April 2015

Federal Way Link Extension

Draft Environmental Impact Statement

TRANSPORTATION TECHNICAL REPORT

Appendix G1

SOUNDTRANSIT
Central Puget Sound
Regional Transit Authority

U.S. Department of Transportation
Federal Transit Administration

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SOUNDTRANSIT

Federal Way Link Extension

Transportation Technical Report

Prepared for:
Sound Transit

Prepared by:
CH2M HILL

April 2015

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Acronyms and Abbreviations

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

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

1.0 Introduction

1.1 Project Background

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

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

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

1.2 Transportation Elements and Study Area

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

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

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

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

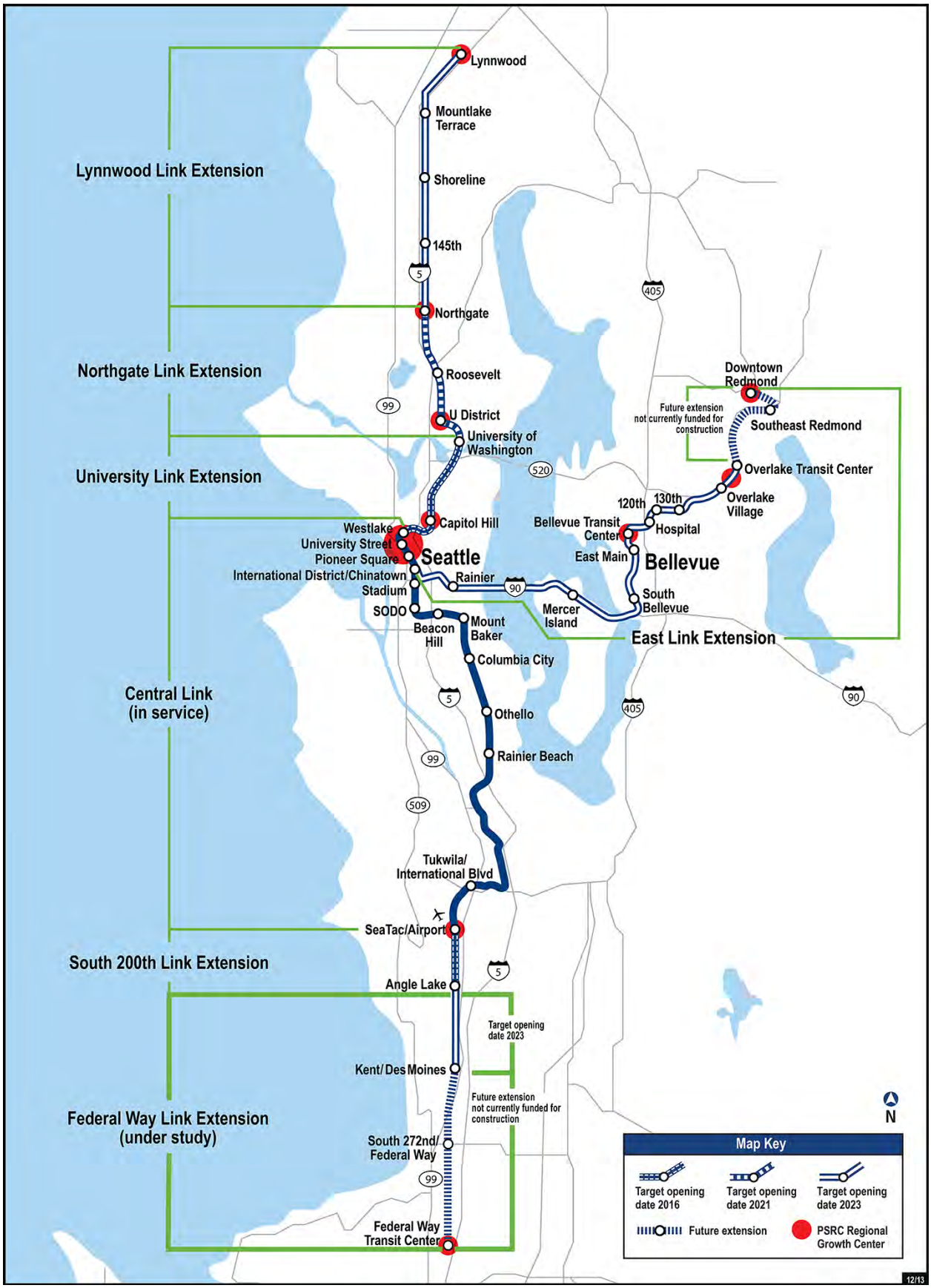


EXHIBIT 1-1
Sound Transit Link Light Rail System and FWLE Location

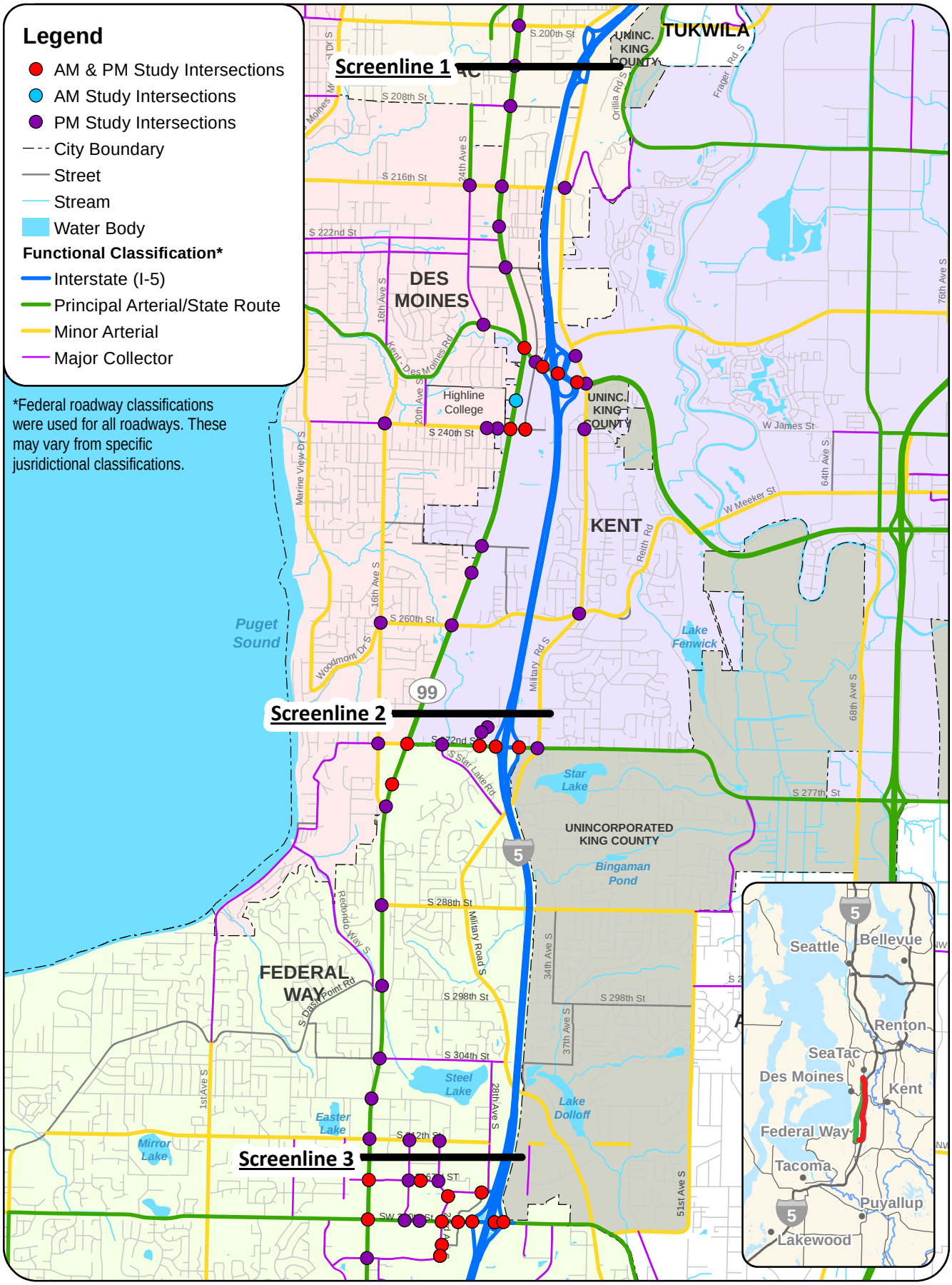
- Chapter 4, Environmental Impacts, describes anticipated impacts in terms of the following:
  - Regional facilities and travel
  - Transit operations
  - Arterial and local street operations
  - Safety
  - Parking
  - Nonmotorized facilities
  - Freight mobility and access
- Chapter 5, Construction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

The following appendices support information presented in this report:

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

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

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



