety impacts and would be addressed in the Maintenance of Traffic plan. Other measures that would be used to minimize safety impacts through construction areas are described in Section 5.3.3.

There would be no additional safety impacts with any of the station options.

5.4.2.2 I-5 Alternative

The guideway construction area for the I-5 Alternative would be located near the I-5 pavement edge in several locations. Full travel lane and shoulder widths along I-5 would be maintained during construction.

During construction, there would be temporary impacts on the clear zone along most of southbound I-5, in particular south of Kent-Des Moines Road. Where the light rail alignment is parallel to the I-5 mainline, from approximately S 211th Street to S 317th Street, a temporary construction barrier would be placed near the southbound I-5 edge of pavement where barriers are not already present. This temporary construction barrier would be present for the duration of guideway construction, approximately 1 to 4 years. Performing a similar analysis using the *Highway Safety Manual*, as described in Section 4.4, placing a temporary barrier along the I-5 southbound mainline (approximately 22,900 feet) could result in an increase of up to four crashes per year. The majority of these crashes would likely be property damage only, based on the severity distribution of the existing crash history.

Converting the S 317th Street and 28th Avenue S roundabout to a temporary stop-controlled intersection would increase the potential for crashes, as suggested in the HSM. The roundabout has a low crash frequency (three crashes over 5 years) at this location, with the potential for crashes to increase by up to 65 percent (AASHTO, 2014) with the temporary stop-controlled intersection configuration during the construction period.

Station and Alignment Options

Kent/Des Moines Station Options

Both Kent/Des Moines station options would have the same safety impacts as the I-5 Alternative.

Landfill Median Alignment Option

Construction of the guideway with the I-5 Landfill Median Alignment Option would require short-term, temporary narrowing of the inside I-5 shoulder to provide adequate construction space between approximately S 240th Street and S 252nd Street. Temporary shoulder closures could occur intermittently over a period of 4 to 6 months. Construction barriers would be placed along the median for northbound and southbound I-5 and after construction, a permanent barrier would be provided. The addition of median barrier could result in up to one crash a year on I-5.

As mentioned in Section 5.2.2.2, if cast-in-place construction methods are used, a shoring tower in the middle of southbound I-5 to support the straddle bents may be required. This would require closure of one to two lanes or restriping southbound I-5 mainline travel lanes around the construction area. The addition to a fixed objected in the roadway could increase the crash potential, however, this construction area would be designed to minimize any safety impacts.

Federal Way City Center Station Options

Both Federal Way City Center station options would have the same safety impacts as the I-5 Alternative.

5.4.2.3 SR 99 to I-5 Alternative

Safety impacts north of Kent-Des Moines Road would be the same as with the SR 99 Alternative. South of S 240th Street, impacts would be the same as with the I-5 Alternative. No additional impacts would occur between Kent-Des Moines Road and S 240th Street.

5.4.2.4 I-5 to SR 99 Alternative

Safety impacts north of Kent-Des Moines Road with the I-5 to SR 99 Alternative would be the same as under the I-5 Alternative. South of S 240th Street, impacts would be the same as under the SR 99 Alternative. No additional impacts would occur between Kent-Des Moines Road and S 240th Street.

5.4.3 Potential Mitigation Measures

Potential safety mitigation measures along local street and arterials are described above in Section 5.3.3. With FWLE alternatives near I-5, potential mitigation measures include placing a temporary construction barrier near the southbound I-5 edge of pavement where barriers are not already present to separate construction activity from I-5 mainline traffic. Additional mitigation measures that address safety on regional facilities are described in Section 5.1.2.

5.5 Parking

5.5.1 Impacts Common to All Alternatives

Parking by construction workers would be provided within the construction area where possible. Construction worker parking could also occur on local streets and arterials where parking is unrestricted. Construction worker parking near designated construction staging areas could affect the nearby parking supply during heavy construction periods. Contractors are generally responsible for

providing parking for construction workers where necessary. It is expected that some worker parking could be accommodated at the staging areas and along the alignment construction area.

5.5.2 Impacts by Alternative

5.5.2.1 SR 99 Alternative

Loss of available parking at the Redondo Heights Park-and-Ride lot is expected during construction of the SR 99 Alternative. The existing park-and-ride facility would be partially or fully closed while the parking structure is constructed. The facility is currently underutilized, with less than 10 percent use, which equals approximately 60 spaces. The Star Lake Park-and-Ride lot has enough capacity (approximately 240 spaces available) to accommodate any displaced riders with the closure of the Redondo Heights Park-and-Ride.

Construction activities at the Federal Way Transit Center could have minor traffic impacts on the streets adjacent to the existing park-and-ride during station construction because of the construction activity and increased truck traffic in the area. Although the transit facility would remain open with its full supply of parking available for transit patrons during the entire construction period. There would be no additional transit and/or public parking impacts with any of the station options.

There is no on-street parking allowed along the length of SR 99. The available on-street parking is generally located along the streets east and west of SR 99 and would not likely be affected by construction activity.

There would be no additional private parking impacts with any of the station options except for the Kent/Des Moines HC Campus Station Option. During construction and FWLE operation, some Highline College student parking would be removed from a highly utilized Highline College parking lot. Permanent replacement parking for Highline College would be provided by Sound Transit prior to station construction.

5.5.2.2 I-5 Alternative

A limited amount of on-street parking, located in neighborhoods west of I-5 in the Kent/Des Moines Station area, is allowed along the length of the I-5 Alternative. This parking would be removed during construction.

Station construction at the Star Lake Park-and-Ride would likely take 18 to 30 months to complete. The existing park-and-ride facility is 60 percent utilized today, with over 300 of the 540 parking stalls being occupied. The park-and-ride would be partially or fully closed during the construction period while the station and parking structure are being built. Some parking would be unavailable and temporary parking would be provided where necessary and where feasible to mitigate the impacts. If bus service was rerouted to the Redondo Heights Park-and-Ride, this location would have enough capacity (approximately 640 spaces) to accommodate the displaced riders from the Star Lake Park-and-Ride.

Construction activities at the Federal Way Transit Center could have minor traffic impacts on the streets adjacent to the existing park-and-ride during station construction because of the increased truck traffic in the area. The transit facility would remain open with its full supply of parking available

for transit patrons during the entire construction period. There would be no additional transit and/or public parking impacts with any of the station options.

