# 3.0 Transportation Environment and Consequences

## 3.1 Summary

This chapter describes the characteristics of the transportation system in the Federal Way Link Extension (FWLE) vicinity and discusses potential impacts and mitigation measures associated with the project alternatives described in Chapter 2. This chapter first describes the existing transportation environment, and then presents the analysis and results showing potential impacts and mitigation. A summary of key findings is provided in Table 3-1. A more detailed discussion of the transportation analysis and results is provided in the Transportation Technical Report in Appendix G1.

TABLE 3-1
**Transportation Key Findings**

| Transportation Element | Key Findings |
|---|---|
| Regional Facilities and Travel | • The build alternatives would decrease overall regional vehicle miles traveled (VMT) by approximately 150,000 miles per day (a 0.2% decrease) and vehicle hours traveled (VHT) by approximately 10,000 hours per day (a 0.3% decrease).<br>• Traffic volumes and congestion across screenlines through the study area and along I-5 are expected to remain similar with the FWLE.<br>• The number of persons traveling through the study area is expected to increase with the FWLE. A greater percentage of these persons would use transit compared to the No Build Alternative. |
| Transit Operations | • The FWLE would have up to 27,500 daily transit riders and up to 8,000 riders would be considered new daily transit riders.<br>• Transit level of service (LOS) measures of effectiveness, including hours of operation, service frequency, reliability, and passenger load, would improve.<br>• The build alternatives, compared with bus service, would provide a comparable travel time from Downtown Seattle to the Federal Way Transit Center. Between Federal Way Transit Center and other key Puget Sound destinations, travel times would be noticeably faster. |
| Arterials and Local Streets Operations | • The S 272nd Redondo Station and S 272nd Star Lake Station would provide the greatest increase in park-and-ride spaces with the full-length build alternatives. Under interim terminus conditions, the Kent/Des Moines Station would provide up to 1,000 parking spaces.<br>• Vehicle trip generation at stations with park-and-rides would range from approximately 300 additional peak hour trips at the Kent/Des Moines Station up to approximately 800 additional peak hour trips with the Federal Way S 320th Park-and-Ride Station Option.<br>• Property access and circulation impacts are expected to be minimal because the FWLE would be located in an exclusive guideway outside of roadway operations. Where needed, additional access roads and traffic control would enhance circulation.<br>• Up to seven intersections could operate worse than the No Build Alternative with the FWLE and at levels below agency LOS standards. Proposed mitigation would improve operations at these locations to be similar or better than the No Build Alternative. |

TABLE 3-1
**Transportation Key Findings**

| Transportation Element | Key Findings |
|---|---|
| Safety | • Safety effects are expected to be minimal because the FWLE would be located in an exclusive guideway outside of roadway operations.<br>• With all build alternatives and station options, there would be an increase in vehicle and nonmotorized activity around the station areas, which would increase the potential for conflicts between different travel modes; however, these are not expected to affect roadway accident rates.<br>• The southbound I-5 clear zone would be maintained under all FWLE alternatives within the I-5 right-of-way. Only the I-5 Alternative's Landfill Median Alignment Option would increase the risk of accidents. The project could provide a barrier (such as guardrail) to protect vehicles on I-5 from light rail columns. |
| Parking | • The build alternatives would provide 1,600 additional parking stalls divided between the three stations: Kent/Des Moines (500 spaces), S 272nd Street (700 spaces), and the Federal Way Transit Center (400 spaces).<br>• The build alternatives would remove between 250 and 830 parking stalls. The I-5 to SR 99 Alternative would remove the greatest amount of parking, and the SR 99 to I-5 alternative would remove the least amount of parking.<br>• The potential additional station at S 216th Street (East option) would have the greatest potential for transit users to park in surrounding neighborhoods due to available on-street parking nearby.<br>• At the Kent/Des Moines Station, Sound Transit could consider a parking management program to maximize the parking capacity and deter Highline College (HC) students from parking at the station parking areas. The parking management program could include restricted parking signage, permit parking only, or priced parking strategies. |
| Nonmotorized Facilities | • The pedestrian LOS would generally be acceptable for all alternatives and station options, with most crosswalks and sidewalks operating between LOS A and C. |
| Freight Mobility and Access | • No substantial changes to freight mobility and access would be expected with the No Build Alternative and build alternatives beyond the increased traffic volumes near the station areas. |

## 3.2 Transportation Elements and Study Area

The transportation system analysis considered seven transportation elements (see box to the right) for the affected environment and 2035 No Build and FWLE build alternatives. Interstate 5 (I-5) 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 I-5 clear zone). Navigable waterways are not evaluated in this analysis because there are not any such waterways in the FWLE transportation study area.

**Transportation System Elements Analyzed**

- Regional facilities and travel
- Transit operations
- Arterial and local street operations
- Safety
- Parking
- Nonmotorized facilities
- Freight mobility and access

The study area for this transportation analysis is generally bound by State Route (SR) 99 and I-5 from S 200th Street in the City of SeaTac to approximately S 324th Street in the City of Federal Way. Intersections studied for level-of-service (LOS) were identified along

major arterials 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 the following sections. Exhibit 3-1 shows the study area and other key transportation study elements.

The affected environment sections for these elements describe existing conditions (in 2013), while impacts are analyzed for the design year 2035 (hereafter referred to as "year 2035"), which is consistent with the planning period of regional and local agencies. The impact analysis compares the No Build Alternative to the build alternatives, including potential mitigation that may be implemented with the project.

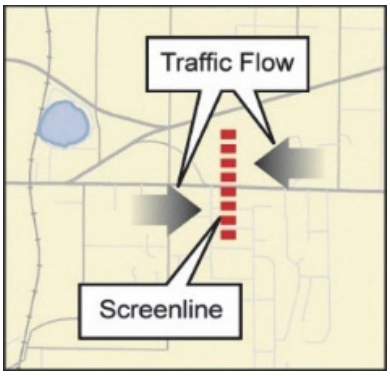
**Design Year 2035**

The year for which ridership forecasts and volumes are estimated to determine the design features required for the proposed FWLE improvements.

## 3.3 Methodology and Assumptions

The methodology and assumptions used to analyze the transportation impacts of the FWLE have been compiled in the *Federal Way Link Extension Technical Analysis Methodology*, which is provided in Appendix A of Appendix G1, Transportation Technical Report. That report presents the following information:

- Agency guidelines and regulations regarding the transportation analysis.
- Transportation analysis methodology, including relevant definitions, data collection, regional traffic analysis, intersection impact analysis, and safety assessments.
- Methods for traffic forecasting and transit ridership estimates.
- Methods for assessing impacts related to light rail stations and park-and-ride areas, parking, nonmotorized facilities and modes, property access and circulation, freight, transit, and construction.
- The transportation impacts of the FWLE were analyzed from three different perspectives: regional, screenline (corridor), and local operations. The regional and screenline assessments studied larger areas of the study area. The operational assessment identified and analyzed specific roadways, intersections, and transit facilities.




*A screenline is an imaginary line across a section of freeways or arterials. These screenlines are used to provide a snapshot of how much volume is entering or exiting a particular area.*


*Data Sources: King County, Cities of Des Moines, Federal Way, Kent, SeaTac (2013).*

N

0 0.5 1 2 Miles

**EXHIBIT 3-1**
FWLE Transportation Study Area

*Federal Way Link Extension*

# 3.4 Affected Environment

## 3.4.1 Regional Facilities and Travel

This section describes the regional travel conditions in the study area, which is served by two north-south highway facilities, SR 99 and I-5. East-west connections are mainly arterial roadways such as Kent-Des Moines Road (also known as SR 516), S 272nd Street, and S 320th Street. These arterials provide connections within the study area and to/from areas to the west and east. There are few regional facilities that directly connect the study area to the region's major population and employment areas, and travel is constrained on these roadways during the peak periods.

### 3.4.1.1 Vehicle Miles Traveled and Vehicle Hours Traveled

Today, over 85 million vehicle miles traveled (VMT) occur daily within the central Puget Sound Region (which includes King, Pierce, and Snohomish counties). This results in over 2.5 million vehicle hours traveled (VHT) daily and approximately 300,000 vehicle hours of delay (VHD) for all users of the transportation system.

### 3.4.1.2 Regional Roadways

Interstate freeways and state highways in the study area are identified in Table 3-2. A range of average daily traffic (ADT) volume is provided because travel characteristics are variable along these regional roadways. Local roadways in the study area are discussed in Section 3.3.3.

**Transportation Analysis Terms**

**Vehicle miles traveled (VMT):** The total number of vehicle miles traveled within a specific geographic area over a given period of time.

**Vehicle hours of delay (VHD):** The extra vehicle hours expended traveling on the roadway network below the posted speed limit in a specified area during a specified time period.

**Vehicle hours traveled (VHT):** The total vehicle hours expended traveling on the roadway network in a specified area during a specified time period.

**Average daily traffic (ADT):** The total volume of traffic during a given time period divided by the number of days in that time period, representative of average traffic in a one-day time period.

**Vehicle volume to capacity (v/c):** The ratio of the vehicle demand compared to the roadway capacity, used as the performance measure to assess travel conditions on the regional facilities in the study area.

**Peak hour:** The hour of the day in which the maximum demand for service is experienced, accommodating the largest number of automobile or transit patrons.

**Mode share:** The percentage of people using a particular type of transportation (automobile, high-occupancy vehicle [HOV], or transit).

TABLE 3-2
**Existing Regional Highway Facilities**

| Roadway | Roadway Classification | Number of Lanes | Speed Limit (mph) | ADT[a] | Bike Lanes | Sidewalk |
|---|---|---|---|---|---|---|
| SR 99 | Principal Arterial | 4 - 6 | 40 – 45 | 23,000 - 36,000 | N | Y |
| I-5 | Freeway | 8 - 10 | 60 | 176,000 - 206,000[b] | N | N |
| Kent-Des Moines Road | Principal Arterial | 4 | 45 | 30,000-35,000 | N | Partial |

[a] ADT is based on 2013 traffic count information where available; otherwise, 2012 counts with 1 year growth were used.
[b] Value based on Washington State Department of Transportation *Ramp and Roadway 2012* (WSDOT, 2012a).
mph = miles per hour; N = no; Y = yes

SR 99 provides a major north-south connection extending through Seattle south to Fife and is classified by the Washington State Department of Transportation (WSDOT) as a highway of state significance (HSS) and is part of the National Highway System (NHS). This road is a major north-south arterial west of I-5 within the study area. The facility is also called International Boulevard through the city of SeaTac and Pacific Highway S through the cities of Kent, Des Moines, and Federal Way.

I-5 is classified as an HSS, is a limited-access facility, and connects the transportation study area directly to key regional urban areas such as Downtown Seattle and Tacoma. I-5 is also part of the NHS.

Kent-Des Moines Road, which runs east-west and connects the Kent and Des Moines communities, is a highway of regional significance (non-HSS) and is part of the NHS. This road provides connections to Downtown Kent, the Kent Manufacturing/Industrial Center, and Downtown Des Moines. The road is classified as a principal arterial.

**Major Roads and Highways**

**Arterial:** A major thoroughfare used mainly for through traffic rather than access to residential neighborhoods. Arterials generally have greater traffic-carrying capacity than collector or local streets and are designed for continuously moving traffic.

**Highway of state significance (HSS):** Interstate highways and principal arterials that are needed to connect major communities in the state.

**Highway of regional significance (non-HSS):** State transportation facilities that are not designated as being of statewide significance.

**National Highway System (NHS):** A network of major highways important to the nation's economy, mobility, and defense.

#### 3.4.1.3 Screenline Performance

Three screenlines, which cut across I-5 and SR 99, were established to assess the regional north-south travel within the study area. These screenlines provide a snapshot of traffic operations, such as volumes and travel mode share, along each corridor based on the travel demand estimated from the Puget Sound Regional Council (PSRC) and Sound Transit regional models. The screenlines are shown in Exhibit 3-1.

Vehicle volume-to-capacity (v/c) ratio is used as the performance measure to assess travel conditions on the regional facilities in the study area. Road deficiencies might exist when a v/c ratio exceeds 0.9. A v/c ratio over 1.0 suggests that the road cannot effectively accommodate all traffic and congestion is likely prohibiting efficient movement of people and goods. Mode share information provided from the PSRC and Sound Transit travel demand models allocates the vehicle demand on a roadway by vehicular type, which includes single-occupancy vehicles (SOVs), high-occupancy vehicles (HOVs), and transit.

The three screenlines cross areas with volumes close to capacity, indicating substantial congestion in the southbound direction, which is the peak direction in the PM peak hour. This level of congestion is

expected during the PM peak period as commuters are leaving large employment centers such as Downtown Seattle north of the study area. The northbound direction of travel does not currently have as much congestion.

## 3.4.2 Transit Operations

### 3.4.2.1 Transit Service and Facilities

Transit centers and park-and-ride facilities are the major transit facilities within the study area. King County Metro Transit (Metro), Sound Transit, and Pierce Transit provide bus service to these facilities. Metro provides most of the bus service in the area with express and local service routes throughout King County. Sound Transit's Regional Express buses provide regional service within the study area to King and Pierce counties. Pierce Transit buses provide service between Pierce County and south King County. Transit facilities in the study area include the following:

- Kent/Des Moines Park-and-Ride and Freeway Station
- Star Lake Park-and-Ride and Freeway Station
- Redondo Heights Park-and-Ride
- Federal Way Transit Center
- Federal Way/S 320th Street Park-and-Ride

Approximately 3,700 park-and-ride spaces are provided at these transit facilities in the study area. A list of transit routes that serve these facilities is provided in Appendix G1.

As of Spring 2012, thirty-three bus routes serve the study area. A mix of peak and all-day routes is provided, with peak service serving regional destinations north of the study area, including Downtown Seattle, First Hill, and the University of Washington. All day service provides more local feeder service from surrounding communities. Bus frequency and hours of service are discussed below in Section 3.4.2.2.

### 3.4.2.2 Transit Levels of Service

The following transit LOS performance measures were analyzed for the PM peak period (3:00 p.m. to 7:00 p.m.) to describe transit performance, unless otherwise noted:

- Service frequency
- Hours of service
- Passenger load
- On-time reliability

**Transit Levels of Service**

For transit, LOS A indicates frequent peak-period service, more hours served during the day, high on-time performance, and minimal passenger crowding in a transit vehicle. Conversely, LOS F indicates infrequent or irregular service, minimal service hours, poor reliability, and passenger crowding in the vehicle.

Appendix G1 describes transit levels of service definitions and the existing and future transit LOS values for each of the LOS measures.

Overall, the majority of the transit routes operate with a peak period level of service frequency of LOS E or worse, meaning average headways (how often transit will pass by a particular point along the route) are every 30 minutes or longer. Bus routes that provide service between Downtown Seattle and the FWLE study area currently operate at average headways of 15 minutes to 60 minutes, with most routes operating at a 30-minute headway. The RapidRide A Line, which provides service between Tukwila and Federal Way on SR 99, has the most frequent bus service in the study area. This route operates with 10-minute headways during the PM peak period and is the only route that operates at LOS B or better.

Little to no existing transit service is provided between the study area and key Puget Sound regional employment centers other than Downtown Seattle, such as Downtown Bellevue, Redmond, the University of Washington, Northgate, and Lynnwood. Within the study area, transit service is available along SR 99 throughout most of the day as RapidRide A Line travels between Federal Way Transit Center and the City of SeaTac, operating at LOS A or B.

The existing passenger load LOS is generally acceptable on most routes, although some routes do experience overcrowding. Detailed bus passenger load data are provided in Table C-1 in Appendix G1.

Service reliability, including on-time performance, was evaluated at regional transit facilities, and overall LOS results are shown in Table 3-3. Transit trips are considered on time if they depart at the scheduled departure time up to 5 minutes late. Trips are also considered unreliable if they depart earlier than their scheduled departure time.

TABLE 3-3
**Transit On-Time Performance and Reliability at Transit Hubs**

| Transit Facility | On-Time Performance Percentage | Reliability LOS |
|---|---|---|
| International District/Chinatown | 58% | F |
| Kent-Des Moines Park-and-Ride/Kent-Des Moines I-5 Freeway Stop | 48% | F |
| Highline College | 82% | D |
| Star Lake Park-and-Ride | 45% | F |
| Federal Way Transit Center | 66% | F |

The International District/Chinatown Station was chosen for this analysis because transit service that occurs between the FWLE study area and Downtown Seattle travels through this station. The other four transit hubs selected are key transit facilities within the study area. The on-time performance and reliability metrics for the key bus routes in the study area are also shown in Appendix G1.

Most buses operate with poor on-time performance because of roadway congestion and wide variations in roadway travel times. In general, as buses travel along their route, the on-time performance percentage decreases. For example, Metro Route 177 is on time approximately 60 percent of the time at the International District/Chinatown Station, but by the time it reaches the Federal Way Transit Center in the PM peak, its on-time performance is less than 40 percent.

The RapidRide A Line reliability measure is not based on on-time performance but rather its headway adherence because it operates at 10-minute headways during the PM peak period. At the two station areas where RapidRide A Line reliability is measured (Federal Way Transit Center and Kent-Des Moines Road), the route operates with typical headway adherence at LOS C or better.

## 3.4.3 Arterials and Local Streets Operations

### 3.4.3.1 Arterial and Local Roadways

Exhibit 3-1 shows the local roadways in the study area, including the major facilities and roadway classification. Local north-south roads, including Military Road, have two travel lanes and speeds between 25 and 40 miles per hour (mph), while east-west cross-streets have between two and six lanes and speeds under 40 mph. Average daily traffic volumes range from a few thousand vehicles per day to up to 43,000 vehicles along S 320th Street. Most roadways in the study area have full or partial sidewalks but generally do not have bicycle lanes. Average daily traffic volumes, speed limits, and functional classification are described in more detail in Appendix G1.

**Intersection Levels of Service**

The quality of intersection operations is also described in LOS terms. LOS ratings range from LOS A to LOS F; LOS A represents the best operations, and LOS F represents the poorest operations. LOS was calculated for all study intersections. Intersections are considered to operate acceptably when they operate at or better than the agency's intersection LOS standard. Failing intersections mean that vehicles incur substantial delay, vehicle queuing is evident, and the intersection does not meet the agency's LOS standard.

### 3.4.3.2 Intersection Operations and Level of Service

Intersections were analyzed to understand the operating conditions on the local streets. Agency intersection LOS standards are shown in Table 3-4. Appendix G1 provides a detailed summary of the traffic analysis results for the existing AM and PM peak-hour conditions, signal control, and the applicable LOS standard.

TABLE 3-4
**LOS Standards for Affected Agencies**

| Agency | LOS Standard |
|---|---|
| Washington State Department of Transportation | LOS D for highways of statewide significance (HSS)<br>LOS E/mitigated for regionally significant state highways (non-HSS) |
| City of SeaTac | LOS E for principal and minor arterials<br>LOS D for collector and lower classification streets<br>LOS F exemptions are at the following SR 99 intersections:<br>- S 188th Street<br>- S 216th Street |
| City of Des Moines | LOS D for signalized intersections or v/c less than 1.0, with the following exceptions (with their LOS and v/c threshold ) along SR 99:<br>- S 216th Street (LOS F, v/c <1.0)<br>- Kent-Des Moines Road (LOS F, v/c <1.2)<br>- S 220th Street (LOS E, v/c <1.0)<br>- S 224th Street (LOS E, v/c <1.0) |
| City of Kent | LOS E for non-SR 99 intersections<br>LOS F for all SR 99 intersections |
| City of Federal Way | LOS E and a v/c ratio less than 1.0 for signalized intersections<br>v/c ratio less than 1.0 for unsignalized intersection lane groups |

Note: The LOS threshold for intersections that have approaches with multiple roadway classifications will be the higher classified roadway (e.g., at an intersection between a principal arterial and a collector, the LOS threshold of the principal arterial will apply).

An AM and PM peak hour intersection LOS analysis was conducted using the collected peak-hour traffic volumes. All of the intersections currently meet the respective jurisdiction's mobility standards except for Kent-Des Moines Road and I-5 southbound ramps intersection during the PM peak hour, and the Kent-Des Moines Road and SR 99 intersection during both the AM and PM peak hours. These intersections do not meet the WSDOT standard of LOS D for HSS facilities.

### 3.4.4 Safety

Crash data records were collected for a 5-year period between 2007 and 2011 for intersections, arterials, and I-5 (mainline and ramps) within the study area. Detailed crash frequencies and rates are provided in Appendix G1, Table 3-12 through Table 3-14. The majority of the crashes in the study area occurred at intersections. The intersection of SR 99 and Kent-Des Moines Road had the greatest number of crashes (197) and the highest intersection crash rate of 2.16 crashes per million entering vehicles (MEV) over the 5-year period. S 320th Street between SR 99 and I-5 had the greatest number of crashes (161) and the highest corridor crash rate of 2.99 crashes per million vehicle miles traveled (MVMT) over the 5-year

period. Appendix G1 provides additional information on the crash analysis results for the study area intersections arterials and the I-5 mainline and ramps.