Station and Alignment Options

Kent/Des Moines At-Grade Station Option

The Kent/Des Moines At-Grade Station Option would have the same parking impacts as the I-5 Alternative.

Kent/Des Moines SR 99 East Station Option

The Kent/Des Moines SR 99 East Station Option would have the same parking impacts as the I-5 Alternative.

Landfill Median Alignment Option

Construction worker parking would not be allowed in the I-5 median; therefore, the Landfill Median Alignment Option would have the same parking impacts as the I-5 Alternative

Federal Way I-5 Station Option

The Federal Way I-5 Station Option would have the same parking impacts as the I-5 Alternative.

Federal Way S 320th Park-and-Ride Station Option

There would be impacts on parking at the existing Federal Way S 320th Park-and-Ride lot during the construction of this station option. The existing park-and-ride would be partially or fully closed while the station and parking structure are being constructed. The existing Federal Way S 320th Park-and-Ride is currently 45 percent utilized, with almost 400 of the 877 parking stalls occupied. Displaced riders would need to use the Federal Way Transit Center, which is currently at capacity, or other facilities that are under-capacity, such as the Star Lake Park-and-Ride.

5.5.2.3 SR 99 to I-5 Alternative

Impacts north of Kent-Des Moines Road would be the same as for the SR 99 Alternative. South of S 240th Street, impacts would be the same as for the I-5 Alternative, including impacts at the Star Lake Park-and-Ride. Between Kent-Des Moines Road and S 240th Street, no additional parking impacts were identified.

5.5.2.4 I-5 to SR 99 Alternative

Parking impacts north of Kent-Des Moines Road with the I-5 to SR 99 Alternative would be the same as under the I-5 Alternative. South of S 240th Street, impacts would be the same as for the SR 99 Alternative, including impacts at the Redondo Heights Park-and-Ride. Between Kent-Des Moines Road and S 240th Street, no additional parking impacts were identified.

5.5.3 Potential Mitigation Measures

Depending on the alternative and station options selected, the existing Star Lake, Redondo Heights, or S 320th Street park-and-ride lots could be fully closed. Measures to mitigate the loss of parking at these locations could include the following:

- Route transit riders that use these locations to available spaces at other nearby park-and-ride lots.

- Consider service increases or other measures to encourage transit trips that do not require automobile access.
- Lease parking lots and/or new parking areas within the vicinity of the closed park-and-ride lots.
- Provide temporary transit service at a nearby off-street location.

5.6 Nonmotorized Facilities

5.6.1 Impacts Common to All Alternatives

All FWLE alternatives would either close sidewalks or reduce the sidewalk width within the construction areas. Impacts specific to each alternative are described in this section.

5.6.2 Impacts by Alternative

5.6.2.1 SR 99 Alternative

There would be some impact on nonmotorized travel modes from constructing the elevated guideway within the SR 99 median, including for very short periods where crosswalks may be closed for construction in that area. Crosswalks would be maintained to the extent feasible. Nonmotorized travel would be affected in areas where roadway reconstruction includes sidewalks. Wherever feasible, sidewalks would remain open. Protected sidewalks next to the construction area would be provided when detour routes are not feasible. Short sections of sidewalks may need to be closed during construction on the roadway and would require pedestrians to detour to the closest signalized crossing of SR 99. Because of the spacing of SR 99 crossings, detours for pedestrians could be circuitous. Bicycle routes and lanes adjacent to the construction areas, such as those located along S 216th Street, may be temporarily removed during construction. Nonmotorized travel would also be affected in the vicinity of station construction, as well as from construction of the elevated guideway over local arterials.

Crosswalks located at signalized intersections would remain open, except when SR 99 or side streets are temporarily closed. The midblock pedestrian crossing north of Kent-Des Moines Road would be closed during the construction period in that area and would require pedestrians to detour to another crossing. Near the Kent/Des Moines Station area, S 236th Lane would be built prior to station construction to provide an additional SR 99 pedestrian crossing that would minimize pedestrian impacts near the Highline College campus if sidewalks are temporarily closed. In addition, a protected pathway along S 236th Lane or S 240th Street would be provided to facilitate pedestrian movement to and from the Highline College campus and SR 99 through the construction area.

During the S 272nd Redondo Station construction, sidewalks on the east side of SR 99 may be closed or a protected sidewalk would be provided next to the station. If sidewalks are closed on the east side of SR 99, pedestrians may require a circuitous reroute because the nearest SR 99 crossings are at S 260th Street and S 288th Street. Sidewalks would remain open at the two signalized intersections adjacent to the station area (S 272nd Street and S 276th Street). During the Federal Way Transit Center Station construction, sidewalks would be maintained, except along short portions of 20th Avenue S, 21st Avenue S, and 23rd Avenue S, where the sidewalks may be temporarily closed or a protected sidewalk would be provided through the construction area.

Station Options

S 216th Station Options

With either of the potential additional S 216th station options (West or East), the impacts on nonmotorized facilities would be similar to the SR 99 Alternative.

Kent/Des Moines HC Campus Station Option

The impacts on nonmotorized facilities of the Kent/Des Moines HC Campus Station Option would be similar as the SR 99 Alternative except that the midblock pedestrian crossing on SR 99 between S 226th Street and Kent-Des Moines Road would remain open. A protected pathway along S 236th Lane would be provided to facilitate pedestrian movement between Highline College campus and SR 99 through the construction area.

Kent/Des Moines HC from S 216th West Station Option

The midblock pedestrian crossing on SR 99 between S 226th Street and Kent-Des Moines Road would remain open with the Kent/Des Moines HC from S 216th W Station Option. Sidewalks along SR 99 would not be impacted with this option between S 216th Street and Kent-Des Moines Road. Along S 240th Street, sidewalk on at least one side of the street would remain open during construction. Students accessing the Highline College campus may be required to use alternate routes to avoid the construction area.

In addition, a protected pathway along S 236th Lane would be provided to facilitate pedestrian movement between the Highline College campus and SR 99 through the construction area.

Kent/Des Moines SR 99 Median Station Option

The impacts on nonmotorized facilities with the Kent/Des Moines SR 99 Median Station Option would be similar to the SR 99 Alternative.

Kent/Des Moines SR 99 East Station Option

The impacts on nonmotorized facilities with the Kent/Des Moines East SR 99 Station Option would be similar to the SR 99 Alternative, except pedestrian movement to and from the Highline College campus should not be affected.

S 260th Station Options

With either of the potential additional S 260th Street station options (West or East), the impacts on nonmotorized facilities would be similar to the SR 99 Alternative.

S 272nd Redondo Trench Station Option

The impacts on nonmotorized facilities with the S 272nd Redondo Trench Station Option would be the same as the SR 99 Alternative.

Federal Way SR 99 Station Option

The impacts on nonmotorized facilities with the Federal Way SR 99 Station Option would be similar to the SR 99 Alternative except no nonmotorized impacts would occur on 20th Avenue S, 21st Avenue S, and 23rd Avenue S.

5.6.2.2 I-5 Alternative

Under the I-5 Alternative, nonmotorized travel could be affected in the vicinity of station construction and from construction of the elevated guideway over arterials and local streets. The limited number of I-5 crossings restricts the pedestrian and bicycle activity in the study area. Therefore, existing nonmotorized facilities across I-5 would be maintained to the extent feasible.

Near the Kent/Des Moines Station area, S 236th Lane would be constructed to provide an additional pedestrian crossing at SR 99. Since the Kent/Des Moines station would be located near I-5 and nonmotorized facilities are currently not provided, impacts on nonmotorized travel would be minimal during station construction.

During the S 272nd Star Lake Station construction, sidewalks on the north side of S 272nd Street may be closed or a protected sidewalk would be provided next to the station. Crosswalks would remain open at the two signalized I-5 ramp terminal intersections adjacent to the station area allowing pedestrians to use the I-5 transit flyer stops during construction.

During the Federal Way Transit Center Station construction, sidewalks would be maintained, except along portions of S 317th Street, 25th Avenue S, 23rd Avenue S, 21st Avenue S, and 20th Avenue S, where the sidewalks may be temporarily closed or a protected sidewalk would be provided through the work area.

Station and Alignment Options

Kent/Des Moines Station Options

Both Kent/Des Moines station options would have similar impacts on nonmotorized facilities as the I-5 Alternative.

Landfill Median Alignment Option

The Landfill Median Alignment Option would have similar impacts on nonmotorized facilities as the I-5 Alternative.

Federal Way I-5 Station Option

The Federal Way I-5 Station Option would have similar impacts on nonmotorized facilities as the I-5 Alternative, except no nonmotorized impacts would occur on 23rd Avenue S and portions of Gateway Center Boulevard may have sidewalk closures.

Federal Way S 320th Park-and-Ride Station Option

The Federal Way S 320th Park-and-Ride Station Option would have similar on nonmotorized facilities impacts as the I-5 Alternative north of S 317th Street. With this station option, no nonmotorized impacts would occur near the existing Federal Way Transit Center.

5.6.2.3 SR 99 to I-5 Alternative

Impacts on nonmotorized facilities north of Kent-Des Moines Road with the SR 99 to I-5 Alternative would be the same as with the SR 99 Alternative. South of S 240th Street, impacts would be the same as with the I-5 Alternative. Between Kent-Des Moines Road and S 240th Street, no additional impacts are identified.

5.6.2.4 I-5 to SR 99 Alternative

Impacts on nonmotorized facilities north of Kent-Des Moines Road with the I-5 to SR 99 Alternative would be the same as with the I-5 Alternative. South of S 240th Street, impacts would be the same as with the SR 99 Alternative. Between Kent-Des Moines Road and S 240th Street, no additional impacts are identified.

5.6.3 Potential Mitigation Measures

Most of the nonmotorized impacts during construction would be related to the closure of sidewalks along SR 99 and other arterial and local streets. Sound Transit would minimize potential impacts on pedestrian and bicycle facilities by providing detours within construction areas, such as protected walkways, and would notify the public as determined appropriate by the project team.

5.7 Freight Mobility and Access

5.7.1 Impacts Common to All Alternatives

Impacts on the movement of trucks carrying freight would be approximately the same as impacts on general traffic, as described in Sections 5.1 and 5.3.

The SR 99 lane closures within the construction areas could temporarily affect freight mobility in a manner similar to the general traffic. When partial lane closures are necessary during construction on SR 99, the intended purpose of any provided detour routes is to provide an alternate route for general purpose traffic. It is expected that freight would continue to travel on SR 99 or on other designated freight corridors. Temporary closures of access for some businesses could also occur, thus affecting freight (such as deliveries). If driveway closures are required, access to these properties would be maintained to the extent possible. With driveway closures, detours for freight would be treated similar to what is described for the general traffic.

With the I-5 Alternative, some of the short-term (nights and weekends) I-5 interchange ramp closures (at Kent-Des Moines Road and S 272nd Street) would affect freight. In addition, freight would be affected with the S 320th Park-and-Ride Station Option as a short-term (nights and weekends) southbound on-ramp closure at the S 320th Street interchange would be required. This would require rerouting or rescheduling of freight trips during these periods. Detour routes for freight would need to be approved by affected jurisdictions. Construction activities with the Landfill Median Alignment Option could have short-term travel impacts on freight because of increased congestion on I-5 or along any detour routes.

5.7.2 Potential Mitigation Measures

To minimize potential freight impacts, Sound Transit would coordinate with affected businesses throughout the construction period to notify them of lane and/or access closures and maintain business access as much as possible.

For any construction activities that might have possible I-5 impacts, Sound Transit would coordinate with freight stakeholder groups and provide construction information to WSDOT for use in the state's freight notification system. Sound Transit would provide information in a format required by WSDOT.

6.0 Indirect Impacts

This chapter discusses indirect transportation impacts that would be caused by the Federal Way Link Extension (FWLE).

6.1 Regional Facilities and Travel

The completion of the FWLE would provide reliable light rail service between Federal Way and a majority of the region's urban centers. Light rail service could help facilitate potential increases in residential and employment uses around the stations. This could lead to changes in regional and local travel patterns as trips both to and from these areas increase for all travel modes, thus affecting transit, local traffic volumes, parking demand, and nonmotorized users.