WSDOT uses a system of collision analysis corridors (CAC) or collision analysis locations (CAL) to identify locations with high potential for safety improvements. The only arterial within the study area classified as a CAC is Kent-Des Moines Road; however, the crash rate on the segment of Kent-Des Moines Road within the study area is around 1.3 crashes per million vehicle miles traveled (MVMT), which is less than the statewide average for urban arterials (2.55 crashes per MVMT). Two SR 99 segments, S 216th Street to Kent-Des Moines Road (2.55 crashes per MVMT) and S 288th Street to S 320th Street (2.56 crashes per MVMT) have crash rates over the statewide average.

On the I-5 mainline through the study area, there were a total of 1,705 crashes between 2007 and 2011. The 2011 statewide collision average for interstates within WSDOT's jurisdiction in urban areas is 1.24 crashes per MVMT. All I-5 mainline segments in the study area have a crash rate less than the statewide average. The only CAC on I-5 in the study area is a 0.3-mile section at the S 272nd Street interchange. WSDOT concluded that no improvements are needed through this segment at this time.

There were a total of 378 crashes on the I-5 ramps in the study area between 2007 and 2011. The southbound off-ramp to S 320th Street has the highest crash frequency of about 17 crashes per year, but it also has the highest volume of any of the ramps in the study area.

A clear zone inventory for the I-5 mainline and ramps was completed for the western edge of I-5 between S 211th Street and S 317th Street and the I-5 median between S 244th Street and S 256th Street. Based on WSDOT Design Manual criteria for clear zone distances, a distance ranging between 20 and 45 feet, measured from the edge of traveled way, would allow for sufficient clear zone along the FWLE study area. Two conditions were assessed:

**Clear Zone**

The Roadside Design Guide defines a clear zone as an unobstructed, relatively flat area beyond the edge of the traveled way that allows a driver to stop safely or regain control of a vehicle that leaves the traveled way.

- Whether the clear zone width is currently met
- Whether a clear zone cannot be provided and barriers are required for safety (e.g., overcrossings)

Based on this inventory, approximately two-thirds of the southbound I-5 mainline currently has a clear zone, while the remaining sections have barriers, walls, or guardrails where the clear zone is not currently met or cannot be provided. The I-5 median between S 244th Street and S 256th Street is shielded by guardrail or barriers along northbound and southbound I-5, except for a small break for emergency vehicle access near S 248th Street.

### 3.4.5 Parking

Existing parking supply and utilization information was collected for the areas surrounding the potential FWLE stations and is provided in Table 3-16 in Appendix G1, Transportation Technical Report.

The areas surrounding the FWLE stations have an on-street parking utilization rate between 13 and 43 percent. These low utilization rates indicate that there is generally on-street parking available in the station areas. The park-and-rides in the study area have a utilization rate of 45 percent or more, except the Redondo Heights Park-and-Ride, which has an 8 percent utilization rate.

Currently, there are no privately operated parking facilities near the FWLE stations. Surrounding the Kent/Des Moines station area, most parking is located in residential neighborhoods and is generally restricted to residential uses only. While on-street parking is provided east of I-5, this parking was not considered because the total walking distance would be substantially greater than 1/4 mile from the station, the distance most pedestrians are willing to walk to access transit service. There is some on-street parking located north of the Star Lake Park-and-Ride adjacent to I-5. The parking at nearby multi-family housing is restricted to residents. The Federal Way Transit Center Station area has limited on-street parking.

### 3.4.6 Nonmotorized Facilities

Sidewalks are provided on both sides of SR 99 and are also along many arterial streets within the study area; however, some arterials are missing sidewalks on one or both sides of the road, such as Kent-Des Moines Road east of I-5 and S 240th Street. Many residential neighborhoods and local streets also lack sidewalks.

Pedestrian mobility between the station areas and east of I-5 occurs at the Kent-Des Moines Road, S 272nd Street, and S 320th Street

interchanges. Sidewalks around these interchange areas are intermittent, and combined with high traffic volumes and congestion at the interchanges, make nonmotorized travel through these areas difficult.

There are only a few existing bicycle facilities and multi-use trails in the study area. South 216th Street is the only roadway that currently provides a designated bicycle lane that runs the entire length between I-5 and Puget Sound. Kent-Des Moines Road, S 240th Street, and S 260th Street are all signed bicycle routes that have a wide shoulder to accommodate bicycles. These designated bicycle routes do not necessarily have marked lanes, although signage typically is present, which indicates to motorists that bicyclists are likely to share the roadway with vehicles. There are currently no bicycle facilities on SR 99, S 272nd Street, or S 320th Street.

The Des Moines Creek Trail and the Bonneville Power Administration Trail (BPA) are the closest regional trails to the study area. The Des Moines Creek Trail begins about 1/2 mile west of SR 99 at S 200th Street and extends southwesterly toward Puget Sound to just south of S 216th Street, and the BPA Trail begins at S 324th Street and 11th Place S in Federal Way.

### 3.4.7 Freight Mobility and Access

Truck mobility within the Puget Sound Region is largely supported by a system of designated freight routes (Exhibit 3-2) that connect major freight destinations. To prioritize truck routes, the WSDOT adopted the Freight Goods Transportation System (FGTS), which classifies roadways according to the amount of annual gross tonnage they carry (T1–T5). Within the study area, the transportation system is vital to moving freight and goods to and from major transportation hubs such as the Port of Seattle, Sea-Tac International Airport (Sea-Tac Airport), Kent Manufacturing/Industrial Center, Port of Tacoma, and other business and consumer destinations. Within the study area, there are no active freight rail lines.

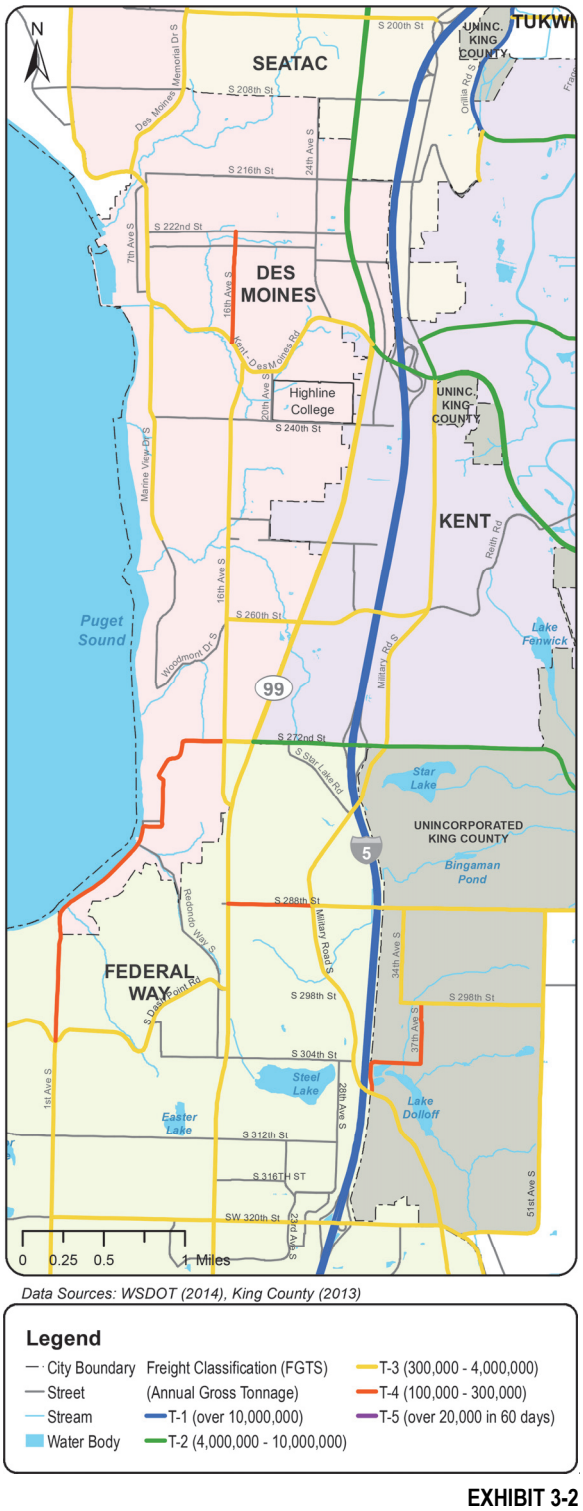



**EXHIBIT 3-2**
Existing Freight Routes

I-5 is the only FGTS Class T-1 roadway in the study area. Within the study area, all of the arterials are classified as either T-2 or T-3 routes. I-5 is a key freight corridor that serves not only the Puget Sound Region but also national and international markets. More than 72 million tons of freight are hauled over the course of a year on I-5. About 8 percent of the total vehicles that travel on I-5 are trucks. Between Sea-Tac Airport and Kent-Des Moines Road, SR 99 carried 3.6 million tons of freight in 2011. About 4 percent of the total vehicles on SR 99 are trucks. Many of these truck trips are destined for the Port of Seattle and the Kent Manufacturing/Industrial Center.

## 3.5 Environmental Impacts

The future long-term effects described in the following sections compare the No Build Alternative with the build alternatives for the year 2035. Agency and station long-range plans were reviewed and foreseeable projects were assumed. Modifications to the transportation system assumed to be in place under both the No Build Alternative and build alternatives (i.e., not associated with the project) are described in Appendix G1. Impacts from the No Build Alternative are quantified for Regional Facilities and Travel, Transit Operations, and Arterials and Local Street Operations. Impacts from the No Build Alternative are not quantified for Parking, Safety, Nonmotorized Facilities, and Freight Mobility because the conditions under the No Build would be similar to existing conditions. For all elements, the discussion of the No Build Alternative is integrated with the build alternatives and is not reported separately.

The effects of the build alternatives were analyzed assuming that light rail would extend to the Federal Way Transit Center, with potential interim terminus locations at the Kent/Des Moines Station and S 272nd Street Station. Potential mitigation to improve conditions was also identified for the build alternatives. The changes and effects described in this section are based on the conceptual light rail guideway and station area plans (Appendix F, Conceptual Design Drawings).

### 3.5.1 Regional Facilities and Travel

Regional travel patterns, including projected vehicle forecasts, traffic congestion, and mode share for the No Build and build alternatives are discussed in this subsection. Refer to Section 3.4.3 for I-5 ramp

terminal operational and queuing analysis and Section 3.4.4 for I-5 safety analysis.

The future arterial and local street system within the study area includes a variety of roadway and transit projects. These reasonably foreseeable projects and transit service changes were incorporated into the transportation analysis for the 2035 No Build and build alternatives. These future year projects are assumed because they already have substantial funding. As funding to construct the SR 509 Corridor Completion and Freight Improvement Project has not been identified by the State, this potential project was not assumed to be part of the No Build Alternative and is discussed in Chapter 6, Cumulative Impacts.

Traffic volumes are expected to increase from existing conditions because travel patterns are not forecasted to change appreciably and regional population growth is projected to continue. Overall, by 2035, traffic volumes are expected to increase within the study area by approximately 0.7 percent annually. Exhibit 3-3 shows the 2035 No Build Alternative v/c ratios for major regional facilities. Congestion would be evident on most major freeways and arterials in King County. The following sections further describe the No Build Alternative and how the build alternatives would affect overall traffic volumes and future congestion.

### 3.5.1.1 Vehicle Miles Traveled, Vehicles Hours of Delay, and Vehicle Hours Traveled

Table 3-5 shows the daily VMT, VHT, and VHD for the No Build Alternative and build alternatives for the year 2035. Changes in VMT, VHT, and VHD would be similar among build alternatives; therefore, a representative build alternative is highlighted in Table 3-5.

With the FWLE project, regional VMT is expected to decrease by approximately 150,000 miles on a typical weekday compared to the No Build Alternative because some auto drivers are expected to ride light rail with the FWLE.

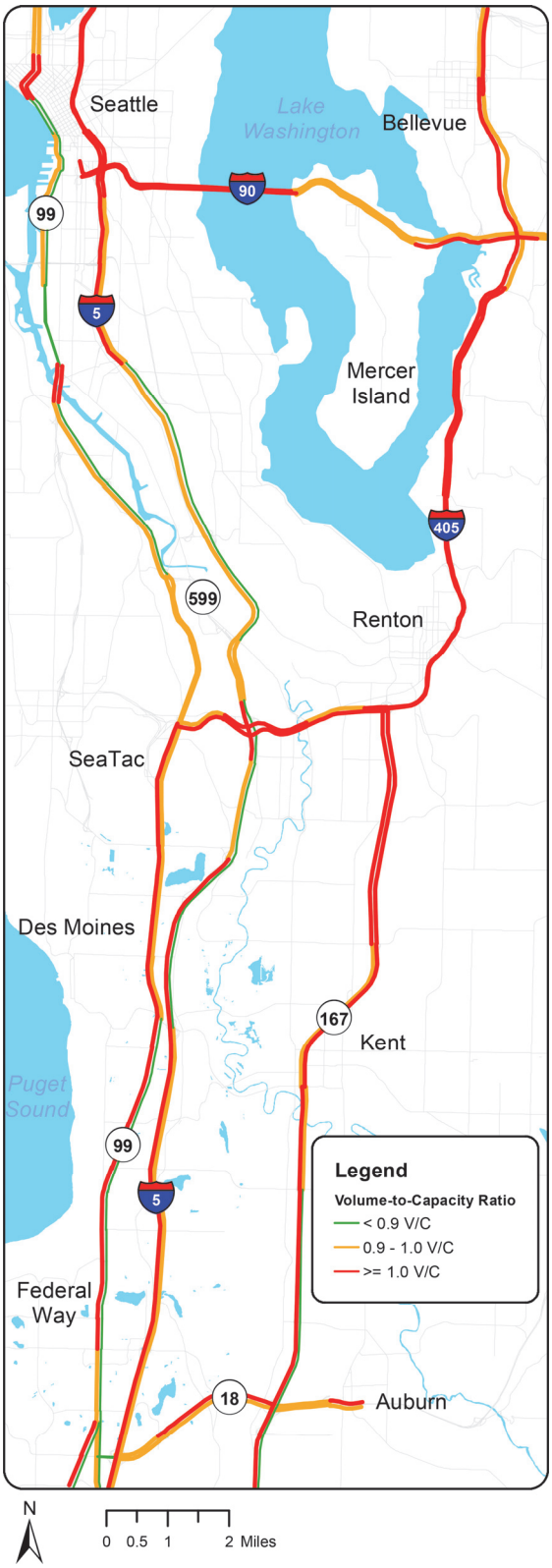



**EXHIBIT 3-3**
2035 No Build PM Highway Volume-to-Capacity Ratios

TABLE 3-5
**2035 Weekday Daily Vehicle Miles of Travel, Vehicle Hours of Travel, and Vehicle Hours of Delay**

| Alternative | VMT | VHT | VHD |
|---|---|---|---|
| No Build Alternative | 103,910,000 | 3,370,000 | 499,000 |
| Build Alternatives[a] | 103,760,000 | 3,360,000 | 495,000 |
| Change | -150,000 | -10,000 | -4,000 |

Source: PSRC, 2012
[a] The SR 99 Alternative is documented for comparison purposes. Other alternatives and station options would have the same regional impacts.

Forecasted VHT are expected to decrease by approximately 10,000 hours per day regionally with the FWLE. Forecasted VHD are expected to decrease by approximately 4,000 hours per day regionally.

### 3.5.1.2 Screenline Performance

The AM peak hour, PM peak hour, daily traffic volumes, and v/c ratios at the three selected screenline locations within the study area were analyzed. Exhibit 3-1 shows the project's three screenline locations. Screenline results are similar between all build alternatives; therefore, a representative value is provided in Table 3-6.

TABLE 3-6
**2035 Screenline Volumes and Volume-to-Capacity Ratios**

| Screenline | Direction | AM Peak Hour | | | | PM Peak Hour | | | | Daily | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No Build | | Build Alternatives[a] | | No Build | | Build Alternatives[a] | | No Build Volume (veh) | Build Alternatives Volume (veh)[a] |
| | | Volume (veh) | V/C | Volume (veh) | V/C | Volume (veh) | V/C | Volume (veh) | V/C | | |
| South of S 200th Street | NB | 14,100 | 0.95 | 14,000 | 0.95 | 9,000 | 0.61 | 8,900 | 0.60 | 168,200 | 166,500 |
| | SB | 6,200 | 0.39 | 6,200 | 0.39 | 14,000 | 0.89 | 13,900 | 0.88 | 161,800 | 160,100 |
| North of S 272nd Street | NB | 15,400 | 1.00 | 15,300 | 0.99 | 9,300 | 0.60 | 9,200 | 0.59 | 174,000 | 172,100 |
| | SB | 6,200 | 0.40 | 6,100 | 0.40 | 15,200 | 0.98 | 15,000 | 0.97 | 168,700 | 166,900 |
| South of S 312th Street | NB | 12,600 | 0.78 | 12,500 | 0.77 | 8,500 | 0.52 | 8,500 | 0.52 | 149,900 | 148,600 |
| | SB | 6,100 | 0.37 | 6,000 | 0.37 | 12,800 | 0.79 | 12,700 | 0.79 | 147,600 | 146,200 |

Source: PSRC, 2012
[a] The SR 99 Alternative is documented for comparison purposes. Other alternatives and station options would have the same regional impacts.
NB = northbound; SB = southbound; veh = vehicle

The FWLE project would attract more persons to transit, thus resulting in minor decreases in traffic volumes and congestion across all screenline locations within the corridor. Modest decreases are

expected in both the peak and off-peak directions of travel. Most roads across the screenline would operate at or near capacity in the peak direction of travel with and without the FWLE.

### 3.5.1.3 Person Mode of Travel

Table 3-7 shows the total person demand and their mode of travel at the three screenline locations during the PM peak hour. A slight decrease in SOV and HOV person demand is expected with the build alternatives, as persons would shift from auto to light rail. The percent of the transit mode share in the total mode share for the PM peak period would increase, from 3 to 4 percent to 5 to 6 percent for northbound travel, and from 10 percent to 12 to 14 percent for southbound travel.

TABLE 3-7
**2035 PM Peak Hour Mode Share**

| Screenline | Direction | No Build Alternative | | | | Build Alternatives[a] | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Total Persons | SOV | HOV | Transit | Total Persons | SOV | HOV | Transit |
| South of S 200th Street | NB | 31,500 | 77% | 19% | 3% | 32,000 | 75% | 19% | 6% |
| | SB | 61,500 | 53% | 37% | 10% | 63,200 | 51% | 35% | 14% |
| North of S 272nd Street | NB | 32,900 | 75% | 21% | 3% | 33,200 | 74% | 20% | 5% |
| | SB | 65,400 | 55% | 36% | 10% | 66,600 | 53% | 35% | 12% |
| South of S 312th Street | NB | 30,700 | 73% | 23% | 4% | 31,000 | 72% | 23% | 5% |
| | SB | 55,900 | 54% | 35% | 10% | 56,800 | 53% | 35% | 13% |

Source: Sound Transit, 2012; PSRC, 2012
Note: Numbers may not add to 100% due to rounding.
[a] The SR 99 Alternative is documented for comparison purposes. Other alternatives and station options would have the same regional impacts.

## 3.5.2 Transit Service and Operations

Transit service and circulation, regional and local bus transit, ridership, station area mode of access, transit LOS measures, bus and light rail travel time, and transit transfer rates for the No Build and build alternatives are discussed in this subsection. Chapter 4.2, Transit Operations, in Appendix G1, provides additional discussion and data regarding the transit elements described in this section.

### 3.5.2.1 Transit Service and Circulation

A variety of transit facility improvements are planned for the FWLE, including new light rail stations with new or expanded park-and-ride capacity and improved transit connectivity through the construction of multimodal transit hubs. This would further integrate bus, transit, auto, and walk modes of access into one convenient location.

### 3.5.2.2 Regional and Local Bus Transit

Regional bus service could be restructured to operate collaboratively with light rail within the study area. Transit agencies have identified conceptual bus service plans that could be integrated with the implementation of light rail in the study area. The information provided by these agencies represents a potential condition where a change to the route may occur. This could include truncating, eliminating, rerouting, or increasing frequency to integrate with light rail service. As part of the conceptual bus service plan, RapidRide A Line would continue to operate along SR 99 with the FWLE, providing local service between the stations and offering an opportunity for people to access the light rail transit system.