6.2 Transit Operations

The FWLE could also affect ridership on other transit routes in the FWLE corridor, particularly on parallel and feeder transit service along the State Route (SR) 99 corridor. Longer distance bus trips could decrease as some riders shift to light rail, and shorter bus trips could increase as more riders use other transit service to access light rail.

In addition to the future conceptual bus service plan assumed for each alternative, other changes in transit service within the FWLE corridor that are not yet planned or anticipated in response to the FWLE could also result in shifts in ridership. For instance, Sound Transit and King County Metro Transit (Metro) could redeploy and/or reinvest in bus service that would be replaced by light rail service above and beyond what has been assumed in the FWLE Draft EIS.

Light rail service could facilitate a concentration of residential and commercial land uses, known as transit-oriented development, surrounding the stations. The population and employment projections used in Sound Transit's ridership forecasting model were the Puget Sound Regional Council's (PSRC) 2013 Land Use Targets data. These plans forecast a substantial amount of population and employment growth in and around the FWLE study area by the year 2035.

Land Use Targets Data

PSRC's 2013 Land Use Targets data reflect a dataset based on local growth targets developed by each county to align with VISION 2040's Regional Growth Strategy. The Land Use Targets data were developed based on local planned development capacities and regional policies adopted in VISION 2040. It represents a regional development pattern consistent with what local jurisdictions are planning for under the first set of VISION 2040-aligned local growth targets (PSRC, 2013)

Because the Sound Transit and PSRC models already include adopted land use changes, the overall FWLE ridership is not expected to substantially change as a result of concentrated development (transit-oriented) around future light rail stations. However, the mode of access to and from stations may shift to a greater percentage of nonmotorized access and lower percentage of automobile access as the population and employment densities increase within station walksheds and bikesheds. For example, if development were to be focused around the Kent/Des Moines Station, or any other light rail station in the FWLE corridor, this could result in an increase in the walk access trips, which would likely be offset by a

reduction of park-and-ride or bus-transfer riders and/or small ridership decreases in other parts of the system or region.

The PSRC's Forecast Analysis Zone that encompasses the Kent/Des Moines Station area includes almost a 50 percent increase in population and employment for the area in the next 20 years. This equates to over 7,000 more jobs and households by 2035. This projected growth is already captured in the Sound Transit ridership model. Within the Midway subarea, the City of Kent's Transportation Master Plan forecasts employment and household increases of less than 2,000 by 2031 (City of Kent, 2011). Since then, the City of Kent's Midway Subarea Plan identified a "land use capacity" for the area that is beyond the 2,000 employment and household forecast in the City's Transportation Master Plan. These land use capacities are expected to be achieved beyond the FWLE's year 2035 planning horizon. Even so, the 7,000 more jobs and households forecasted by PSRC in the Midway subarea could incorporate all of the City of Kent's Transportation Master Plan forecast as well as additional development in line with the vision of the Midway Subarea Plan.

Any development beyond the PSRC's adopted population and employment land use forecasts for 2035 would require further regional and local planning and policy decisions and could result in additional increases in overall ridership in the FWLE corridor.

6.3 Arterial and Local Streets Operations

Increased automobile and bus trips to and from the station areas could result from potential increases in land use development around the light rail stations along the corridor. The increase in traffic could cause additional impacts on the arterials and local streets. Mode shifts from automobile transit, bicycle, and pedestrian could also result from increased development along the FWLE corridor.

6.4 Safety

The potential for increases in residential and employment uses around the light rail stations could lead to an increase in nonmotorized activity and further conflicts between all travel modes (automobile, transit, and nonmotorized).

6.5 Parking

Increase in parking demand around station areas along the FWLE corridor might result from the potential increase in land use development surrounding these areas. The demand for park-and-ride spaces beyond 1/4 mile from the stations could increase because riders could park along feeder bus routes and travel to the station by bus. Loss in park-and-ride demand on parallel corridors could result from riders shifting to the light rail service.

6.6 Nonmotorized Vehicles

Additional pedestrian and bicycle trips to the station could result from potential increases in higher-density residential and commercial developments. Light rail ridership at the affected station could potentially increase. These trips could travel along older streets that lack Americans with Disabilities

Act accessibility but could encourage improvements to these facilities by local jurisdictions as increased usage becomes evident.

6.7 Freight Mobility and Access

Increased automobile and bus trips to and from the station areas could result from potential increases in land use development around the light rail stations along the FWLE corridor. The increase in traffic could cause additional impacts on the arterials and local street operations near stations, which could affect freight mobility and access on local roadways. Any impacts on freight would be similar to those for automobiles.

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7.0 Potential Mitigation Measures

This chapter describes whether mitigation would be needed and describes potential mitigation measures for the transportation elements analyzed in this report.

7.1 Regional Facilities and Travel

No transportation impacts were identified for regional facilities as a result of the Federal Way Link Extension (FWLE); therefore, no mitigation would be needed for these elements.

7.2 Transit Service and Operations

Mitigation for transit services and operations with the FWLE would not be expected. The FWLE would improve the regional transit system and provide Sound Transit, King County Metro Transit (Metro), and Pierce Transit the ability to develop bus service integration plans that coordinate bus service with the regional light rail system. Sound Transit would also provide expanded park-and-ride facilities to accommodate the expected increase in transit ridership with the project.

7.3 Arterial and Local Street Operations

Mitigation could be required at intersections where the intersection level of service (LOS) would be worse than with the No Build Alternative and would not meet the applicable agency LOS standard. If an intersection is not expected to meet agency LOS standards with the No Build Alternative, mitigation could be required if the FWLE would further degrade the intersection performance. Under this scenario, improvements were identified if the build alternatives would result in further vehicle delay increases of over 10 percent at signalized and unsignalized intersections compared with the No Build Alternative.

Potential improvements for up to seven intersections not meeting the described LOS and delay thresholds are summarized in Table 7-1. As the project advances in design, Sound Transit will continue to work with local jurisdictions and agencies to evaluate potential mitigation strategies for safe and efficient operations. Final mitigation would be determined and agreed upon by Sound Transit and the affected jurisdiction(s) and agency(s). Sound Transit will work with affected agencies during the permitting process to determine Sound Transit's contribution to improve intersections, which may include contributing a proportionate share of costs to improve intersections affected by the FWLE. This could be determined by the project's proportionate ratio of trips at the intersection or another equitable method.

7.3.1 Full Length Build Alternatives

The following intersections would be affected by all build alternatives and require mitigation:

- State Route (SR) 99/Kent-Des Moines Road
- I-5 southbound ramp/Kent-Des Moines Road
- I-5 northbound ramps/S 272nd Street

TABLE 7-1
Potential Transportation Mitigation

Intersection	FWLE Alternative/Option Requiring Mitigation	Full Length Condition	Kent/Des Moines Interim Terminus Condition	S 272nd Interim Terminus Condition
SR 99/Kent-Des Moines Road	All alternatives and Kent/Des Moines station options	Provide a second northbound right-turn pocket at SR 99/ Kent-Des Moines Road intersection that could transition into a third eastbound lane on Kent-Des Moines Road until transitioning with the I-5 northbound loop on-ramp.	Same as full-length condition.	Same as full-length condition.
I-5 Southbound Ramps/Kent-Des Moines Road	All alternatives and Kent/Des Moines station options		Same as full-length condition.	Same as full-length condition.
SR 99/S 240th Street	I-5 Alternative with the Kent/Des Moines At-Grade Station Option	Provide a second southbound left-turn lane that would require widening of S 240th Street between SR 99 and 30th Avenue S and construct a northbound right-turn pocket. Provide flashing yellow arrow phasing for eastbound/west bound approaches.	Same as full length condition.	Same as full-length condition.
I-5 Northbound Ramps/S 272nd Street	All alternatives	Provide northbound left-turn pocket.	Same as full-length condition.	Same as full-length condition.
I-5 Northbound Ramps/ Kent-Des Moines Road (Kent/Des Moines Interim Condition only)	All alternatives	No mitigation required	Provide a traffic signal for the off-ramp and westbound traffic on Kent-Des Moines Road	No mitigation required
I-5 Southbound Ramps/S 272nd Street (S 272nd Interim Condition Only)	SR 99 Alternative and I-5 to SR 99 Alternative	No mitigation required	No mitigation required	Provide eastbound right turn pocket to I-5 southbound ramp.
SR 99/S 276th Street (S 272nd Interim Condition Only)	SR 99 Alternative and I-5 to SR 99 Alternative	No mitigation required	No mitigation required	Provide northbound right-turn pocket from SR 99 to S 276th Street.

The first two intersections listed above would have impacts associated with the Kent/Des Moines Station, while the third intersection would have impacts associated with any of the S 272nd Street stations.

No mitigation is proposed around the potential additional stations at S 216th Street and S 260th Street, or within the Federal Way Transit Center Station area because the surrounding intersections would meet jurisdictional LOS standards or operate the same as, or better, than the No Build Alternative.

Table 7-2 identifies how the three affected intersections would operate with mitigation under the build alternatives and station options (although because none of the intersections are around the Federal Way Transit Center, those station options are not included). With the Kent/Des Moines At-Grade Station Option, an additional intersection (SR 99/S 240th street) would also require mitigation. Vehicle

queue lengths are also expected to be similar or improved compared to the No Build Alternative at intersections with potential mitigation.

TABLE 7-2
Comparison of Intersection LOS for No Build and Mitigated Full-Length Build Alternatives

	Intersection ID			
	SR 99/Kent-Des Moines Road	**I-5 Southbound Ramps/ Kent Des Moines Road**	**I-5 Northbound Ramps/ S 272nd Street**	**SR 99/ S 240th Street**
LOS Standard	D	D	D	D
No Build Alternative	**F (F)**	**C (E)**	**E (D)**	**D(D)**
SR 99 Alternative	**F (F) / F (E)**	**C (C) / E (E)**	**E (E) / D (D)**	**D (D) / C (C)**
Kent/Des Moines Station Options				
HC Campus Station Option	F (F) / F (E)	C (C) / E (E)	E (E) / D (D)	D (D) / D (D)
SR 99 Median Station Option	F (F) / F (E)	C (C) / E (E)	E (E) / D (D)	D (D) / D (D)
SR 99 East Station Option	F (F) / F (E)	C (C) / E (E)	E (E) / D (D)	D (D) / D (D)
I-5 Alternative	**F (F) / F (E)**	**C (C) / E (E)**	**F (E) / D (D)**	**D (D) / D (D)**
Kent/Des Moines Station Options				
At-Grade Station Option	F (F) / F (E)	C (C) / E (E)	F (E) / D (D)	F (D) / E (D)
SR 99 East Station Option	F (F) / F (E)	C (C) / E (E)	F (E) / D (D)	D (D) / D (D)
SR 99 to I-5 Alternative	**F (F) / F (E)**	**C (C) / E (E)**	**F (E) /D (D)**	**D (D) / D (D)**
I-5 to SR 99 Alternative	**F (F) / F (E)**	**C (C) / E (E)**	**E (E) / D (D)**	**D (D) / D (D)**

Notes:
Data in table formatted as AM LOS Unmitigated (AM LOS Mitigated) / PM LOS Unmitigated (PM LOS Mitigated).
LOS designation based on local jurisdiction or WSDOT Standards.
N/A = not applicable; mitigation not proposed for intersection.

7.3.2 Interim Terminus Conditions

7.3.2.1 Kent/Des Moines Station Interim Terminus Conditions

In the Kent/Des Moines Station interim terminus condition, mitigation is proposed at the following intersections, regardless of alternative or station option:

- SR 99/Kent-Des Moines Road
- I-5 southbound ramps/Kent-Des Moines Road
- I-5 northbound ramps/Kent-Des Moines Road

In the build condition, intersection operations would degrade at these intersections from the No Build Alternative and not meet LOS standards. The potential mitigation identified in Table 7-1 would improve intersection operations to operate the same as, or better, than under the No Build Alternative.

In addition, with the I-5 Alternative Kent/Des Moines At-Grade station option, the intersection operations at SR 99 and S 240th Street would not meet LOS standards, so mitigation is also proposed at that intersection. The potential mitigation identified in Table 7-1 would improve intersection operations to operate the same as, or better than, the No Build Alternative. Vehicle queue lengths are also expected to be similar or improved compared with the No Build Alternative at intersections with

the potential mitigation. Table 7-3 provides mitigated LOS results for each of the improved intersections.