### 3.5.2.3 Transit Travel Time

Light rail travel times are expected to range between 12 and 14 minutes between the Federal Way Transit Center and the Angle Lake Station, depending on the alternative and stations selected. In general, alignments that are shorter in length and have fewer curves (e.g., Federal Way SR 99 Station Option and Federal Way I-5 Station Option) would have slightly faster travel times. Travel times for each alternative and station option are provided in Appendix G1.

**Key Ridership Definitions**

- **Transit Boardings** – The entry of passengers onto a transit vehicle.
- **Transit Alightings** – The exit of passengers from a transit vehicle.
- **Transit Trips** – The transit route between a starting location and an ending location. A transit trip could have one or more transit boardings if a transfer occurs.
- **Project Riders** – Total transit boardings and alightings that occur in the FWLE study area
- **New Transit Riders** – Any person who shifted to transit from a non-transit mode.

Table 3-8 shows the estimated PM peak-period transit travel times between the Federal Way Transit Center and key regional destinations for year 2035. The travel times for the build alternatives assume three FWLE stations (Kent/Des Moines, S 272nd Street, and Federal Way Transit Center) and do not include the potential additional S 216th or S 260th station options. Bus travel times are based on the 95th percentile travel times from Sea-Tac Airport and Downtown Seattle (International District) to Federal Way. For trips in the No Build alternative that originate from North Seattle/Lynnwood or the Eastside, a portion of the trip was assumed to be made on light rail (Lynnwood Link/Central Link and East Link), and a bus-to-light rail transit transfer would occur at the International District/Chinatown Station. Future travel times account for factors such as the time it takes to get on or off the bus and train, transit transfer wait times, light rail train acceleration and deceleration, and system operating speeds.

TABLE 3-8
**Year 2035 PM Peak Period Transit Travel Times (minutes) and Transfers between Federal Way and Regional Centers**

| Regional Centers | No Build Alternative | | Build Alternatives | |
|---|---|---|---|---|
| | Travel Time (min) | # of Transfers | Travel Time (min) | # of Transfers |
| Downtown Seattle (International District/Chinatown Station) | 49[a] | 0 | 47 | 0 |
| Sea-Tac Airport | 42[a] | 0 | 16 | 0 |
| Downtown Bellevue | 79[b] | 1 | 72[c] | 1 |
| University of Washington | 71[b] | 1 | 61 | 0 |
| Northgate | 76[b] | 1 | 66 | 0 |
| Lynnwood | 91[b] | 1 | 80 | 0 |
| Overlake | 89[b] | 1 | 83[c] | 1 |

[a] Sources: No Build Alternatives – Existing 95th Percentile Travel Time for a representative bus route from the summer of 2012 (Sound Transit, Metro). Travel times were factored to 2035 by using future estimated roadway congestion based on regional growth (WSDOT, 2011).

Build alternatives and Central Link/East Link Travel Times – Sound Transit light rail travel time estimates (Sound Transit, 2012).

[b] Trip assumes light rail taken to the International District, and an 8-minute transfer time was assumed to access a surface bus.

[c] Trip assumes light rail taken to the International District, and a 4-minute transfer time was assumed to access light rail to Federal Way Transit Center.

The travel time from the regional centers to Federal Way would be 2 to 26 minutes faster with the build alternatives compared with the No Build Alternative. Express bus service between Federal Way and Downtown Seattle (International District) would have a 49-minute travel time under the No Build Alternative. These express routes have very limited stops and use I-5 exclusively to reach Downtown Seattle. The build alternatives would have a 47-minute travel time to Downtown Seattle. Light rail would also serve South Seattle neighborhoods, have more stops, and operate at-grade along portions of the alignment, resulting in similar travel times. While bus service is frequent and generally a one-seat ride from Federal Way Transit Center to Downtown Seattle, the reliability of the trip depends on freeway and local roadway conditions. With light rail operating in a grade-separated guideway, this trip would be more reliable even though the overall travel times would be similar.

The travel time from Federal Way to SeaTac Airport is forecasted to be 42 minutes in year 2035 under the No Build Alternative. Bus routes that provide service between these two destinations stop frequently and are delayed by congestion and traffic signals on arterials, which increases travel time. Light rail would operate with fewer stops and would not be delayed by vehicular traffic, resulting in a 16-minute travel time under the build alternatives.

While travel times between Federal Way and the International District/Chinatown Station are documented in Table 3-8, a greater travel time savings would be realized as light rail continues north, serving more of Downtown Seattle and other key Seattle destinations (e.g., Westlake Center), compared with the No Build Alternative. The Downtown Seattle Transit Tunnel would be used exclusively by light rail, whereas buses would use city surface streets. Buses would be slowed by traffic signals and congestion, which could result in higher travel times when compared with light rail.

For Seattle destinations north of downtown, such as the University of Washington and Northgate, light rail would provide at least a 10-minute travel time savings compared with the No Build alternative. In the No Build Alternative, a transfer from bus to light rail would be required, thus increasing travel time, and may result in the potential to miss a connection.

#### 3.5.2.4 Ridership

The ridership forecasts produced for the FWLE were consistent with regional planning and used the most up-to-date information available. This included land use forecasts released by PSRC in September 2013 that reflected the most current release available. This land use set, referred to by PSRC as the "local targets" forecasts, was created by PSRC to reflect local agencies' adopted plans, including population and employment forecasts. It represents a regional development pattern consistent with what local jurisdictions are planning under the first set of VISION 2040-aligned local growth targets, such as the City of Kent's Midway Subarea Plan. Overall, these land uses assume a substantial growth pattern within the study area for year 2035 (close to a 50 percent increase in employment and households surrounding the Kent-Des Moines station area) and were used as the basis for ridership projections.

Table 3-9 shows the year 2035 daily transit ridership for the No Build Alternative and build alternatives. Table 3-9 also documents the expected daily ridership and number of new transit riders for the build alternatives. Total daily trips (ridership) includes all riders on the FWLE, regardless of where they board the train. The FWLE would serve 25,500 and 27,500 daily riders, and about 8,000 would be new transit riders. Under all the build alternatives, the number of regional (Sound Transit service area) daily transit boardings is expected to increase by about 2 percent.

TABLE 3-9
**2035 FWLE Weekday Transit Trips and Project Riders**

| Measure | No Build Alternative | Build Alternatives | | | | | |
|---|---|---|---|---|---|---|---|
| | | SR 99 | I-5 | SR 99 to I-5 | I-5 to SR 99 | SR 99 – Four Stations[a] | SR 99 – Five Stations[b] |
| Total Regional Daily Transit Trips[c] | 602,000 | 609,500 | 609,500 | 609,500 | 609,500 | 609,500-610,000 | 610,000 |
| Total Daily System-wide Link Boardings[d] | 280,000 | 300,000 | 299,000 | 299,000 | 299,500 | 300,000-301,000 | 301,000 |
| Total FWLE Light Rail Project Riders | N/A | 26,500 | 25,500 | 26,000 | 26,000 | 27,000-27,500 | 27,500 |
| New Transit Riders | N/A | 7,500 | 7,500 | 7,500 | 7,500 | 7,500-8,000 | 8,000 |

Source: Sound Transit, 2012

[a] Range provided assumes a station at S 216th Street or S 260th Street.

[b] Assumes SR 99 Alternative with additional stations at S 216th Street and S 260th Street.

[c] Includes both light rail and bus riders in the Sound Transit service area.

[d] The increase in total daily system-wide boardings is greater than the number of FWLE station boardings shown in Exhibit 3-4 and Exhibit 3-5 because the total daily system-wide boardings includes new transfers that would occur between FWLE and East Link. Each transfer is counted as an additional boarding within the Link Light Rail system..

N/A = not applicable

Average 2035 weekday and PM peak period (3 p.m. to 6 p.m.) station boardings are shown in Exhibit 3-4 for the build alternatives and in Exhibit 3-5 for the build alternatives with station options. These boardings show only the trips starting at each FWLE station and the Angle Lake Station, while the total trips shown in Table 3-9 include all trips to or from any FWLE station.

In these exhibits, potential station areas are listed north to south, and the size of the circle represents the relative number of boardings at each station. The ridership at each station would vary depending on the combination of stations and various station options. For the four build alternatives, total daily boardings in the FWLE study area would range from 13,000 to 13,500 boardings per day. The total daily boardings for the build alternatives with the potential additional stations and station options would range from 12,500 with the I-5 Alternative with the Federal Way I-5 Station Option to 15,000 under the SR 99 alternative with five stations. Although the addition of stations would increase overall ridership, a portion of those additional station boardings would come from the other surrounding stations.

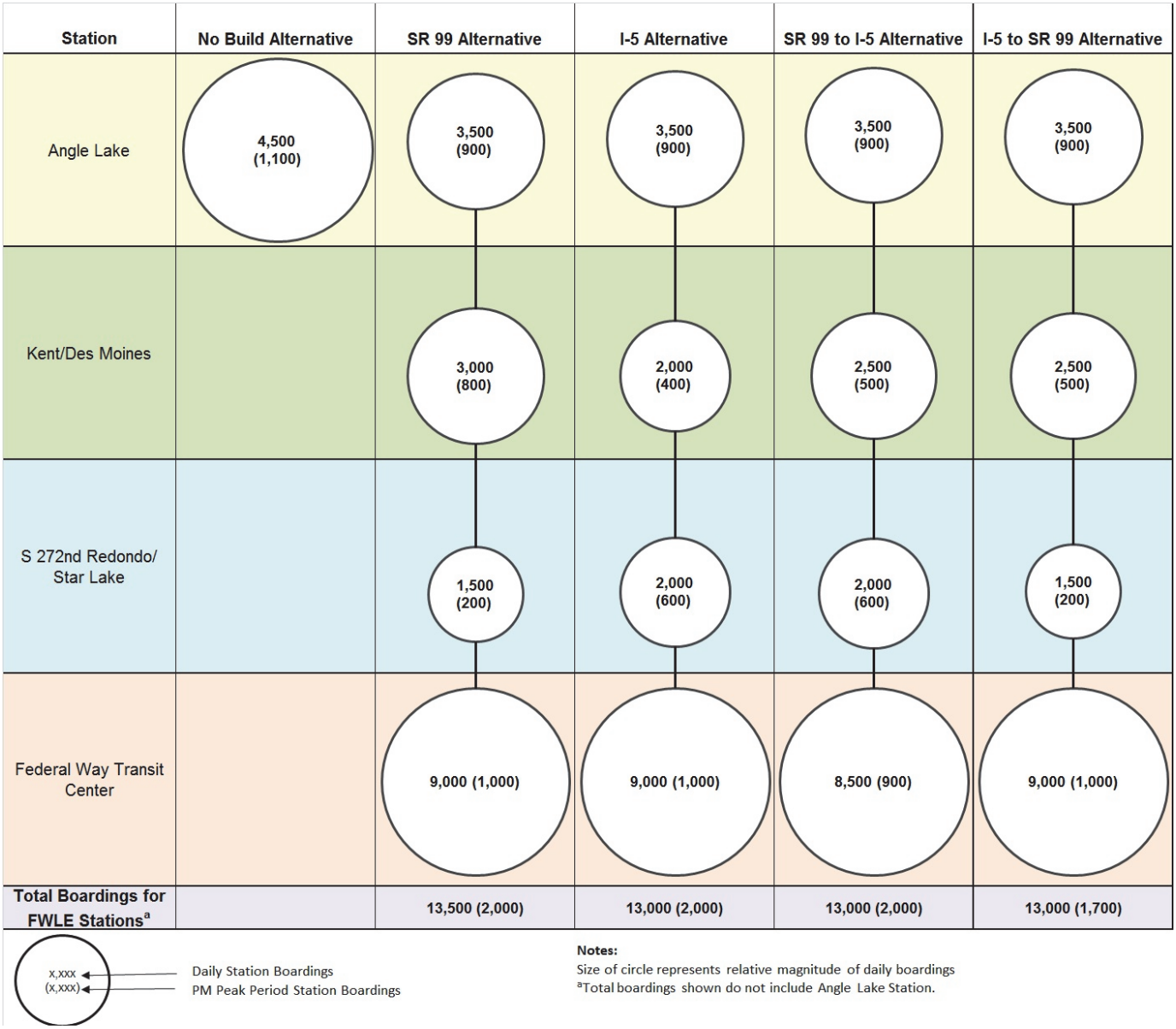



**EXHIBIT 3-4**
2035 FWLE Build Alternatives Weekday Station Boardings

In general, the ridership forecasts for the build alternatives are relatively similar. The primary factors influencing ridership are the number of people in the travelshed, the station locations, the transit service connections, and the Link light rail travel times. factors are similar among the alternatives, but vary between some station options. Minor ridership differences within station areas are expected because of differences in the density of population and employment close to the station, connections to local and regional transit (such as proximity to RapidRide stops), details of station access and walkability, and the amount of parking provided at the station.

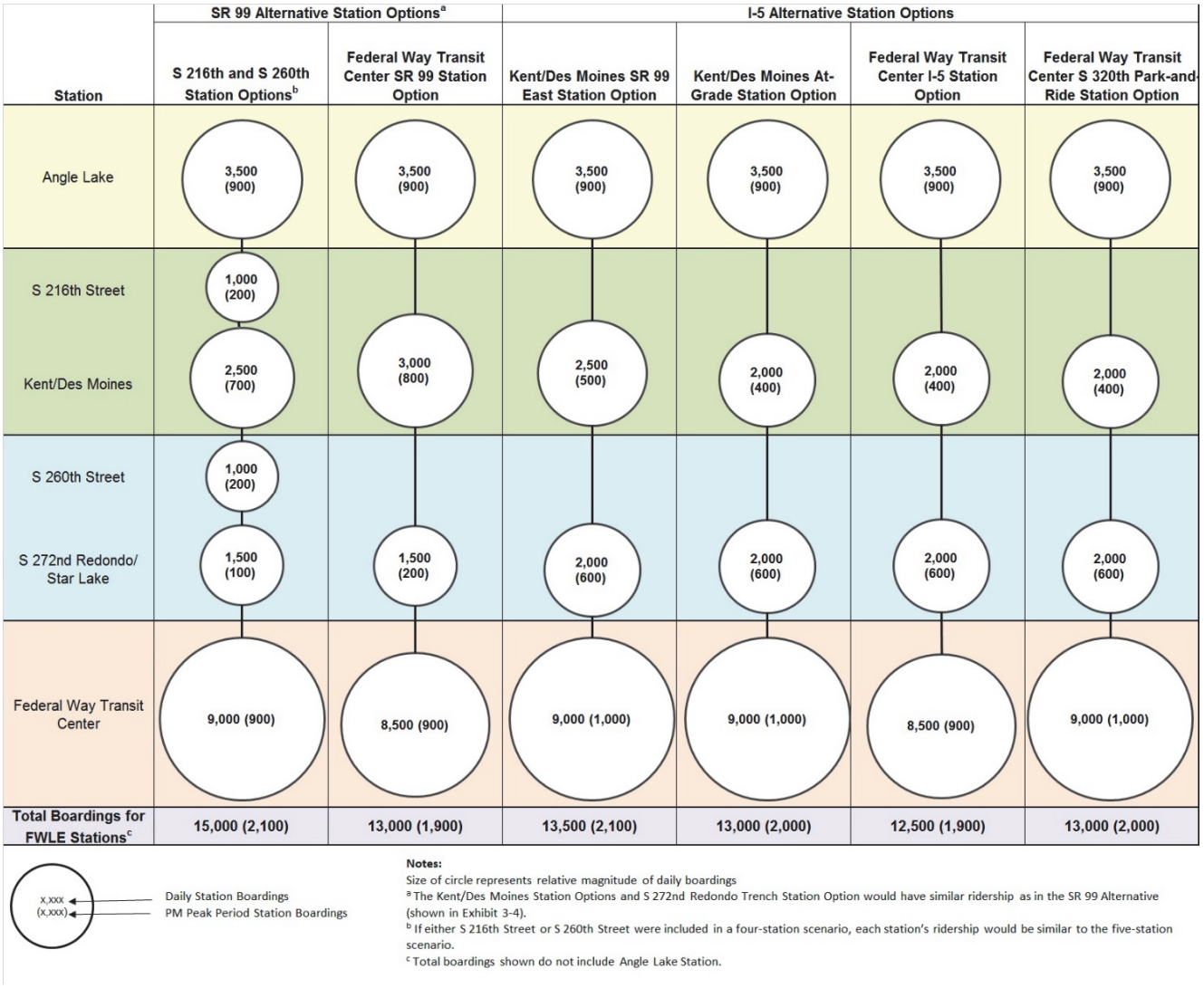



**EXHIBIT 3-5**
2035 FWLE Light Rail Station Options Weekday Station Boardings

For example, because the I-5 Alternative Kent/Des Moines station options are farther from SR 99 and Highline College and would not be directly served by the RapidRide A line, they would have about one-third fewer boardings than stations along SR 99. While RapidRide A Line riders may not access the Link system at the I-5 Kent/Des Moines Station, they are likely to continue using transit and access the Link system at another nearby station.

For the S 272nd Redondo and S 272nd Star Lake stations, more bus feeder service (i.e., routes to and from the Kent Valley area) has been assumed in the vicinity of the Star Lake Station than the Redondo Station, which contributes to the difference in station boardings between these two stations (Exhibit 3-4).

Tables 3-10 and 3-11 document the expected corridor ridership and change in new transit riders for the build alternatives under the Kent/Des Moines and S 272nd Street interim terminus conditions, respectively. Under all the build alternatives, the number of regional (Sound Transit service area) daily transit trips would increase slightly, to approximately 603,000 per day, with the FWLE to the Kent/Des Moines Station. Extending farther south to S 272nd Street, total transit trips would increase more, to approximately 604,000 per weekday.

TABLE 3-10
**2035 Kent/Des Moines Station Interim Terminus Weekday Ridership and Project Riders**

| Measure | 2035 No Build | 2035 Light Rail Alternative | | | |
|---|---|---|---|---|---|
| | | SR 99 | I-5 | SR 99 to I-5 | I-5 to SR 99 |
| Total Daily Transit Trips | 602,000 | 603,000 | 603,000 | 603,000 | 603,000 |
| Daily System-wide Link Boardings | 280,000 | 284,000 | 283,000 | 284,000 | 284,000 |
| Total Corridor Project Riders | N/A | 9,000 | 5,500 | 8,500 | 8,500 |
| 2035 New Transit Riders | N/A | 1,000 | 1,000 | 1,000 | 1,000 |

Source: Sound Transit, 2012
N/A = not applicable

TABLE 3-11
**2035 S 272nd Station Interim Terminus Weekday Ridership and Project Riders**

| Measure | 2035 No Build | 2035 Build Alternative | | | |
|---|---|---|---|---|---|
| | | SR 99 | I-5 | SR 99 to I-5 | I-5 to SR 99 |
| Total Daily Transit Trips | 602,000 | 603,500 | 603,500 | 604,000 | 604,000 |
| Daily System-wide Link Boardings | 280,00 | 288,000 | 286,000 | 288,000 | 288,000 |
| Total Corridor Project Riders | N/A | 12,500 | 10,000 | 12,500 | 12,500 |
| 2035 New Transit Riders | N/A | 1,500 | 1,500 | 2,000 | 2,000 |

Source: Sound Transit, 2012
N/A = not applicable

In the interim condition with the Kent/Des Moines Station, the SR 99 Alternative would have the highest total corridor project riders (9,000) and the I-5 Alternative the lowest boardings (5,500). As previously described, the station's location and proximity to RapidRide stops would affect the ridership between these stations.

For example, with the I-5 Alternative's SR 99 East Station option, the ridership would be similar to the SR 99 Alternative and station options. Under the S 272nd Street Station interim condition, the SR 99, SR 99 to I-5, and I-5 to SR 99 alternatives would have slightly more project riders than the I-5 Alternative.

Similar to the full-length project, the difference in project riders between the build alternatives would be influenced by a combination of factors, including the density of population and employment around the station area, local and regional transit service connectivity, proximity to RapidRide stops, station access and walkability, the amount of parking stalls at the stations, and expected light rail operating speeds.