TABLE 7-3
Comparison of Standard, No Build, and Mitigated Build Intersection LOS for Kent/Des Moines Interim Terminus Condition

Alternative	SR 99/Kent-Des Moines Road	I-5 Southbound Ramps/Kent-Des Moines Road	I-5 Northbound Ramps/ Kent-Des Moines Road	SR 99/S 240th Street
LOS Standard	D	D	D	D
No Build Alternative	**F (F)**	**C (E)**	**C (B)**	**D (D)**
SR 99 Alternative	**F (F) / F (F)**	**C (C) / E (E)**	**F (C) / B (B)**	**N/A**
Kent/Des Moines Station Options				
HCC Campus Station Option	F (F) / F (F)	C (C) / E (E)	F (D) / B (B)	N/A
SR 99 Median Option	F (F) / F (F)	C (C) / E (E)	F (C) / B (B)	N/A
SR 99 East Station Option	F (F) / F (F)	C (C) / E (E)	F (C) / B (B)	N/A
I-5 Alternative	**F (F) / F (F)**	**C (C) / E (E)**	**F (C) / B (B)**	**D (D) / D (D)**
Kent/Des Moines Station Options				
At-Grade Station Option	F (F) / F (F)	C (C) / E (E)	F (C) / B (B)	F (D) / E (D)
SR 99 East Station Option	F (F) / F (F)	C (C) / E (E)	F (C) / B (B)	D (D) / D (D)
SR 99 to I-5 Alternative	**F (F) / F (F)**	**C (C) / E (E)**	**F (C) / B (B)**	**D (D) / D (D)**
I-5 to SR 99 Alternative	**F (F) / F (F)**	**C (C) / E (E)**	**F (C) / B (B)**	**N/A**

Notes:
Data in table formatted as AM LOS Unmitigated (AM LOS Mitigated) / PM LOS Unmitigated (PM LOS Mitigated)
LOS designation based on local jurisdiction or WSDOT Standards.
N/A = not applicable; mitigation not proposed for intersection.

7.3.2.2 S 272nd Redondo Station Interim Terminus Conditions

SR 99 Alternative and I-5 to SR 99 Alternative

In the S 272nd Station interim terminus condition, mitigation is proposed at the following intersections in the S 272nd Redondo Station area:

- SR 99/Kent-Des Moines Road
- I-5 southbound ramps/Kent-Des Moines Road
- I-5 southbound ramps/S 272nd Street
- I-5 northbound ramps/S 272nd Street
- SR 99/S 276th Street

In the build condition, intersection operations would degrade at these intersections relative to the No Build Alternative and not meet LOS standards. The potential mitigation identified in Table 7-1 would

improve operations at these intersections to meet the jurisdictional LOS standards or No Build Alternative conditions. Levels of service for the intersections identified above with potential mitigation by build alternative are provided in Table 7-4, along with LOS for the No Build Alternative.

TABLE 7-4
Comparison of Standard, No Build, and Mitigated Build Intersection LOS for S 272nd Interim Terminus Condition

Alternative	SR 99/ Kent-Des Moines Road	I-5 Southbound Ramps/ Kent-Des Moines Road	I-5 Southbound Ramps/ S 272nd Street	I-5 Northbound Ramps/ S 272nd Street	SR 99/ S 276th Street
LOS Standard	D	D	D	D	D
No Build Alternative	**F (F)**	**C (E)**	**C (D)**	**E (D)**	**B (B)**
SR 99 Alternative	**F (F) / F (E)**	**C (C) / E (E)**	**C (C) / E (D)**	**F (E) / E (D)**	**E (D) / B (B)**
I-5 Alternative	**F (F) / F (E)**	**C (C) / E (E)**	**N/A**	**F (E) / D (D)**	**N/A**
SR 99 to I-5 Alternative	**F (F) / F (E)**	**C (C) / E (E)**	**N/A**	**F (E) / D (D)**	**N/A**
I-5 to SR 99 Alternative	**F (F) / F (E)**	**C (C) / E (E)**	**C (C) / E (D)**	**F (E) / E (D)**	**E (D) / B (B)**

Notes:
Data in table formatted as AM LOS Unmitigated (AM LOS Mitigated) / PM LOS Unmitigated (PM LOS Mitigated).
LOS designation based on local jurisdiction or WSDOT Standards.
N/A = not applicable; mitigation not proposed for intersection.

7.3.2.3 S 272nd Star Lake Station Interim Terminus Conditions

I-5 Alternative and SR 99 to I-5 Alternative

In the S 272nd Star Lake Station interim terminus condition, mitigation is proposed at the following three intersections under build conditions, regardless of the station option:

- SR 99/Kent-Des Moines Road
- I-5 southbound ramps/Kent-Des Moines Road
- I-5 northbound ramps/S 272nd Street

In the build condition, the I-5 northbound ramps and S 272nd Street intersection would operate below No Build Alternative conditions in the AM peak period. The potential mitigation identified in Table 7-1 would improve intersection operations to operate the same as, or better than, under the No Build Alternative. Table 7-4 provides mitigated LOS results for each of the improved intersections.

7.4 Safety

The FWLE alternatives would have no effects on the transportation safety in the FWLE corridor that require mitigation, except as noted along I-5. By designing the project elements (such as placement of guideway columns) to roadway standards, no additional mitigation would be required to improve transportation safety. Within the FWLE study area along the I-5 southbound mainline, there are approximately 11,500 feet of existing guardrail, walls, or barriers that would shield vehicles from light rail columns.

In instances where the minimum I-5 clear zone could not be maintained through grading, Sound Transit would coordinate with the Washington State Department of Transportation to identify the appropriate safety treatment. These treatments may include additional guardrail, barriers, and/or walls.

7.5 Parking

For acquired off-street parking resulting from partial property acquisitions, business opportunities might be reduced. The value of acquired parking depends on the quantity of spaces lost and the business type. Sound Transit would work with private business owners to determine fair market value of the acquired spaces.

The potential additional S 216th West or East and S 260th West or East station options also would have the potential for hide-and-ride activity because no parking would be provided at the station; however, the hide-and-ride potential would be minimized at the S 216th West or either S 260th Station because there is a low amount of easily accessible on-street public spaces near these stations. A greater likelihood for hide-and-ride parking exists near the potential additional S 216th East Station and may require mitigation. Sound Transit would work with local jurisdictions to develop a plan to evaluate and, if necessary, implement hide-and-ride mitigation that could consist of parking meters, restricted parking, passenger and truck load zones, and residential parking zones (RPZs). For parking controls agreed to with local jurisdictions, Sound Transit would be responsible for the cost of installing the parking controls agreed to with the local jurisdictions for 1 year after the opening of the FWLE. The local jurisdictions would be responsible for monitoring the parking controls and providing all enforcement and maintenance, including ongoing RPZ-related costs. Off-street private lot owners would be responsible for monitoring and preventing potential hide-and-ride parking within their own lots.

At the Kent/Des Moines Station, Sound Transit could consider a parking management program to maximize the parking capacity and to deter Highline College students from parking at the station parking areas. The parking management program could include restricted parking signage, permit parking only, priced parking similar to Highline College pricing rates, and/or working with Highline College to develop on-campus pricing strategies that make on-campus parking more attractive.

7.6 Nonmotorized Facilities

The FWLE would not result in any adverse impacts on existing nonmotorized facilities because all of the nonmotorized analysis indicate an LOS D or better near the stations. At stations, Sound Transit would provide pedestrian and bicycle improvements to safely accommodate the projected increase in pedestrian and bicycle travel associated with the FWLE in accordance with Sound Transit System Access Policy. Sound Transit would also work with local agencies to determine which pedestrian and bicycle improvements would be most appropriate to support station access and safety. Any new facilities would be expected to meet local and federal design standards for pedestrian and bicycle facilities.

7.7 Freight Mobility and Access

No transportation impacts were identified for freight mobility and access as a result of the FWLE; therefore, no mitigation would be needed for these elements.

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8.0 Cumulative Impacts

This chapter discusses potential cumulative transportation mobility impacts that would be caused by the Federal Way Link Extension (FWLE). The analysis of the No Build Alternative and the FWLE alternatives is inherently cumulative because it is based on regional forecasts that assume future funded projects and future growth in population and employment, located in designated growth centers, and consistent with adopted land use plans. However, there could be differences in effects based on the details of other individual transportation or development projects and the actual rate and timing of population or employment growth in a given community.

8.1 Regional Facilities and Travel

The cumulative effect of the FWLE in conjunction with the planned extension of State Route (SR) 509 between its current terminus near S 188th Street and I-5 could improve overall traffic operations beyond the conditions forecasted with the No Build or build alternatives. The cumulative effect of the FWLE and the completion of the SR 509 Extension Project would likely result in less congestion on I-5 and along major north-south arterials like SR 99 in the vicinity of the study area than would occur with constructing only the FWLE.

Beyond the SR 509 Extension Project, Washington State Department of Transportation (WSDOT), as part of the I-5 Puget Sound Gateway Project, could implement lane management strategies, such as express tolled lanes. Depending on how lane management strategies were administered, managed lanes could improve travel conditions on I-5 for some travel modes.

8.2 Transit Service and Operations

Future extensions of the regional mass transit network are depicted in Sound Transit's *Regional Transit Long-Range Vision* and include an extension south to Tacoma (Sound Transit 1996a). If voters approve funding for construction of additional extensions, transit accessibility for the communities in the FWLE corridor would be increased through connections to additional regional destinations.

8.3 Arterial and Local Street Operations

The future transportation impacts discussed in Chapter 4 were based on the results of traffic and ridership modeling that incorporates funded and approved future actions as well as projected growth that would include development in the region. Other planned, but not funded, regional and local transportation and development projects could have some effects on transit ridership and travel patterns within the study area, including traffic operations near the FWLE stations. This includes the potential for transit-oriented development. This form of land development could change how people access the stations, with a likely increase in people walking or biking to the station as nearby development occurs.

The current design of the SR 509 extension proposes closing S 208th Street east of SR 99 and extending S 211th Street east to 32nd Lane S to maintain neighborhood access to SR 99. If the I-5 Alternative or I-5 to SR 99 Alternative is identified as the Preferred Alternative, roadway improvements in this area proposed as part of the SR 509 Extension Project would need to be redesigned to maintain neighborhood access and maintain a grade-separated light rail guideway in this area. Sound Transit would coordinate with WSDOT on potential alternatives to the current roadway design for S 211th Street.

8.4 Safety

The SR 509 Extension Project would require widening of the I-5 mainline between S 200th Street and S 310th Street. For the No Build and I-5 alternatives, a clear zone assessment of the I-5 mainline and ramps was completed for the southbound I-5 mainline with the SR 509 Extension Project. This assessment assumed the most recent SR 509 conceptual design (2003). Table 8-1 documents the southbound I-5 roadside conditions between S 211th Street and S 317th Street with the SR 509 extension and without and with the FWLE I-5 Alternative alignment. Table 8-1 includes the length of where barriers along I-5 are located, or proposed with SR 509, the length of clear zone impact that would result from the FWLE alignment, and the resulting length of available clear zone along I-5. Additional clear zone data are provided in Chapter 3, Section 3.4.2; Chapter 4, Section 4.4.3.1; and Appendix H of this report.

TABLE 8-1
Southbound I-5 No Build and I-5 Alternative Clear Zone Summary with SR 509 Extension Project (Between S 211th Street and S 317th Street)

Condition	No Build	I-5 Alternative	I-5 Landfill Median Alignment Option
Length of barrier provided (in feet)[a]	20,900	21,700 (+800)	22,800 (+1,900)
Length of available clear zone (in feet)[b]	15,100	14,300	13,200
Total segment length (in feet)	36,000	36,000	36,000

Notes:
( ) Values shown in parenthesis represents the additional length of the corridor where the FWLE would be located in an existing clear zone. Mitigation, such as barrier or guardrails, may be required with the project in these locations.
[a] Represents areas where barriers are proposed with the SR 509 Extension Project. These areas include shielding to protect highway infrastructure, tree stands, steep side slopes, and other landscaping elements, or would be used to protect grade-separated crossings.
[b] Represents areas where future conditions meet the definition of a clear zone.