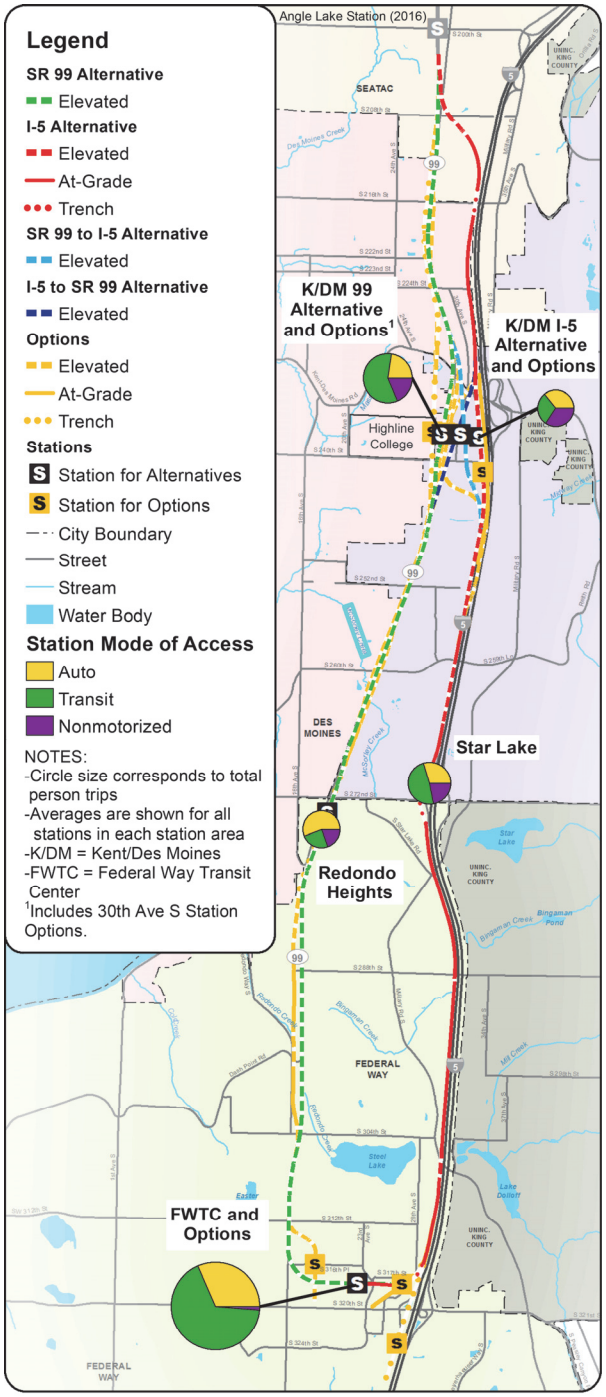
### 3.5.2.5 Station Area Mode of Access

Station area mode of access was analyzed for each type of person trip at a station. Exhibit 3-6 shows the average expected mode of access to each station area for the four build alternatives and the station options for the PM peak hour. The pie chart size is indicative of the relative number of boardings at each station area.

At the Kent/Des Moines stations, any station located near SR 99 would have a higher transit transfer mode share than stations near I-5 because there would be more transfers between RapidRide A Line and light rail. These transfers would decrease with station options that are located farther from RapidRide A Line stops along SR 99.

At S 272nd Street, the Star Lake Station would have a higher transit transfer percentage than the Redondo Station as a result of the higher number of transit routes serving the Star Lake facility.

At the Federal Way Transit Center, the majority of trips would be transit transfer, while the remaining portion would be generally automobile-based. Although land uses in this station area are forecasted to change from the current commercial focus to more mixed use, the




*Data Sources: King County, Cities of Des Moines, Federal Way, Kent, SeaTac (2013).*

**EXHIBIT 3-6**
**2035 Build Alternatives PM Peak Hour Station Mode of Access**

mode of access at this station is forecasted to be focused on transit and automobile modes of access, with a smaller share of pedestrian- and bicycle-based trips. The Federal Way S 320th Park-and-Ride Station would generate a higher percentage of auto-based trips, because a larger proportion of parking spaces would be available for light rail users and fewer feeder transit routes would serve the station area.

For the potential additional stations at S 216th Street and S 260th Street, the mode of access is expected to be predominately nonmotorized because no parking is assumed to be provided and transit transfer potential is limited because only a few bus routes would serve these stations. A small portion of the trips at this station would be passenger drop-off/pick up trips, which represent the only type of auto access trips at these stations.

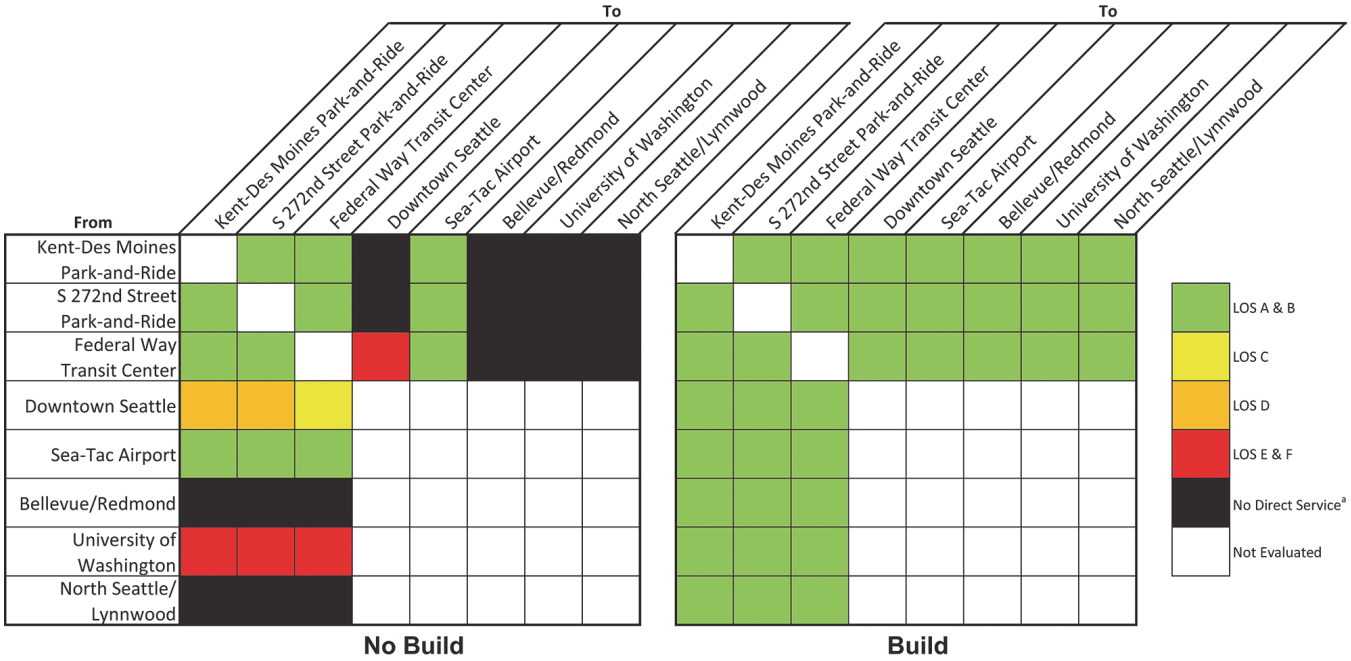
#### 3.5.2.6 Transit LOS Measures

Transit LOS was analyzed for service frequency, hours of service, and passenger loads to describe transit performance in the No Build and build alternatives for the year 2035. The transit LOS methodology used the same procedures and metrics described earlier in Section 3.4.2.2.

**Service Frequency**

Exhibit 3-7 shows the LOS for service frequency for the 2035 No Build and build alternatives during the PM peak hour. The 2035 No Build service frequency is expected to be the same LOS as existing conditions. Direct transit service to regional destinations, such as Downtown Seattle and the University of Washington, would be limited and generally only provided in the southbound (peak) direction of travel. Direct northbound transit service (not requiring a transfer) to/from the study area to North Seattle and Bellevue/Eastside would not be available with the No Build Alternative.

With the build alternatives, access to regional destinations east of Lake Washington (Bellevue/Redmond) would still require a transfer; however, the frequency of the rail service and the ease of transfer between light rail lines would minimize the transfer time. The FWLE would overall improve the service frequency to LOS A for connections between Federal Way, Kent, Des Moines, SeaTac, and the many of the Puget Sound regional destinations.




[a]No direct service or requires one or more bus transfers.
At LOS A, passengers are assured a transit vehicle will arrive soon after they arrive at a stop (>6 bus/hr), while the threshold between LOS E and F is service once per hour.

**EXHIBIT 3-7**
2035 No Build Alternative and Build Alternatives Transit Level of Service for Service Frequency

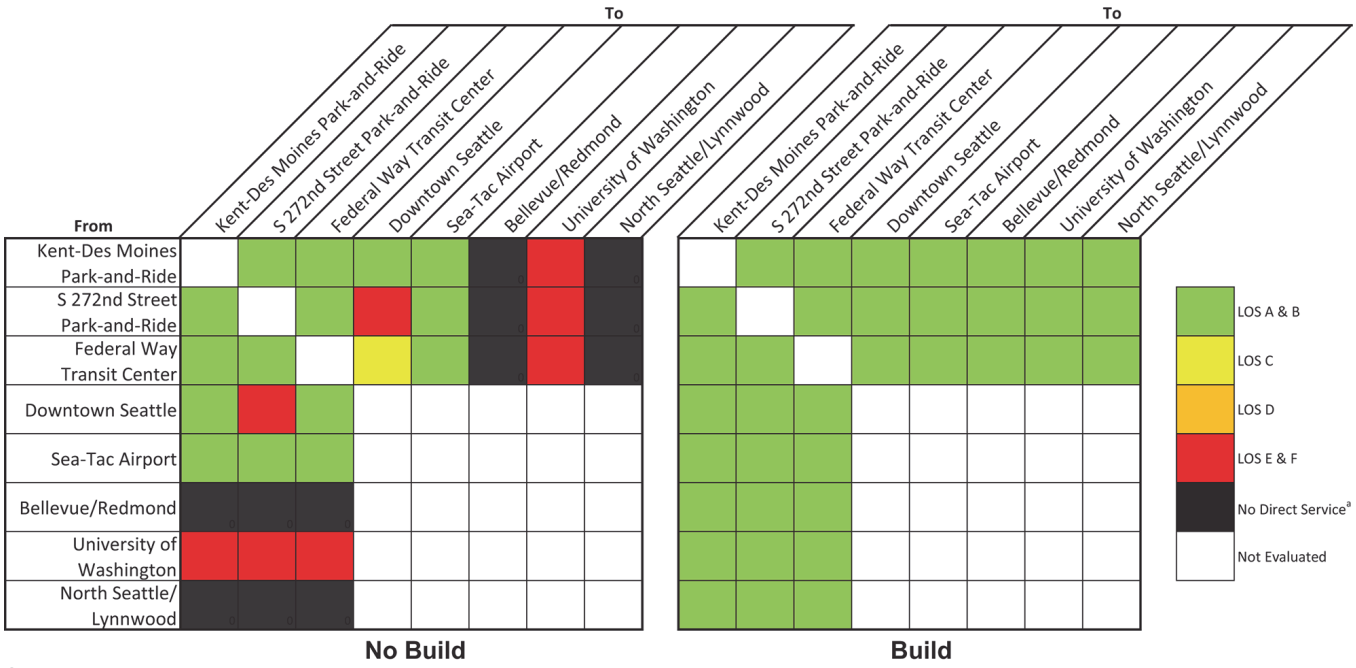
## Hours of Service

Exhibit 3-8 shows the LOS for hours of service for the 2035 No Build and build alternatives. The 2035 No Build transit hours of service are assumed to remain the same as existing transit operations. With the No Build Alternative, the hours of service to Downtown Seattle from the Federal Way Transit Center and the Redondo Heights/Star Lake service areas would be LOS C and LOS F, respectively. With the build alternatives, continuous, two-way transit service would be provided for 20 hours, resulting in LOS A for all evaluated areas.

## Passenger Load

Passenger load LOS for the No Build and light rail alternatives was analyzed using estimated PM peak period passenger volume forecasts from the Sound Transit ridership model (Sound Transit, 2012). Under the No Build Alternative, transit passenger load is expected to be at LOS A or B in the northbound direction of travel.

Traveling southbound from origins such as Downtown Seattle and the University of Washington, the passenger load LOS is expected to be LOS D. On average, buses would exceed their seated capacity on several routes during the PM peak period. With the build alternatives, bus passenger loads would improve to LOS A, and light rail passenger loads would range from LOS A to C.




[a]No direct service or requires one or more bus transfers.
At LOS A, service is available most or all day (>19 hr) while at LOS F, transit service is only offered for a few hours a day(<3 hr).

**EXHIBIT 3-8**
2035 No Build Alternative and Build Alternatives Transit Level of Service for Hours of Service

### 3.5.2.7 Reliability and On-time Performance

The future reliability of bus service for the No Build Alternative is expected to degrade compared with existing conditions. By year 2035, key transit facilities, such as I-5 HOV lanes, are expected to have speeds decrease by up to 30 percent in the peak direction of travel during the PM peak period. Poor bus reliability could result in passengers becoming less confident of arriving at the scheduled time, and as a result they might take an earlier trip to ensure getting to their destination on-time or take another mode of travel.

With the build alternatives, light rail operating in the corridor would be more reliable because it would operate in an exclusive right-of-way and have no at-grade vehicle crossing conflicts. However, light rail reliability in the corridor could be affected by unexpected delays at station areas or by system delays outside of the FWLE corridor where light rail is operating at-grade with traffic.

**Transit Transfer Effects**

Transit transfers can make service more efficient for operators; however, increases in travel time, the potential to miss a connection, and increasing the complexity of a transit trip can be less convenient for passengers. Therefore, with an increase in transfers, transit riders might choose not to use transit for their trip.

### 3.5.2.8 Transit Transfers

Transfers include trips between multiple buses or between a bus and light rail/commuter rail. Riders will accept transit transfers if they provide reliable, quick transfer connections. Evidence has shown that short transfers are acceptable and

might only be a minor inconvenience to riders. Several hubs in the Sound Transit region, including the Federal Way Transit Center within the study area, are considered "multi-centered" route hubs where bus routes converge so transfers can be made to multiple destinations in one location. The transfer rate with the No Build Alternative would be 1.47 boardings per trip in 2035 and would be similar with any of the build alternatives.

## 3.5.3 Arterial and Local Street Operations

This section describes the effect of the No Build and build alternatives on arterial and local streets in the study area. This section includes year 2035 traffic volume forecasts; expected traffic generated at stations; intersection operations; and changes in access, circulation, traffic control, and traffic safety. Section 4.3 in Appendix G1 provides additional details regarding arterial and local street operations, including network growth rates, trips generation, and intersection LOS.

### 3.5.3.1 Future Arterial and Local Street System

#### Traffic Forecasts

Year 2035 AM and PM peak hour traffic volume forecasts were developed for the FWLE based on the PSRC's current population and land use forecasts. Overall, by 2035, traffic volumes in the study area are expected to increase by an average annual growth rate of approximately 0.7 percent in the AM and PM peak hours for the No Build Alternative.

For the build alternatives, the anticipated vehicular trip generation was calculated for each station area based on information from Sound Transit's Ridership Model (Sound Transit, 2012) and station characteristics. The vehicle trips at a station are comprised of three different types: (1) park-and-ride vehicle trips, (2) passenger drop-off/pick-up trips, and (3) buses. The increase in vehicle trips was applied to No Build Alternative traffic volume forecasts to develop an estimate of the traffic volumes with the build alternatives. This vehicle forecast is conservative because it does not consider people changing their travel mode from driving in the No Build Alternative to using transit with the FWLE.

For stations that include a park-and-ride, it was assumed that the vehicle trips within the 3-hour peak period would reflect the park-and-ride lot being full. This provides a conservatively high estimate of traffic impacts near the stations because it assumes each lot would be

at capacity. It was assumed that slightly less than half (45 percent) of the 3-hour peak period trips would occur during the peak hour. Also, based on research from the Tukwila International Boulevard Station, it was assumed that 10 percent of PM peak period ridership at each FWLE station would be from riders being dropped off or picked up. Bus routes trips were estimated based on preliminary bus service assumptions provided by Metro and Sound Transit.

In general, station areas that would have the greatest increase in parking would have the greatest increase in vehicular traffic. With the build alternatives, the S 272nd Redondo Station would have the highest increase in vehicle trip generation because it is currently underused and the FWLE is proposing to add 700 stalls to the existing facility. The trip generation at the Kent/Des Moines Station would not vary substantially among the build alternatives or station options as the parking and transit services are assumed to be fairly consistent among the alternatives and station options.

Trip generation at the Federal Way Transit Center Station is expected to vary depending on the alternative and station options, with a modest increase in vehicle trips. However, this station would have a noticeable increase in passenger drop-off/pick-up trips (slightly more than 300 vehicles per hour) because it would be the end-of-the line station. The number of buses at the Federal Way Transit Center Station could decrease slightly as a result of the elimination of some bus routes that would duplicate light rail service. The Federal Way S 320th Park-and-Ride Station Option would have the highest increase in vehicle activity among the transit center station options.

The potential additional stations at S 216th Street and S 260th Street (West and East options) would have the lowest trip generation because park-and-ride parking would not be provided. Table 3-12 shows the total vehicle trip generation associated with the FWLE light rail stations and alternatives as well as with each station option and the interim condition.

**Interim Terminus Conditions**

The Kent/Des Moines Station would provide 1,000 parking stalls in the interim terminus condition. These stalls and an overall increase in station activity would generate more trips under an interim station condition compared to the full length condition.

TABLE 3-12
**Park-and-Ride Capacity and Trip Generation Assumptions by Station**

| Station Area | Alternative | Park-and-Ride Capacity | | | Existing Underutilized Parking[c] | Total Available Parking for FWLE[d] | Peak Hour Vehicle Generation[a] | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Existing | Proposed Increase[b, c] | With FWLE[b, c] | | | Full Length Alternative | Kent/Des Moines Interim Terminus | S272nd Interim Terminus |
| S 216th Street[e] | SR 99, SR 99 to I-5 | 0 | 0 | 0 | N/A | 0 | 30 | 30 | 30 |
| Kent/Des Moines | SR 99, I-5, SR 99 to I-5, I-5 to SR 99 | 0 | +500 (+1,000) | 500 (1,000) | N/A | +500 (+1,000) | 310 to 350 | 610-770 | 320-400 |
| S 260th Street[e] | SR 99, I-5 to SR 99 | 0 | 0 | 0 | N/A | 0 | 10 | 10 | 10 |
| S 272nd Redondo | SR 99, I-5 to SR 99 | 697 | +700 (+700) | 1,397 (1,397) | 643 | +1,343 (+1,343) | 670 | N/A | 710 |
| S 272nd Star Lake | I-5, SR 99 to I-5 | 540 | +700 (+700) | 1240 (1,240) | 229 | +929 (+929) | 480 to 490 | N/A | 570 |
| Federal Way SR 99 | SR 99 | 0 | +400 (N/A) | 400 (N/A) | N/A | +400 (N/A) | 460 | N/A | N/A |
| Federal Way Transit Center and | SR 99, I-5, SR 99 to I-5, I-5 to SR 99 | 1,190 | +400 (N/A) | 1,590 (N/A) | 11 | +411 (N/A) | 460 to 520 | N/A | N/A |
| Federal Way I-5 | I-5 | 0 | +400 (N/A) | 400 (N/A) | N/A | +400 (N/A) | 460 | N/A | N/A |
| Federal Way S 320th Park-and-Ride | I-5 | 877 | +400 (N/A) | 1,277 (N/A) | 485 | +885 (N/A) | 780 | N/A | N/A |

Note: Full length (interim condition).

[a] Includes park-and-ride, passenger drop-off/pick-up, and bus transit vehicle trips; assumes full park-and-ride lots. Values rounded to the nearest 10.

[b] Full length build alternative parking spaces shown outside parenthesis. Interim conditions park-and-ride capacity shown inside parenthesis.

[c] Source: Metro, 2012b.

[d] Total available parking assumes park-and-ride capacity with FWLE and any existing unused parking at existing park-and-ride lots.

[e] No park-and-ride assumed at these stations; only includes passenger drop-off/pick-up and bus transit vehicle trips.

N/A = not applicable.

The number of parking stalls provided with the S 272nd Redondo and Star Lake stations would not change between interim and full length conditions. Even so, there would be an increase in the passenger drop-off/pick-up trips at these two stations in the interim terminus condition because it would be an end of the line station.

#### 3.5.3.2 Traffic Circulation, Property Access, and Traffic Control

The build alternatives would have some effect on property access, traffic circulation patterns, and traffic control, depending on the alternative and station options compared with the No Build Alternative, which is expected to remain similar to existing conditions. Trench options would require shifting traffic movements to specific access points but would still provide a similar level of access as elevated alternatives. The changes and effects described in this section are based on the conceptual light rail guideway and station area plans (Appendix F, Conceptual Design Drawings).

**SR 99 Alternative**

The SR 99 Alternative and its station options are not expected to substantially affect private property access and vehicular circulation, except around the Kent/Des Moines Station area. The S 272nd Redondo and Federal Way Transit Center stations would be located at existing park-and-ride facilities, and no changes to vehicle circulation and access are expected.

In general, the SR 99 Alternative would operate in an exclusive right-of-way, grade-separated, within the existing SR 99 median. When light rail operates in the SR 99 median, the median would be widened to accommodate guideway columns. All existing mid-block turn locations would be maintained, although their location could shift slightly to provide adequate sight distance between the columns. All existing property access would be maintained.

Most SR 99 intersections would be reconstructed to accommodate the light rail median alignment while maintaining the existing channelization and turn pocket storage lengths. Crosswalk lengths across SR 99 would typically increase. Some vehicle turn movements (e.g., right turns) would be delayed by increased pedestrian activity in crosswalks near stations. As a result, traffic signal timings would be modified to accommodate increased pedestrian volumes. All of the Kent/Des Moines station options would also require a new traffic signal at the SR 99/S 236th Lane intersection. The potential additional

stations at S 216th and S260th streets would have low levels of traffic because they would not have any parking; therefore, impacts on traffic circulation and access would be minimal.

**Kent/Des Moines Stations**

For all Kent/Des Moines stations, S 236th Lane would be reconstructed between Highline College and 30th Avenue S, and a new traffic signal would be provided at the S 236th Lane/SR 99 intersection to accommodate all traffic movements at this location. Access to the station's parking areas would be provided via S 236th Lane, S 240th Street, 30th Avenue S, and driveways along SR 99. S 236th Lane and 30th Avenue S would be improved as part of the station construction. Appendix F, Conceptual Design Drawings, shows the extent of roadway improvements near the station area. With the Kent/Des Moines SR 99 Median Station Option, access and circulation would be similar to the Kent/Des Moines SR 99 West Station. Because the SR 99 median between the S 236th Lane and S 240th Street intersections would be widened, pedestrians would cross SR 99 in two separate pedestrian crossing intervals—one to the west of the median and one to the east of the median at the S 236th Lane and S 240th Street intersections.

**S 272nd Redondo Station**

The S 272nd Redondo Station and S 272nd Redondo Trench Station Option would be located at the existing Redondo Heights Park-and-Ride and access would be similar to existing conditions. Internal circulation would be improved with an access road connecting S 276th Street and S 272nd Street. Vehicles could use this road for access between the station and S 272nd Street. This station would not include any changes in traffic control.

Access to the S 272nd Redondo Trench Station would be similar to the S 272nd Redondo Station. Compared to the S 272nd Redondo Station, the passenger drop-off/pick-up area would be located farther south along the access road adjacent to the north station entry.

**Federal Way Transit Center Station**

With the Federal Way Transit Center Station, new driveways would be provided for the transit layover and parking area along 21st Avenue S and 23rd Avenue S south of the existing transit center. This station would not include any changes to the existing transit center access and circulation. The Federal Way SR 99 Station Option would include a new east-west road between the existing Federal Way

Transit Center and the Federal Way SR 99 Station Option to allow buses to connect between the two transit facilities. This street may only allow buses between 19th Avenue S and 21st Avenue S. A road between S 316th Street and S 314th Street would be provided to allow entry to the station property north of 316th Street. Access to the 400-stall parking lot associated with this option would be provided along 20th Avenue S and S 316th Street.

### I-5 Alternative

No change in property access, traffic circulation, or signal control would result from the I-5 Alternative except for specific improvements to the Kent/Des Moines Station area and the I-5 Landfill Median Alignment Option. WSDOT I-5 maintenance activities would change from existing conditions, but the impacts are not expected to be substantial or adversely impact operations of I-5 or the maintenance of clear zones. The S 272nd Star Lake and Federal Way Transit Center stations would be located at the existing transit facilities; therefore, impacts on vehicle circulation and access are not expected.

WSDOT routinely performs maintenance activities along I-5. Maintenance activities generally include mowing, stormwater facility maintanence, spraying noxious weeds, accessing Intelligent Transportation System (ITS) equipment and signs, and removing invasive plant species. Typical maintenance activities, such as mowing, are generally performed adjacent (within a 10-foot wide area) to the edge of pavement. To perform these maintenance activities, WSDOT will typically park vehicles in the shoulder and provide advance warning signage to drivers. The current design of the I-5 Alternative would not affect this type of maintenance activity as WSDOT would continue to be able to perform maintenance activites between I-5 and the guideway from the I-5 shoulder.

For maintenence access west of the guideway, such as servicing stormwater facilities and removing invasive weeds, access from I-5 would be provided beneath the guideway where there would be vertical clearances of 10 feet or more or from local streets.

The Landfill Median Option would require breaks in sections of the guardrail to allow access for maintenance equipment. It would not otherwise affect access, circulation, or Interstate operations. Even though most of this alternative is adjacent to I-5, there would be no circulation or access impacts on I-5 because the number and

configuration of freeway lanes, interchange accesses, and freeway shoulder would be maintained. This alternative would travel near three I-5 interchanges (Kent-Des Moines Road, S 272nd Street, and S 317th Street) but would be grade-separated (either above or below) from the interchange ramps and cross streets; therefore, no changes to intersection control or traffic circulation are expected.

The Landfill Median Alignment Option would not affect property access, circulation, or traffic operations on I-5.

**Kent/Des Moines Stations**

With the Kent/Des Moines I-5 Station, S 236th Lane would be extended between SR 99 and the station area and include a new traffic signal at the S 236th Lane and SR 99 intersection. Access to the parking areas with this station would be provided along 30th Avenue S via S 236th Lane and S 240th Street. S 236th Lane and 30th Avenue S would be improved as part of the station construction. Appendix F, Conceptual Design Drawings, shows the extent of roadway improvements near the station area.

The Kent/Des Moines At-Grade Station Option would be located adjacent to I-5 south of S 240th Street. Primary station access would be at S 240th Street, which would be extended between SR 99 and the station area. Property access, circulation, and traffic control north of S 240th Street would remain the same as under the No Build Alternative. A new road (S 242nd Street) would extend from SR 99 to the station area. Access within the station site would connect S 240th Street and S 242nd Street. This road would provide access to the transit bus service and passenger drop-off/pick-up areas.

Property access, circulation, and traffic control at the Kent/Des Moines SR 99 East Station Option would be the same as the Kent/Des Moines stations described under the SR 99 Alternative.

**S 272nd Star Lake Station**

The S 272nd Star Lake Station would be located at the existing Star Lake Park-and-Ride. Access to the site would continue to be via 26th Avenue S; however, the road would be reconfigured for the station. No changes to adjacent property access or circulation are anticipated.

**Federal Way City Center Stations**

Property access, circulation, and traffic control at the Federal Way Transit Center Station would be the same as described above for this station under the SR 99 Alternative.

Transit and vehicle access would be provided to the Federal Way I-5 Station Option along S 317th Street. Access to the park-and-ride area would also be provided along 23rd Avenue S. Access to the passenger drop-off/pick-up area would be provided along S Gateway Center Plaza. Vehicles from the north that are dropping off or picking up passengers would need to circulate around the station and use S 320th Street to access the drop-off area. No change in property access, circulation, or traffic control beyond the station area is expected.

The Federal Way S 320th Park-and-Ride Station Option would be located at the existing S 320th Street Park-and-Ride. Access would remain along 23rd Avenue S and access along 25th Avenue S would be modified so vehicles leaving the station could also use this road. Currently, this street provides bus access out of the park-and-ride.

Bus routes accessing the station would be from S 320th Street, 23rd Avenue S, and 25th Avenue S because the existing transit-only egress from the southbound I-5 on-ramp would be removed. No changes to traffic control are expected with this option.

### SR 99 to I-5 Alternative

The SR 99 to I-5 Alternative would have similar circulation, access, and traffic control to the SR 99 Alternative north of S 224th Street. At S 224th Street, this alternative would transition to the east side of SR 99 and continue toward I-5, then become the same as the I-5 Alternative near the Midway Landfill. No impacts are expected to the I-5 mainline or any ramp terminals with the SR 99 to I-5 Alternative.

Traffic circulation, property access, circulation, and traffic control for the Kent/Des Moines 30th Avenue East Station would be similar to the Kent/Des Moines SR 99 East Station Option described under the SR 99 Alternative except driveways would not be provided along SR 99. Property access, local circulation, and traffic control at the S 272nd Star Lake and Federal Way Transit Center stations would be the same as described for these stations under the I-5 Alternative.

**Station Options**

The SR 99 to I-5 Alternative would have the same potential additional station at S 216th Street as described under the SR 99 Alternative,

and the Federal Way City Center Station Options described under the I-5 Alternative. Property access, local circulation, and traffic control at these stations would be the same for each of these options, as described previously.

### I-5 to SR 99 Alternative

North of the Kent-Des Moines Road, the I-5 to SR 99 Alternative would have similar circulation, access, and traffic control as the I-5 Alternative. Near Kent-Des Moines Road, this alternative would begin to transition to the west to SR 99 near S 231st Street. This alternative would then become similar to the SR 99 Alternative. No impacts are expected to the I-5 mainline or any ramp terminals with the I-5 to SR 99 Alternative.

Property access, local circulation, and traffic control at the Kent/Des Moines 30th Avenue West Station would be the same as with the Kent/Des Moines SR 99 East Station Option described previously under the I-5 Alternative. Property access, local circulation, and traffic control at the S 272nd Redondo and Federal Way Transit Center stations would be the same as described under the SR 99 Alternative.

#### Station Options

The I-5 to SR 99 Alternative would include the S 260th West and East potential additional stations, the S 272nd Redondo Trench Station Option, and the Federal Way SR 99 Station Option as described for the SR 99 Alternative. Property access, local circulation, and traffic control at these stations would be the same for each of these options as described under the SR 99 Alternative.

## 3.5.3.3 Traffic Operations

For the year 2035 traffic operations analysis, the conditions under the No Build Alternative are compared to the build alternatives and their station options. With input from the local jurisdictions, Sound Transit selected 63 intersections for analysis in the PM peak hour (see Exhibit 3-1). These locations include intersections that would be most directly affected by the FWLE, such as a change in channelization, roadway width, or signal control, and those intersections that would be indirectly affected, such as by a change in vehicular or pedestrian activity. An AM peak hour analysis was also conducted but with a smaller study area focused on I-5 ramp terminals and intersections adjacent to stations with a park-and-ride.

The traffic operations analysis and any potential mitigation measures consider the travel time and delay for both vehicles and buses. In

general, the build alternatives and their options would maintain or improve the speed and reliability of travel for both autos and buses.

LOS standards for each agency are presented in Table 3-4. Under the No Build Alternative, four intersections would operate worse than the agency standard. Most intersections near light rail stations are expected to operate at an LOS similar to the No Build Alternative. The exceptions occur around the Kent/Des Moines and S 272nd Street station areas where the LOS degrades with the project. Additionally, a few other intersections show a LOS degradation that would be dependent on a station design option. Exhibits 3-9 through 3-11 present the 2035 AM and PM peak hour intersection LOS among the No Build Alternative and build alternatives.

At I-5 ramp terminals, off-ramp vehicle queue lengths were also analyzed to assess if any vehicle queues would reach the I-5 mainline. This analysis is described under Section 3.5.3.4, I-5 Ramp Terminal Operations.

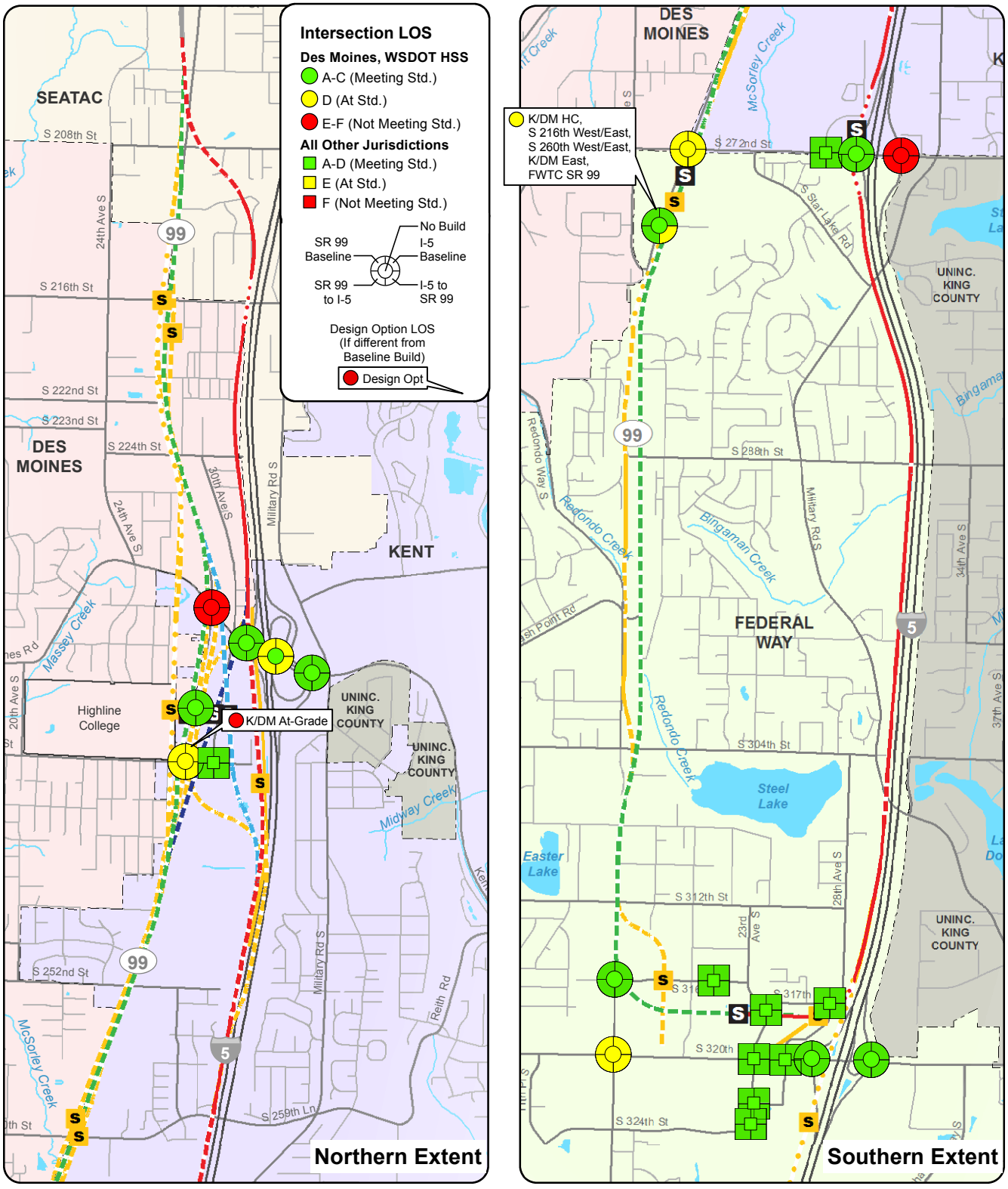
## Full Length Build Alternatives

### SR 99 Alternative

The majority of the intersections analyzed for the SR 99 Alternative would operate similar to the No Build Alternative in year 2035. Of the intersections analyzed, three intersections would operate worse than the No Build Alternative and not meet LOS standard. These impacts would be caused by the increased vehicles traveling to and from the station areas.

- SR 99/Kent-Des Moines Road (AM and PM peaks)
- I-5 southbound ramps/Kent-Des Moines Road (PM peak only)
- I-5 northbound ramps/ S 272nd Street (AM peak only)

No intersection LOS impacts were determined near the Federal Way Transit Center station area. There would be no changes in LOS between the SR 99 Alternative and any of the SR 99 station or alignment options.




## Legend

**SR 99 Alternative**
- Elevated

**I-5 Alternative**
- Elevated
- At-Grade
- Trench

**SR 99 to I-5 Alternative**
- Elevated

**I-5 to SR 99 Alternative**
- Elevated

**Options**
- Elevated
- At-Grade
- Trench

**Stations**
- S Station for Alternatives
- S Station for Options

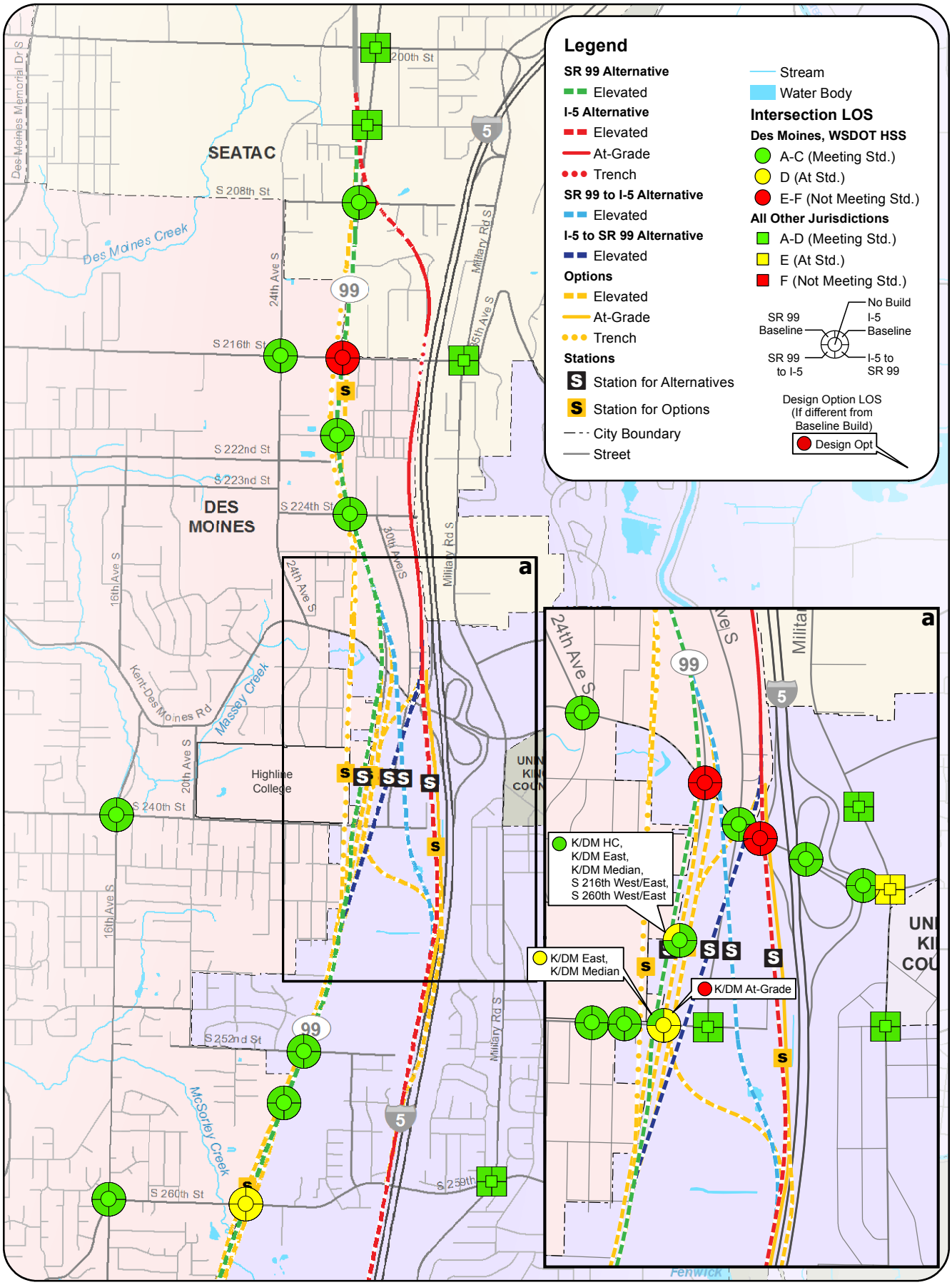
- City Boundary
- Street
- Stream
- Water Body

*Data Sources: King County, Cities of Des Moines, Federal Way, Kent, SeaTac (2013).*
*HSS = Highway of Statewide Significance*

N

0 0.25 0.5 1 Miles

**EXHIBIT 3-9**
2035 AM No Build and Build Alternatives Level of Service Northern and Southern Study Area Extents
*Federal Way Link Extension*