If the SR 509 Extension Project is constructed prior to the FWLE, 15,100 feet of clear zone would be provided along I-5 southbound. The SR 509 Extension Project proposes about 20,900 feet of longitudinal barrier, which would increase the shielded segments of southbound I-5 by 9,400 feet compared to the no SR 509 Extension condition. The shielded segments of the southbound I-5 roadside include 18,800 feet where WSDOT could potentially create a clear zone by alteration of, removal, or relocation of the roadside hazards described in Chapter 3, Section 3.4.2 of this report. Approximately 2,900 feet of barrier would shield grade-separated streets, and a clear zone cannot be created.

The I-5 and the I-5 to SR 99 alternatives would have a slight impact on the I-5 southbound clear zone. There would be a short distance (approximately 800 feet) on the Kent-Des Moines Road southbound

on-ramp to I-5 where a clear zone would not be provided and guardrails or barriers would be provided to protect the light rail guideway columns. No other I-5 southbound clear zones would be affected. Based on *Highway Safety Manual* (AASHTO, 2014) analysis, adding guardrail or barrier along the Kent-Des Moines Road southbound on-ramp could result in an increase of up to one crash per year. This on-ramp currently has had one crash over a recent 5-year period (2007–2011).

If the SR 509 Extension Project is constructed and the I-5 median is used for tolling, the I-5 Alternative's Landfill Median Alignment Option would require the reduction of the inside shoulder width on I-5 from approximately 10 feet to 6 feet for approximately 1/2 mile. The light rail guideway would be located less than 30 feet from the edge of traveled way when the alignment is in the I-5 median. A barrier along the inside shoulder of I-5 southbound and northbound mainlines would be proposed to protect the guideway columns from vehicle collisions. Furthermore, as the guideway transitions to and from the I-5 median, barrier would be required along the southbound I-5 outside shoulder (up to 600 feet for the northernmost transition section and up to 500 feet for the southernmost transition section) to shield the guideway. Based on safety analysis using the HSM, adding a barrier such as a guardrail through this median section of both directions of I-5 and along the southbound I-5 outside shoulder could result in an increase of up to two crashes per year.

Maintenance impacts when the I-5 Alternative is next to the I-5 mainline with the SR 509 Extension Project would have the same impacts as identified in Chapter 4, Section 4.3.1.3. No additional maintenance impacts would be expected with operation of the FWLE and with the construction of the SR 509 Extension Project.

8.5 Parking

Parking within the FWLE corridor could be affected by land use and transportation infrastructure changes that are not reflected in this analysis. In particular, transportation projects that increase roadway capacity could increase parking demand within the corridor. Conversely, increases in regional transit connectivity could decrease parking demand as travelers shift their modes of travel.

8.6 Nonmotorized Facilities

Future unfunded projects or accelerated growth could add more pedestrian and bicycle trips to the street network surrounding the light rail stations. These projects could also improve nonmotorized facilities associated with the FWLE.

8.7 Freight Mobility and Access

As described in the future transportation impacts in Chapter 4, none of the build alternatives would have long-term travel impacts on automobile or truck traffic in the Puget Sound Region because the light rail guideway would operate in its own right-of-way. Therefore, there would be no potential cumulative transportation mobility impacts on freight mobility and access with any of the build alternatives.

8.8 Construction

If the SR 509 Extension Project is completed prior to FWLE construction, there would be no direct impact on the I-5 travel lanes with the I-5 Alternative. However, the light rail construction area for the I-5 Alternative could be located adjacent to the I-5 pavement edge in the following two locations:

- Midway Landfill between S 246th and S 252nd streets (approximately 1/2 mile) and
- McSorley Creek wetland area in the vicinity of S 272nd Street (approximately 1/4 mile).

Short-term, temporary I-5 shoulder reductions would be required in these two locations. In these locations, the freeway capacity could be reduced temporarily due to the loss of shoulder width and could result in slower vehicle speeds through the construction areas. For the remaining construction areas along I-5, full shoulder widths would be maintained during construction. A Maintenance of Traffic plan that addresses all travel modes would be prepared during final design for agency approval.

The clear zone would already be reduced along many sections of I-5 through the study area compared with the No Build Alternative if the current design of the SR 509 Extension Project were constructed. Even so, temporary impacts on the I-5 southbound clear zone would occur. About 1,000 feet of clear zone would remain during construction (from approximately S 240th Street to S 243rd Street). However, a temporary construction barrier would be placed for approximately 15,100 feet near the southbound I-5 edge of pavement where barriers would not already be present. Based on the safety analysis using HSM methodologies, placing a temporary barrier along southbound I-5 between S 211th Street and S 317th Street could result in an increase of up to three crashes per year during the construction period. This would be a smaller increase than the condition without the SR 509 Extension Project because more permanent barriers would already be present with that project.

Between approximately S 240th Street and S 252nd Street, construction of the guideway with the I-5 Landfill Median Alignment Option would require the temporary closure of one southbound lane and the temporary narrowing of the inside shoulder to provide adequate space during construction of the guideway. This would likely occur over 4 to 6 months. During this period, the freeway capacity would be temporarily reduced in this short section from the loss of shoulder and travel lanes. The loss of capacity would result in slower vehicle speeds through this area and could require detours.

Construction of the girders for the guideway bridges over the southbound lanes of I-5 would have impacts on I-5 traffic operations during installation. If cast-in place construction methods are used, this could require a shoring tower in the middle of southbound I-5 to support the straddle bents while they are being constructed, thus requiring closure of one to two lanes for up to 6 weeks, or restriping southbound I-5 mainline travel lanes around the construction area. Using precast cap beams across southbound I-5 would avoid the need for shoring towers but would require multiple overnight and/or weekend closures. If I-5 southbound is closed, the likely detour route would use the Kent/Des Moines interchange to SR 99 and/or Military Road, with traffic rerouted back to I-5 at S 272nd Street. Either of these revisions to the I-5 southbound mainline would require advanced signage and restriping to ensure safe operations through this construction area.

Simultaneous construction of the SR 509 Extension and FWLE projects could result in an increased number of trucks within the study area. Construction of the SR 509 Extension would have direct impacts on the I-5 mainline and would require construction access directly from I-5, whereas construction of the FWLE would not require direct vehicle access via I-5 and would have no direct impacts on the I-5 mainline operations, except with the I-5 Landfill Median Alignment Option. Any lane closures and detour routes would be coordinated to minimize any traffic impacts related to simultaneous construction.

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