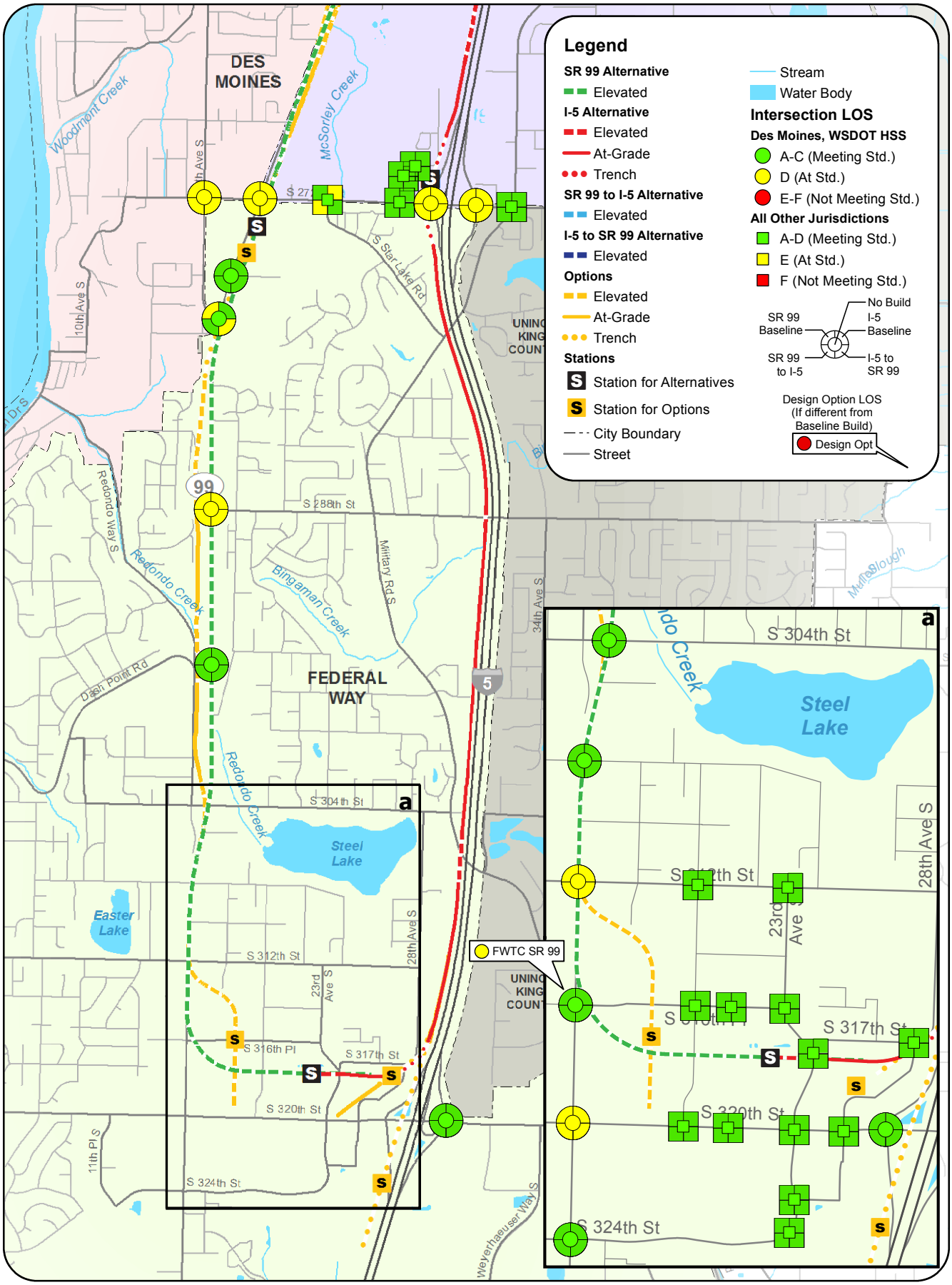



*Data Sources: King County, Cities of Des Moines, Federal Way, Kent, SeaTac (2013).*
*HSS = Highway of Statewide Significance*

N

0 0.25 0.5 1 Miles

**EXHIBIT 3-10**
2035 PM No Build and Build Alternatives
Level of Service Northern Study Area Extent
*Federal Way Link Extension*




*Data Sources: King County, Cities of Des Moines, Federal Way, Kent, SeaTac (2013).*
*HSS = Highway of Statewide Significance*

N

0 0.25 0.5 1 Miles

**EXHIBIT 3-11**
2035 PM No Build and Build Alternatives
Level of Service Southern Study Area Extent
*Federal Way Link Extension*

### I-5 Alternative

The intersections described above under the SR 99 Alternative that would operate worse than the No Build Alternative would operate the same with the I-5 Alternative. This applies to all station and alignment options except the I-5 At-Grade Station Option. With the I-5 At-Grade Station Option, the SR 99 and S 240th Street intersection would also operate worse than with the No Build Alternative and would not meet agency LOS standards. With this station option, vehicle traffic associated with the station would travel along S 240th Street, thus increasing the congestion at the intersection compared to the No Build Alternative.

### SR 99 to I-5 Alternative

The SR 99 to I-5 Alternative would have intersection LOS results similar to the SR 99 Alternative north of the Kent/Des Moines Station and intersection LOS results similar to the I-5 Alternative south of the Kent/Des Moines Station. Therefore, the same three intersections previously described would operate worse than the No Build Alternative and not meet LOS standards.

### I-5 to SR 99 Alternative

The I-5 to SR 99 Alternative would have intersection LOS results similar to the I-5 Alternative north of Kent/Des Moines Station and results similar to the SR 99 Alternative south of Kent/Des Moines Station. Therefore, the same three intersections previously described would operate worse than the No Build Alternative and not meet LOS standards.

## Interim Terminus Condition Analysis

Intersection LOS analyses were also conducted for the Kent/Des Moines and S 272nd Redondo or Star Lake stations interim terminus conditions for both the SR 99 and I-5 Alternatives.

### SR 99 Alternative

The two intersections listed below that are identified for the full length SR 99 Alternative as not meeting agency LOS standards and operating worse than the No Build Alternative would also be affected in both the Kent/Des Moines and S 272nd Redondo interim terminus station conditions:

- SR 99/Kent-Des Moines Road (AM and PM peaks)
- I-5 southbound ramps/Kent-Des Moines Road (PM peak only)

***Kent/Des Moines Station Interim Terminus Condition***

In addition to the two intersections already identified as being affected with the SR 99 Alternative, the I-5 northbound off-ramp at Kent-Des Moines Road would operate worse than the No Build Alternative and not meet agency LOS standards in the AM peak hour. This would be a result of the increase in vehicles heading to the Kent/Des Moines Station in the morning with the larger park-and-ride and without light rail south of this station.

***S 272nd Redondo Station Interim Terminus Condition***

With the S 272nd Redondo Station interim terminus condition, the following three additional intersections would operate worse than the No Build Alternative and not meet agency LOS standards:

- I-5 northbound ramps/ S 272nd Street (AM peak only)
- I-5 southbound ramps/ S 272nd Street (PM peak only)
- SR 99/ S 276th Street (AM peak only)

All of these intersections would operate worse than the No Build Alternative because there would be an increase in the number of vehicles traveling to and from the S 272nd Redondo Station with no light rail station south of this location.

**I-5 Alternative**

The intersections identified with the full length I-5 Alternative as not meeting agency LOS standards and operating worse than the No Build Alternative would also be affected in both the Kent/Des Moines and S 272nd Star Lake stations interim terminus conditions. However, in the Kent/Des Moines interim terminus condition, the I-5 northbound ramps/ S 272nd Street intersection would operate the same as in the No Build condition.

***Kent/Des Moines Station Interim Terminus Condition***

Similar to the Kent/Des Moines Station interim terminus condition under the SR 99 Alternative, the I-5 northbound off-ramp at Kent-Des Moines Road would also operate worse than the No Build Alternative and not meet agency LOS standards in the AM peak hour.

***S 272nd Star Lake Station Interim Terminus Condition***

No additional intersections beyond those three identified in the full-length I-5 Alternative would not meet agency LOS standards and operate worse than the No Build Alternative.

#### 3.5.3.4 I-5 Ramp Terminal Operations

The intersections at I-5 interchanges (Kent-Des Moines Road, S 272nd Street, S 317th Street, and S 320th Street) were analyzed based on their proximity to future FWLE stations, the potential for vehicle trips to and from the stations to travel through these interchanges, and to assess the change in vehicle queue lengths on the off-ramps compared with the No Build Alternative.. The intersection LOS results were described previously under Subsection 3.4.3.3. Additional queue length information is provided in Appendix E, I-5 Ramp Terminal Queue Length Results, of Appendix G1.

Year 2035 vehicle queue lengths at the Kent-Des Moines Road southbound off-ramp would increase with all of the full length build alternatives and would increase at the northbound off-ramp with the Kent/Des Moines Station interim terminus condition. Even with longer queue lengths, the forecasted vehicle queues are not expected to extend onto the I-5 mainline or in the portion of the ramp used to decelerate from freeway to ramp speeds.

The S 272nd Street northbound off-ramp queue length is also expected to increase with all the full length build alternatives and in both the S 272nd Redondo and Star Lake stations interim terminus conditions; however, these queues would also occur only on the off-ramp and not reach the I-5 mainline or the ramp deceleration area. The S 317th Street and S 320th Street interchanges would not be noticeably affected (by intersection LOS or queue length) with the build alternatives or any of the station options. The forecasted vehicle queues at these ramps are not expected to back up onto the I-5 mainline ramp deceleration area.

### 3.5.4 Safety

The safety of the transportation system for all users was assessed for the build alternatives and station options. Overall, the safety of the transportation system is expected to be minimally affected compared with the No Build Alternative because the build alternatives would be grade-separated and operate in exclusive right-of-way with no direct conflicts with vehicles, pedestrians, or bicyclists. The design would also adhere to both light rail and roadway standards to minimize the potential effects on traffic safety.

If transportation infrastructure such as mid-block U-turns, medians, and intersection sizing are removed or modified with the FWLE, these facilities would be replaced or upgraded to ensure that the

transportation system would not be considerably affected. Additionally, infrastructure elements of the FWLE, such as walls and columns, would be designed to comply with WSDOT standards in order to ensure minimal conflicts resulting from fixed objects, clearances, and other infrastructure-related safety concerns.

#### 3.5.4.1 SR 99 Alternative

The SR 99 Alternative would increase vehicle and nonmotorized activity around the station areas, which could increase the potential for conflicts between different travel modes, including vehicle/vehicle, pedestrian/vehicle, pedestrian/bicycle, or bicycle/vehicle conflicts; however, these are not expected to affect accident rates or appreciably affect safety. This alternative would widen SR 99 at some intersections and increase pedestrian crossing distances. All station options in the Kent/Des Moines and the S 272nd Redondo station areas would require many passengers transferring between RapidRide A Line and the station platform to cross at least part of SR 99, thus increasing the risk of pedestrian/vehicle collisions. For the Federal Way Transit Center Station option, the level of increased nonmotorized activity around the station area could increase the potential for conflicts with cars and buses.

**Station Options**

Potential impacts would not change for the Kent/Des Moines station options and the Federal Way SR 99 station option except the Kent/Des Moines SR 99 Median Station Option. This option would widen SR 99 and therefore increase the pedestrian crossing distances. The S 216th and S 260th potential additional stations would have less potential for congestion-related crashes compared to other stations with park-and-ride facilities because they would have fewer vehicles accessing the stations from not having any parking.

#### 3.5.4.2 I-5 Alternative

The I-5 Alternative would have a minimal effect on traffic safety in the study area. There would be an increase in vehicle and nonmotorized activity around the station areas, which would increase the potential for conflicts between different travel modes; however, these are not expected to affect accident rates or appreciably affect safety. Vehicle queues at I-5 ramp terminals are expected to increase; however, they are not expected to back up to the I-5 mainline or affect how vehicles decelerate from freeway to ramp speeds.

The I-5 Alternative would be like current conditions in having an adequate clear zone along most of the alignment, and guardrails or barrier in all other places. This alternative has the same potential for future clear zone as the No Build Alternative. The entire I-5 guideway alignment would be located more than 46 feet away from the existing edge of the pavement. Moreover, it has been designed not to interfere with any existing or potential future I-5 clear zone areas, and to allow WSDOT to create adequate clear zones where they do not currently exist or are substandard. The I-5 clear zone safety analysis is further discussed in Appendix G1, Transportation Technical Report, Section 4.4.3.1, and in Appendix H, Section H2.1.1, of this Draft EIS.

**Station and Alignment Options**

All I-5 station options would have a minimal effect on traffic safety in the study area. Increases in vehicle and nonmotorized activity around the stations would be similar compared to the I-5 Alternative.

The Landfill Median Alignment Option would transition into the I-5 median for approximately 1/2 mile from south of S 240th Street to approximately S 252nd Street. This option would place guideway columns in the median without altering the existing travel lanes, shoulder, or median width. 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, a barrier would be required along the southbound I-5 outside shoulder to shield the guideway. Based on safety analysis using the HSM, adding a barrier, such as 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.

### 3.5.4.3 SR 99 to I-5 Alternative

The SR 99 to I-5 Alternative would have the same impacts as the SR 99 Alternative north of the Kent/Des Moines Station and the same impacts as the I-5 Alternative south of the Kent/Des Moines Station. There would be no additional impacts associated with the Kent/Des Moines 30th Avenue East Station.

#### 3.5.4.4 I-5 to SR 99 Alternative

The I-5 to SR 99 Alternative would have the same impacts as the I-5 Alternative north of the Kent/Des Moines Station and the same impacts as the SR 99 Alternative south of the Kent/Des Moines Station. There would be no additional impacts associated with the Kent/Des Moines 30th Avenue West Station.

### 3.5.5 Parking

Parking for the build alternatives would be provided in the station areas either with existing parking and/or, if part of the station, additional park-and-ride stalls. The parking assessment evaluated whether the build alternatives would remove public (on- and off-street) and private (off-street) parking along the alignment and at the station areas and if the demand for station parking could potentially exceed the available park-and-ride capacity. If so, there could be spillover to nearby on-street parking that surrounds the station areas.

#### 3.5.5.1 Parking Impacts

The build alternatives would have minimal impact on public on-street and off-street parking compared with the No Build Alternative (assumed to be similar to existing conditions), with 40 spaces removed in the Kent/Des Moines Station area with the I-5 and I-5 to SR 99 alternatives. Each build alternative would remove some private parking. Table 3-13 summarizes the number of public (on- and off-street) and private parking that would be removed by each alternative.

TABLE 3-13
**Summary of Parking Impacts by FWLE Alternative**

| Alternative | Removed Public Parking | | Removed Private Parking | Total |
|---|---|---|---|---|
| | On-Street | Off-Street | | |
| **SR 99 Alternative** | **0** | **0** | **600** (540–1,240) | **600** |
| **I-5 Alternative** | **20** | **20** | **370** (220–590) | **410** |
| **SR 99 to I-5 Alternative** | **0** | **0** | **250** (100–350) | **250** |
| **I-5 to SR 99 Alternative** | **20** | **20** | **790** (780–1,080) | **830** |

Notes:
Parking numbers are rounded up to the nearest 10 stalls.
Number in parenthesis represents the range of off-street private parking removed with each alternative's station options. See Table 4-38 in Appendix G1 for further information.

Private parking spaces within properties that are expected to be entirely acquired by Sound Transit for a build alternative are not included because there would be no demand for these spaces when the existing use is displaced. Displaced off-street private parking

resulting from partial property acquisitions could reduce business opportunities. The amount of private parking removed under the build alternatives would range between 250 and 790 parking stalls. The I-5 to SR 99 Alternative would remove the greatest amount of off-street private parking, and the SR 99 to I-5 Alternative would remove the least amount of parking. There would be no additional impact on public (on-street or off-street) parking with any of the station options. The amount of private parking removed could be more substantial with the station and alignment options—up to 230 more parking stalls (refer to Table 4-38 in Appendix G1).

All SR 99 station options except the Kent/Des Moines SR 99 Median Station Option and the potential additional station at S 260th Street (East option) would have additional impacts on private parking. The Federal Way SR 99 Station would have the greatest parking impact of all design options, with 230 additional parking spaces removed, while the S 272nd Redondo Trench Station Option would have the least additional impact, with only 10 additional parking stalls removed. The Kent/Des Moines SR 99 Median Station Option would reduce the number of parking stalls removed by 50 compared with the SR 99 Alternative, and the potential additional station at S 260th Street (East option) would reduce the number of parking stalls removed by 10.

With the I-5 Alternative, only the Kent/Des Moines SR 99 East Station Option would increase parking impacts, with 220 additional parking spaces removed. The Federal Way City Center station options would reduce the number of parking spaces removed by up to 150. Impacts from station options for the SR 99 to I-5 and I-5 to SR 99 alternatives would be the same as for the SR 99 and I-5 alternatives.

#### 3.5.5.2 Station Area Parking

All of the light rail station areas that currently have existing park-and-rides would have additional parking to accommodate the forecasted parking demand with the FWLE. With all of the full length build alternatives, there would be about 1,600 additional park-and-ride stalls provided at the stations. No parking would be provided at the S 216th and S 260th Street potential additional stations..

At the Kent/Des Moines Station, 500 structured parking spaces would be provided. At either the S 272nd Star Lake Station or the S 272nd Redondo Station, 700 spaces would be provided in addition to the current park-and-ride parking supply. At any of the Federal Way

Transit Center stations, an additional 400 spaces would be provided adjacent to the light rail station. At the existing Federal Way Transit Center, the 1,190 existing spaces would remain.

Under an interim terminus condition, an additional 500 parking spaces (for a total of 1,000 parking spaces) would be provided at the Kent/Des Moines Station. These parking spaces would likely be on a surface lot.

**Hide-and-Ride**

This activity, which occurs when transit users park in neighborhoods surrounding transit stations, is generally caused by parking demand that exceeds supply at the transit station.

Hide-and-ride parking is more likely to occur when there is a substantial amount of easily accessible on-street public parking and the forecasted park-and-ride demand would be greater than the park-and-ride capacity. No hide-and-ride parking is expected near the Kent/Des Moines stations because public on-street parking is not available and the forecasted parking demand is less than the parking capacity. The S 272nd Street stations are also forecasted to have excess parking capacity; therefore, hide-and-ride activity is not expected at either S 272nd Street station. Stations in the Federal Way City Center area would have the potential for hide-and-ride activity. However, the potential for hide-and-ride activity is low because there would be a limited number of available on-street parking spaces and the park-and-ride supply at nearby stations are forecasted to have excess capacity available for these vehicles to potentially use.

The potential additional stations at S 216th Street and S 260th Street also would have the potential for hide-and-ride activity because no park-and-ride would be provided at the stations. However, very limited public on-street parking is available near the S 260th station options; therefore, the hide-and-ride potential would be minimized. At the S 216th station options, the S 216th West Station would have limited nearby public on-street parking, which would minimize the hide-and-ride potential. However, the S 216th East Station would be adjacent to residential neighborhoods to the south and east that have some available on-street parking; therefore, hide-and-ride activity could be experienced with this station option.

At the Kent/Des Moines Station, there is a potential that the designated park-and-ride spaces for light rail could be used by Highline College students because of its proximity to the Highline College campus. Currently, Highline College charges students a fee to park on campus. This could result in some students choosing to park

in nearby park-and-ride lot(s), thereby reducing the available capacity of the park-and-ride for transit users.

### 3.5.6 Nonmotorized Facilities

The FWLE station layout and location with respect to surrounding land uses and transit services would affect the travel mode people use to access and circulate around each station. Existing and year 2035 pedestrian and bicycle facilities in the FWLE corridor are shown in Exhibits 3-12 and 3-13, respectively. New facilities that are planned and have identified funding sources were assumed to be part of the No Build Alternative; however, generally these facilities would not be located near the FWLE stations.

The nonmotorized facilities were inventoried and evaluated for a walkshed of 1/2 mile and a bikeshed of 1 mile around each FWLE station area, assuming the actual walk or bicycle distance on the roadway system from the station platform. Natural barriers, such as topography, were not included as part of the walk- and bikeshed analysis; however, they could make nonmotorized travel less attractive.

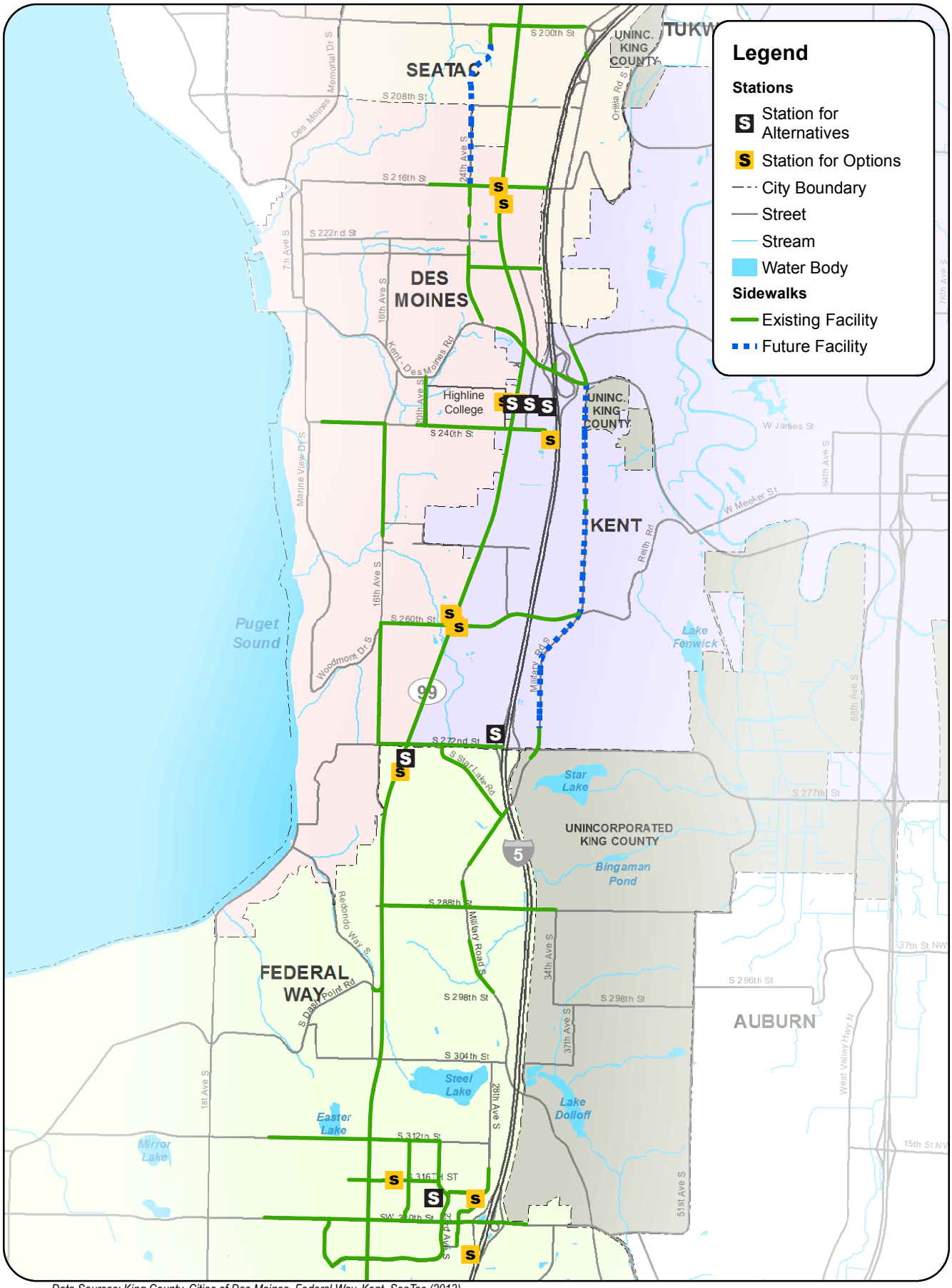
**Walkshed and Bikeshed**

A walkable (or bikeable) area around a particular point of interest. For the FWLE stations, the walkshed is defined as a 1/2-mile actual walk distance, while a bikeshed is defined as a 1-mile bicycle distance via streets and nonmotorized use trails to a station.

A 1/2-mile walkshed and 1-mile bikeshed were also used to assess the potential population and employment that could directly access the light rail without requiring motorized travel. All of the Kent/ Des Moines station options would have similar population and employment within a 1/2-mile walkshed and 1-mile bikeshed. At these stations, employment would range between 2,200 and 2,700 persons, and population would range between 2,100 to 2,600 persons within a 1/2-mile walkshed. The S 272nd Street station options would have the least employment (200 persons) of all FWLE stations within a 1/2-mile walk; however, within a 1-mile bike ride, the S 272nd Redondo Station would provide greater accessibility to nearby businesses than the S 272nd Star Lake Station. The Federal Way Transit Center would serve the highest amount of both employment and population (4,100 and 3,600 persons, respectively) based on a 1/2-mile walk, while the Federal Way SR 99 Station Option would serve the highest population and employment (both 8,100 persons) based on a 1-mile bike ride. Appendix G1 provides more detail on the population and employment within these walksheds and bikesheds and the methodology used for assessing impacts, including pedestrian trip generation and pedestrian LOS, on nonmotorized facilities.

**Pedestrian LOS**

The FWLE analysis focused on three components of the pedestrian experience 1) holding areas while waiting to cross an intersection 2) circulation area within crosswalks and 3) the overall pedestrian experience. As the volume of pedestrians increases, the area available for maneuverability and comfort is decreased. LOS C or better represents that pedestrians can move at their desired speed. At LOS D or worse, the speed and ability to pass slower pedestrians becomes more restricted. At LOS F, speed is severely restricted and contact with other pedestrians is




*Data Sources: King County, Cities of Des Moines, Federal Way, Kent, SeaTac (2013).*

**EXHIBIT 3-12**
Existing and Future Sidewalk Locations

*Federal Way Link Extension*


*Data Sources: King County, Cities of Des Moines, Federal Way, Kent, SeaTac (2013).*

N

0 0.5 1 2 Miles

**EXHIBIT 3-13**
Existing and Future Bicycle Facilities and Routes
*Federal Way Link Extension*

A pedestrian LOS analysis was conducted for signalized intersections located within 300 feet of the FWLE station areas for the 2035 PM peak hour. Pedestrian facilities near the FWLE light rail stations are expected to have an LOS score ranging between LOS A and LOS C with the No Build Alternative. Most LOS C crosswalks are across SR 99 and S 272nd Street, which require longer crossing distances because of the width of these streets.

For the build alternatives, the accessibility to the station areas would be a major contributor to the nonmotorized activity at the stations. The presence of sidewalks, bicycle lanes, and other nonmotorized facilities would enable connections to the transit system with the surrounding land uses. The location of crossings, bus stops, drop-off/pick-up areas, and park-and-ride lots are design elements that would also affect the way pedestrian trips circulate within the station areas. Tables 3-14 and 3-15 show the total pedestrian trips estimated at the FWLE stations during the PM peak hour, respectively, and Table 3-16 shows the pedestrian trips at the stations in the interim terminus conditions. The total pedestrian trips forecasted at each station were categorized if they access the station by auto, transit transfer, or walk/bicycle.

TABLE 3-14
**2035 PM Peak Hour Pedestrian Trip Generation at FWLE Alternatives Stations**

| Station Area | Alternative | Total Pedestrian trips (persons/hr) | Auto (persons/hr)[a] | Walk/Bicycle (persons/hr)[b] | Transit (persons/hr)[b] |
|---|---|---|---|---|---|
| Kent/Des Moines | SR 99 | 950 | 290 | 160 | 500 |
| | I-5 | 570 | 280 | 160 | 130 |
| | I-5 to SR 99 | 780 | 280 | 150 | 350 |
| | SR 99 to I-5 | 750 | 290 | 160 | 300 |
| S 272nd Redondo | SR 99 | 850 | 700 | 60 | 90 |
| | I-5 to SR 99 | 850 | 700 | 60 | 90 |
| S 272nd Star Lake | I-5 | 910 | 490 | 130 | 290 |
| | SR 99 to I-5 | 900 | 490 | 120 | 290 |
| Federal Way Transit Center | SR 99 | 1,670 | 380 | <10 | 1,290 |
| | I-5 | 1,700 | 390 | <10 | 1,310 |
| | I-5 to SR 99 | 1,640 | 380 | <10 | 1,260 |
| | SR 99 to I-5 | 1,600 | 380 | <10 | 1,220 |

Note: The trips by mode may not add up to total trips due to rounding to nearest 10.
[a] Source: Parking Stall Estimate and Passenger Drop-off/Pick-up forecasts
[b] Source: Sound Transit Ridership Model

TABLE 3-15
**2035 PM Peak Hour Pedestrian Trip Generation at FWLE Alternatives Station Options**

| Station Area | Alternative | Station Option | Total Pedestrian trips (persons/hr) | Automobile (persons/hr)[a] | Walk/Bicycle (persons/hr)[b] | Transit (persons/hr)[b] |
|---|---|---|---|---|---|---|
| Kent/Des Moines | SR 99 | Highline College Campus | 960 | 300 | 160 | 500 |
| | | SR 99 Median | 960 | 300 | 160 | 500 |
| | | SR 99 East | 960 | 300 | 160 | 500 |
| | I-5 | At-Grade | 590 | 280 | 160 | 150 |
| | | SR 99 East | 830 | 300 | 160 | 370 |
| Federal Way Transit Center or City Center | SR 99 | Federal Way SR 99 | 1,780 | 370 | 120 | 1,290 |
| | I-5 | Federal Way I-5 | 1,500 | 370 | 30 | 1,100 |
| | | Federal Way S 320th Park-and-Ride | 2,460 | 650 | <10 | 1,810 |
| S 216th Street | SR 99 | West | 220 | 20 | 190 | 10 |
| | | East | 220 | 20 | 190 | 10 |
| S 260th Street | SR 99 | West | 170 | 10 | 160 | <10 |
| | | East | 170 | 10 | 160 | <10 |

Note: The trips by mode may not add up to total trips due to rounding to nearest 10.
[a] Source: Parking Stall Estimate and Passenger Drop-off/Pick-up forecasts
[b] Source: Sound Transit Ridership Model

TABLE 3-16
**2035 PM Peak Hour Pedestrian Trip Generation at FWLE Stations (Interim Terminus Conditions)**

| Station Area | Alternative | Station Option | Total Pedestrian trips (persons/hr) | Auto (persons/hr)[a] | Walk/Bicycle (persons/hr)[b] | Transit (persons/hr)[b] |
|---|---|---|---|---|---|---|
| Kent/Des Moines | SR 99 | West | 2,010 | 600 | 130 | 1,280 |
| | | Highline College Campus | 2,010 | 600 | 130 | 1,280 |
| | | SR 99 Median | 2,010 | 600 | 130 | 1,280 |
| | | SR 99 East | 2,010 | 600 | 130 | 1,280 |
| | I-5 | I-5 | 1,380 | 560 | 110 | 710 |
| | | At-Grade | 1,380 | 560 | 110 | 710 |
| | | SR 99 East | 2,010 | 600 | 130 | 1,280 |
| | SR 99 to I-5 | 30th Avenue East | 1,380 | 560 | 110 | 710 |
| | I-5 to SR 99 | 30th Avenue West | 1,380 | 560 | 110 | 710 |
| S 272nd Redondo | SR 99, I-5 to SR 99 | Redondo | 1,020 | 720 | 50 | 250 |
| S 272nd Star Lake | I-5, SR 99 to I-5 | Star Lake | 1,360 | 540 | 130 | 690 |

Note: The trips by mode may not add up to total trips due to rounding to nearest 10.
[a] Source: Parking Stall Estimate and Passenger Drop-off/Pick-up forecasts
[b] Source: Sound Transit Ridership Model

Generally, the pedestrian LOS for the FWLE alternatives would range between LOS A and LOS D. For most intersections, a lower LOS rating would be attributed to a noticeable increase in pedestrian volume (e.g., where the park-and-ride facilities or transit stops are not

located adjacent to light rail stations). For some intersections in the interim terminus condition, the pedestrian LOS would be LOS D. To accommodate some of the larger pedestrian volumes, at some locations, sidewalk and crosswalk widths exceeding design standards would be constructed with the project. A discussion of the nonmotorized elements and pedestrian LOS is provided in the following subsections for each station area.

#### 3.5.6.1 Kent/Des Moines Station

Exhibit 3-14 shows the walk- and bikesheds for the build alternatives and station options in the Kent/Des Moines Station area. In general, all the Kent/Des Moines build alternatives and station options would have a fairly similar walk- and bikeshed. In the Kent/Des Moines station area, I-5 is a major barrier to walking and bicycle trips east of I-5. Pedestrian crossings along SR 99 would be provided at the signalized intersections of S 240th Street and Kent-Des Moines Road.

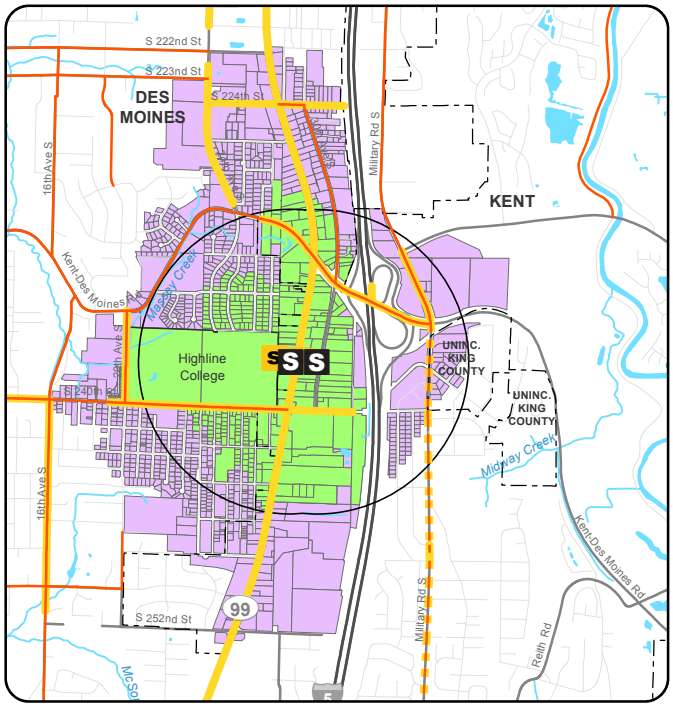
The proposed signalized intersection on SR 99 at S 236th Lane would provide crosswalks on all approaches. This would be provided in all of the FWLE alternatives, except with the Kent/Des Moines At-Grade Station Option.

For the FWLE alternatives and station options adjacent to SR 99, the majority of the pedestrian trips at the station would be riders transferring between light rail and the RapidRide A Line.

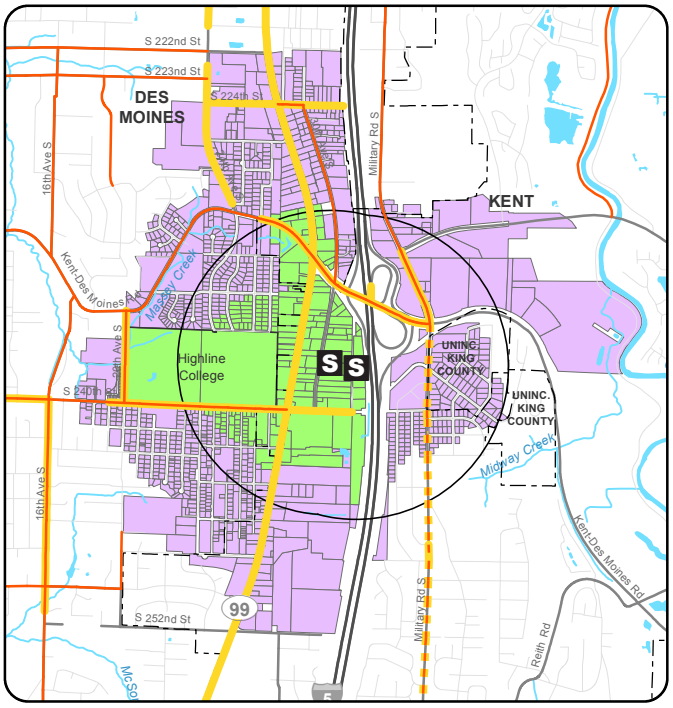
With the station located farther east of SR 99, the number of pedestrian trips transferring between light rail and the RapidRide A Line would decrease because of the longer walking distance between the station and SR 99. At crosswalks near the station, the pedestrian LOS is expected to range from LOS A to LOS C for the No Build Alternative and all build alternatives and station options.

#### 3.5.6.2 S 272nd Redondo Station

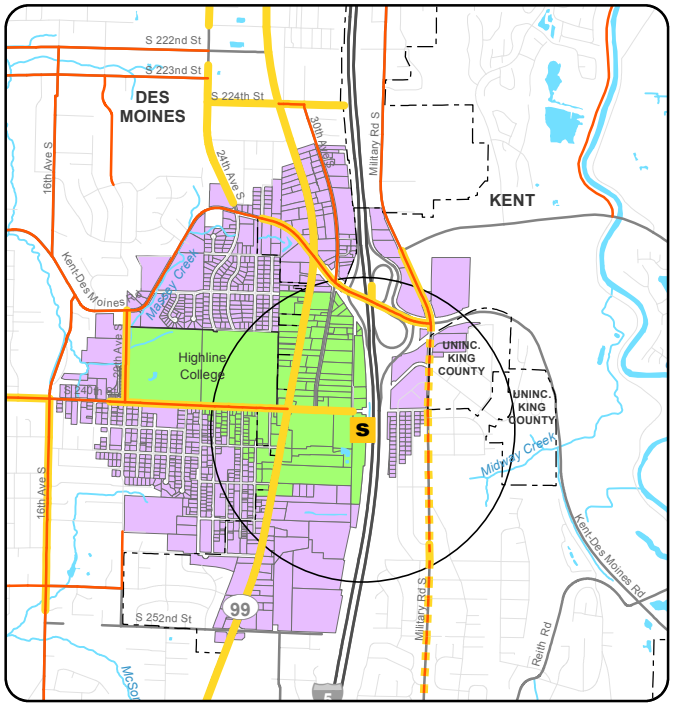
Exhibit 3-15 shows the walk- and bikesheds for the S 272nd Redondo Station. The SR 99 and I-5 to SR 99 alternatives would serve the S 272nd Redondo Station area just south of S 272nd Street. Poor sidewalk connectivity limits the walkshed for the residential neighborhoods southeast of the station area. Sound Transit would provide pedestrian crossings of SR 99 at the signalized intersections of S 276th Street and S 272nd Street.




**SR 99 West Station with SR 99 East, SR 99 Median, HC Station & 30th Avenue West Options**




**I-5 Station & 30th Avenue East Station**




**I-5 At-Grade Station Option**

**Legend**

**Stations**
- S — Station for Alternatives
- S — Station for Options
- City Boundary
- Street
- Stream
- Water Body
- 1/2-Mile Walkshed Parcels
- 1-Mile Bikeshed Parcels
- 1/2-Mile Buffer

**Bike Facilities**
- Existing Bike Facilities
- Future Bike Facilities

**Sidewalks**
- Existing Sidewalks
- Future Sidewalks

N

*Notes:*
*-Bike facility types include: lanes, routes, shared roadways, paths, and trails.*
*-Sheds were calculated based on roadway network and on-road distances.*
*-HC = Highline College*

**EXHIBIT 3-14**
Kent/Des Moines Station Area
Walksheds and Bikesheds
*Federal Way Link Extension*

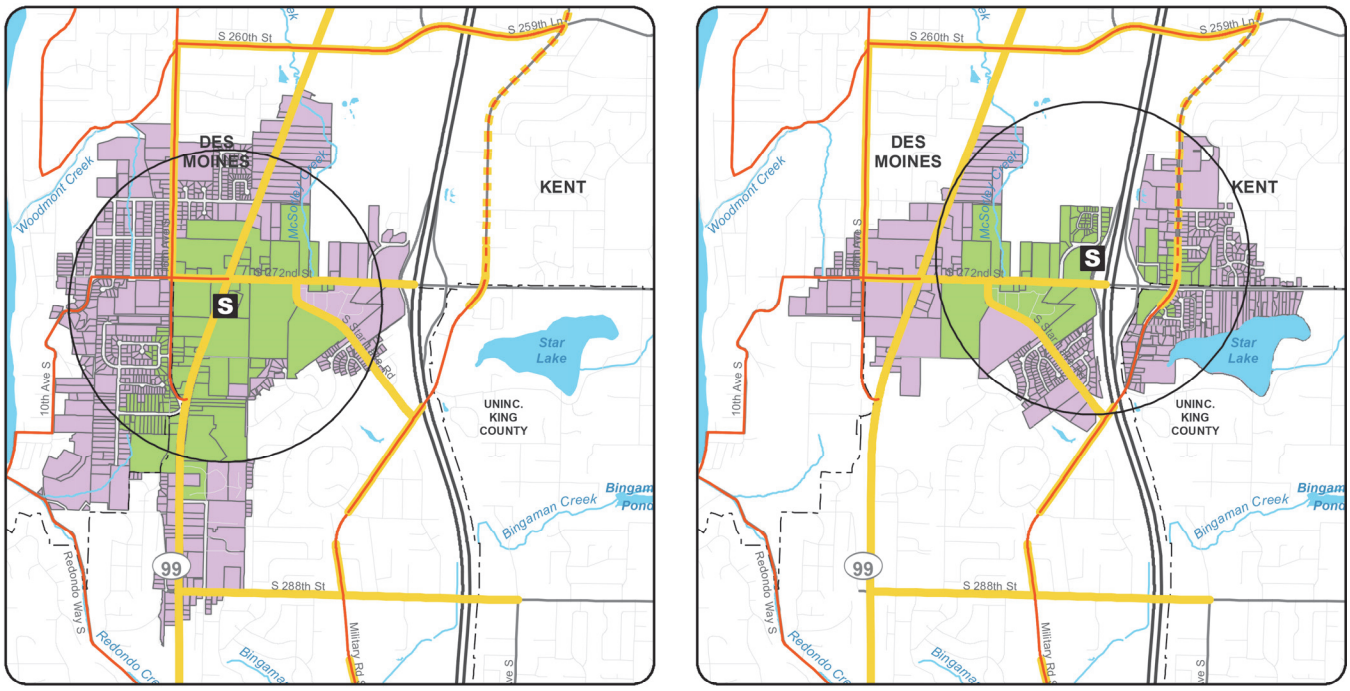



**EXHIBIT 3-15**
S 272nd Street Station Area Walkshed and Bikeshed

The pedestrian LOS would be between LOS A and LOS C, except for the south leg of the SR 99 and S 276th Street intersection, which would be at LOS D.

### 3.5.6.3 S 272nd Star Lake Station

The I-5 and SR 99 to I-5 alternatives would serve the S 272nd Star Lake Station area. The walk- and bikesheds for this station area are focused west of the station area because of limited walk and bicycle facilities south of S 272nd Street and the wetlands to the northwest of the station area. Exhibit 3-15 shows the walk and bikesheds for the S 272nd Star Lake Station area.

The pedestrian LOS would range between LOS A and LOS C at the S 272nd Street/26th Avenue S intersection under the No Build, I-5, and SR 99 to I-5 alternatives.

#### 3.5.6.4 Federal Way Transit Center Station

The majority of commercial development surrounding the existing Federal Way Transit Center station area is accessible by sidewalks, but the area lacks bicycle facilities. The location of the station area between SR 99 and I-5 generally limits the walk- and bikesheds between those two regional facilities. Exhibit 3-16 shows the walk- and bikesheds for the Federal Way Transit Center area.

With the Federal Way station locations north of S 320th Street, the pedestrian LOS would be the same as the No Build Alternative (LOS A to LOS C) for crosswalks at signalized intersections. At the S 320th Street Park-and-Ride Station, the pedestrian LOS score would change from LOS B to LOS C at the S 322nd Street/23rd Avenue S intersection.

#### 3.5.6.5 S 216th Station and S 260th Station Options

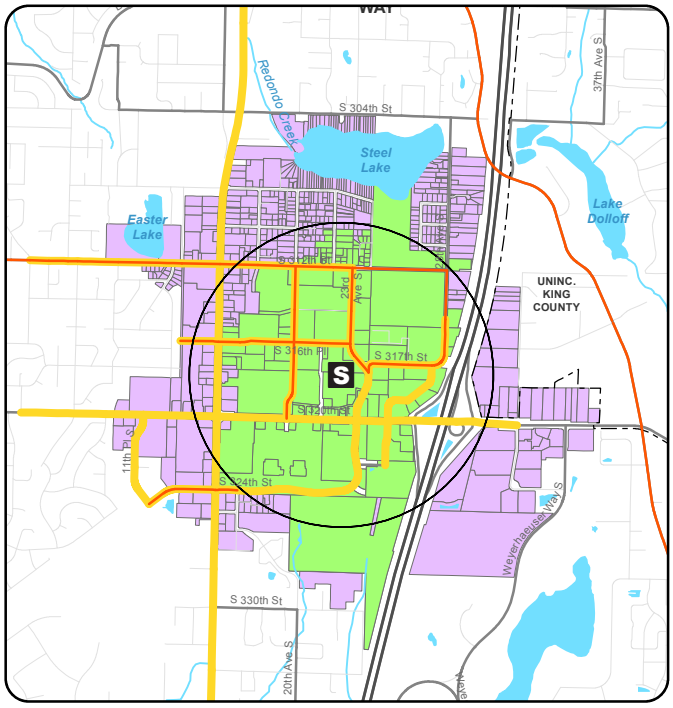
Potential additional stations at S 216th Street and S 260th Street (West or East options) would have connections to nonmotorized facilities that provide access in all directions. Exhibit 3-17 shows the walk- and bikesheds for these potential additional station areas.

The pedestrian LOS with these station options would be the same as with the No Build Alternative (LOS A to LOS C) for crosswalks at signalized intersections, except for the south leg of the S 216th Street/SR 99 intersection for the S 216th Street potential additional stations (West and East options), where the pedestrian LOS would be D.

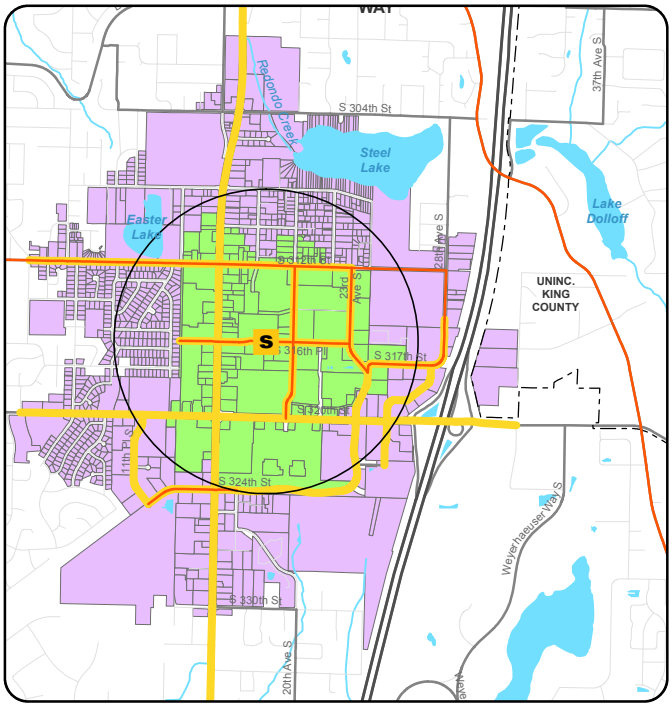
#### 3.5.6.6 Kent/Des Moines Interim Terminus Conditions

Nonmotorized facilities provided under the Kent/Des Moines interim terminus condition would be the same as with the full length build alternatives and station options.

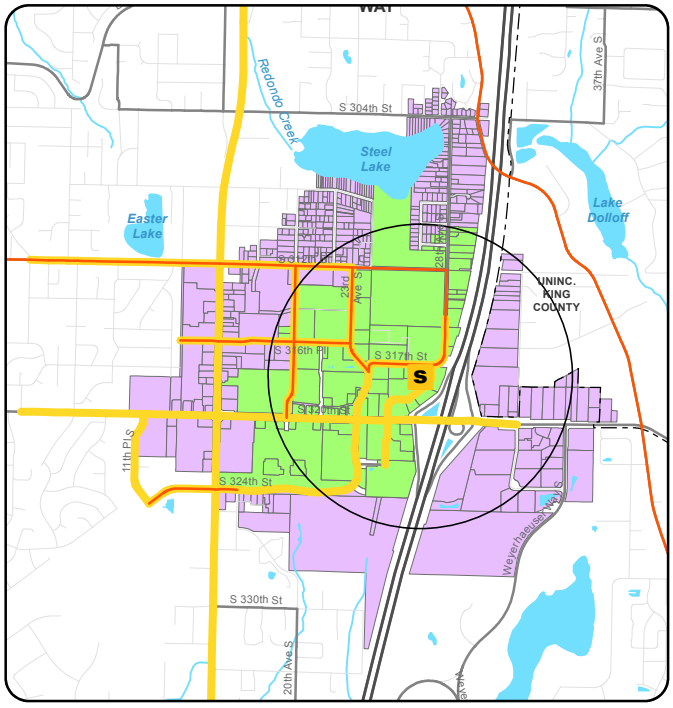
With the Kent/Des Moines station options located on the west side or median of SR 99, a pedestrian LOS of up to D would occur at the S 236th Lane/SR 99 intersection. This would be because of an increased number of pedestrian trips transferring between bus service and the park-and-ride across SR 99 compared with the full-length alternatives. The south crosswalk with the Kent/Des Moines SR 99 Median Station Option at the SR 99/S 236th Lane intersection would serve as the northern station entry. Providing a sidewalk and crosswalk with widths greater than typical standards would achieve an acceptable LOS at this location.



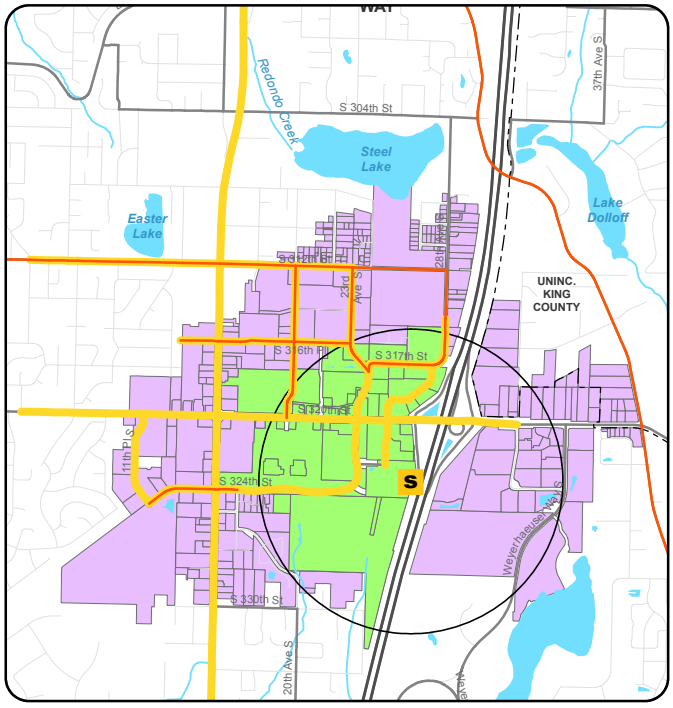

**Federal Way Transit Center Station**




**SR 99 Station Option**




**I-5 Station Option**




**S 320th Park-and-Ride Station Option**

## Legend

**Stations**

- S — Station for Alternatives
- S — Station for Options
- City Boundary
- Street
- Stream
- Water Body
- 1/2-Mile Walkshed Parcels
- 1-Mile Bikeshed Parcels
- 1/2-Mile Buffer

**Bike Facilities**

- Existing Bike Facilities
- Future Bike Facilities

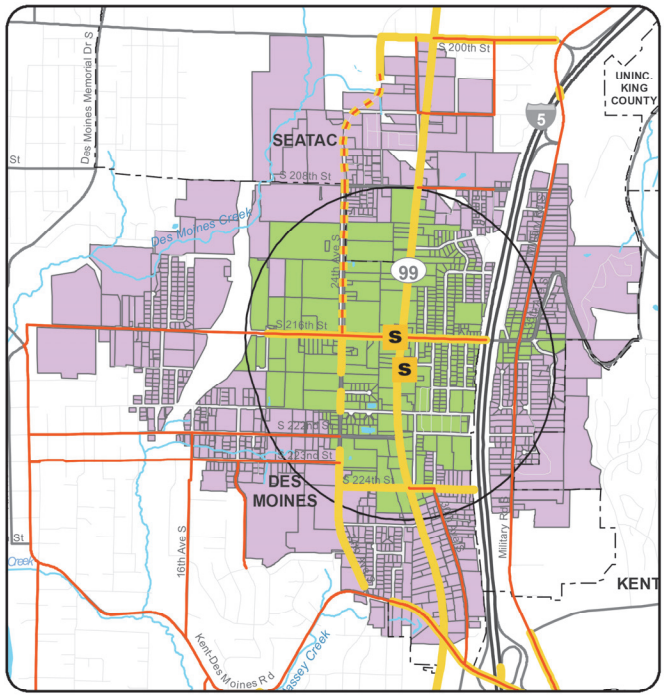
**Sidewalks**

- Existing Sidewalks
- Future Sidewalks

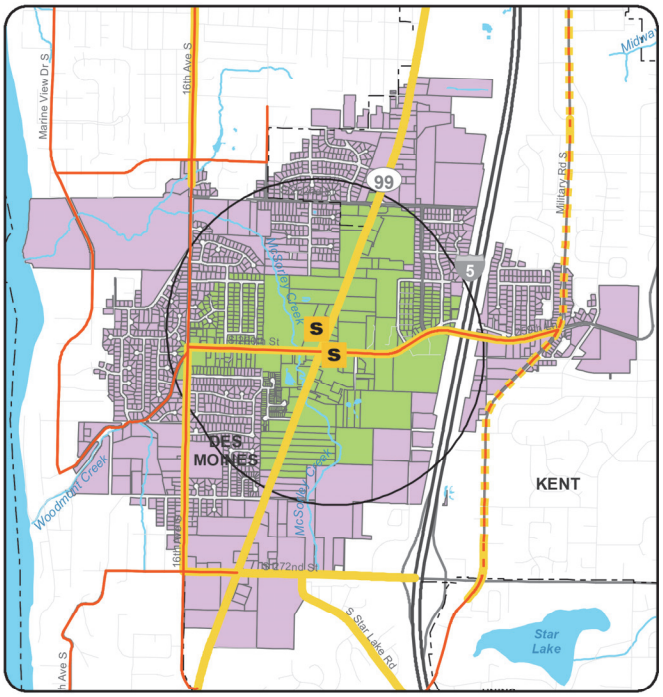
N

*Notes:*
*-Bike facility types include: lanes, routes, shared roadways, paths, and trails.*
*-Sheds were calculated based on roadway network and on-road distances.*

**EXHIBIT 3-16**
Federal Way Transit Center Station Area
Walksheds and Bikesheds
*Federal Way Link Extension*




**S 216th West & East Station Options**




**S 260th West & East Station Options**

**Legend**

**Stations**
- Station for Alternatives
- Station for Options
- City Boundary
- Street
- Stream
- Water Body
- 1/2-Mile Walkshed Parcels
- 1-Mile Bikeshed Parcels
- 1/2-Mile Buffer

**Bike Facilities**
- Existing Bike Facilities
- Future Bike Facilities

**Sidewalks**
- Existing Sidewalks
- Future Sidewalks

N

*Notes:*
*-Bike facility types include: lanes, routes, shared roadways, paths, and trails.*
*-Sheds were calculated based on roadway network and on-road distances.*

**EXHIBIT 3-17**
S 216th Street and S 260th Street Station Areas Walkshed and Bikeshed

### 3.5.6.7 S 272nd Street Interim Terminus Conditions

The nonmotorized facilities provided with the S 272nd Redondo and S 272nd Star Lake stations interim terminus conditions would be the same as with the full length build alternatives and station options.

Pedestrian LOS for signalized intersections around either the S 272nd Redondo or the S 272nd Star Lake stations in the interim terminus conditions would be same as the full length build alternatives. Even though the number of pedestrian trips at the station is expected to be higher under the interim terminus conditions, there is expected to be available pedestrian capacity adjacent to each station.

## 3.5.7 Freight Mobility and Access

Only minor changes to freight mobility and access are expected with the No Build Alternative beyond the increases in roadway congestion that could occur as expected future traffic volumes increase in the

study area. The 28th/24th Extension Project, planned for completion in 2017 in the cities of SeaTac and Des Moines, will provide an additional freight corridor in the study area.

With the build alternatives on either I-5 or SR 99, trucks would still be expected to use the currently designated freight facilities. The distribution of trucks on SR 99 and I-5 would be similar to existing conditions. As the build alternatives would be either grade-separated or travel in exclusive guideway outside the roadway travel lanes, freight mobility and access would be similar to automobile mobility and access. Isolated freight movements could experience a benefit with the FWLE locations through project improvements and/or mitigation (see Chapter 2, Alternatives Considered, and Section 3.7, Potential Mitigation Measures). Any modifications to the roadway system are not anticipated to affect truck circulation or change truck route designations on the regional and local street system. No at-grade crossings of freight rail tracks would occur with the FWLE.

## 3.6 Indirect Impacts

The FWLE project would result in reliable light rail service between Federal Way and a majority of the region's urban centers. Light rail service would help facilitate potential increases in residential and employment uses around the stations.

**Indirect Impacts**

Indirect effects are caused by an action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems (40 CFR § 1508.8).

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 (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 this document. The FWLE could also affect ridership on other transit routes in the corridor, particularly parallel transit service along SR 99. 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.

As discussed in Section 3.5.2.4, the land uses assumed in the ridership model included a substantial amount of growth in the study area, based on PSRC's 2013 Land Use Targets data. Light rail service could result in a higher concentration of residential and commercial land

uses, known as transit-oriented development (TOD) surrounding the stations. 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. These plans forecast a substantial amount of population and employment growth in and around the FWLE study area by the year 2035 (PSRC, 2014).

Because the Sound Transit and PSRC models already include the adopted land use changes, the overall FWLE ridership is not expected to substantially change as a result of concentrated development (TOD) 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. This could occur as a result of increased population and employment density within the walksheds and bikesheds for the stations. 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 ridership in the FWLE corridor.

## 3.7 Potential Mitigation Measures

No transportation impacts were identified for freight mobility and access; therefore, no mitigation would be needed for these elements. Potential impacts on I-5 ramp terminal intersections and safety are described in Sections 3.6.2 and 3.6.3.

**Mitigation Measures**

Actions, projects, or programs intended to reduce or avoid an expected adverse impact of a proposed project. The impact could affect transportation or a particular environmental resource, such as ecosystems. Mitigation can include:

- Avoiding impacts
- Minimizing impacts by limiting the degree or magnitude of an action
- Rectifying impacts by restoration, rehabilitation, or repair of the affected environment
- Reducing or eliminating impacts over time
- Compensating for the impact by replacing or providing substitute resources or environments to offset the loss

### 3.7.1 Transit Operations

Mitigation for transit services and operations are not expected. The FWLE would improve the regional transit system and provide Sound 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.

### 3.7.2 Arterial and Local Street Operations

Mitigation could be required at intersections where the intersection LOS would degrade to levels that do not meet the applicable agency LOS standards when compared to the No Build Alternative. Additionally, if an intersection is not expected to meet

agency LOS standards with the No Build Alternative, mitigation could be required if the FWLE further degrades the intersection performance. Potential mitigation measures at up to seven intersections are summarized in Table 3-17. The potential intersection modifications would improve delay and v/c ratios in the AM and PM peak hour to meet LOS standards, or attain the same or better vehicle delay and v/c ratios for intersections operating below LOS standards in the No Build Alternative.

TABLE 3-17
**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 and continue until transitioning into the I-5 northbound loop on-ramp. | Same as full length. | Same as full length. |
| I-5 Southbound Ramps/Kent-Des Moines Road | All alternatives and Kent/Des Moines station options | | Same as full length. | Same as full length. |
| SR 99/ S 240th Street | I-5 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. | Same as full length. |
| I-5 Northbound Ramps/S 272nd Street | All alternatives | Provide northbound left-turn pocket. | Same as full length. | Same as full length. |
| I-5 Northbound Ramps/ Kent-Des Moines Road | All alternatives (Kent/Des Moines Interim Condition only) | 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 | SR 99 Alternative and I-5 to SR 99 Alternative (S 272nd Interim Condition Only) | No mitigation required. | No mitigation required. | Provide an eastbound right turn pocket to I-5 southbound ramp. |
| SR 99/S 276th Street | SR 99 Alternative and I-5 to SR 99 Alternative (S 272nd Interim Condition Only) | No mitigation required. | No mitigation required. | Provide a northbound right-turn pocket from SR 99 to S 276th Street. |

Vehicle queue lengths are also expected to be similar or improved compared with the No Build Alternative at intersections with the proposed mitigation. Mitigation would not be required around the potential additional stations at S 216th Street and S 260th Street, or in the Federal Way Transit Center area.

As the project design advances, Sound Transit will continue to work with affected jurisdictions/agencies to evaluate potential mitigation strategies for safe, 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, based on the project's proportionate ratio of trips at the intersection or another equitable method.

### 3.7.3 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. As noted in Appendix G1, I-5 southbound mainline within the FWLE study area has about 11,500 feet of existing guardrail, walls, or barriers that would shield vehicles from FWLE light rail columns.

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

### 3.7.4 Parking

For acquired off-street parking resulting from partial property acquisitions, reduced business opportunities might occur. 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 for hide-and-ride parking exists at the potential additional station at S 216th Street (East option) 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 the local jurisdictions, Sound Transit would be responsible for the cost of installing the signage or other parking controls 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 lots 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 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 work with Highline College to develop on-campus pricing strategies that make on-campus parking more attractive.

### 3.7.5 Nonmotorized Facilities

The FWLE project would not result in any adverse impacts on existing nonmotorized facilities because all of the nonmotorized analysis indicates a 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 jurisdictions 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 or exceed local and federal design standards for pedestrian and bicycle facilities.

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