Data Sources: King County (2013)

N

0 0.5 1 2 Miles

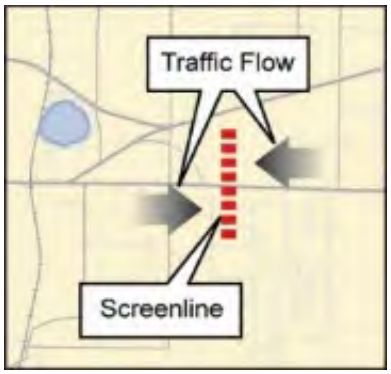
EXHIBIT 1-2
FWLE Transportation Study Area

Federal Way Link Extension

2.0 Methodology and Assumptions

The methodology and assumptions used to analyze the transportation impacts of the Federal Way Link Extension (FWLE) have been compiled in the *Federal Way Link Extension Transportation Technical Analysis Methodologies* (Sound Transit, 2014), which is provided in Appendix A of this technical report. That report presents the following information:

- Agency guidelines and regulations regarding the transportation analysis
- Data collected and sources, such as traffic volumes, parking supply and utilization, pedestrian and bicycle facilities, crash data, and transit service characteristics
- Transportation analysis methodology, including relevant definitions, and procedures for regional traffic analysis, transit operations, local and arterial traffic analysis, intersection operational analysis, and safety assessments
- Methods for traffic forecasting and transit ridership estimates
- Methods for assessing impacts related to light rail station and park-and-ride areas, parking, nonmotorized facilities and modes, property access and circulation, freight, transit, and construction



*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.*

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. The following types of information were developed and evaluated:

- Regional analysis, such as projectwide ridership, daily vehicle miles traveled (VMT), and vehicle hours traveled (VHT)
- Screenline analysis of transit service and ridership, roadway volumes, volume to capacity (v/c) ratio, and mode share
- Operational analysis, which includes an analysis of the level of service (LOS) and safety of arterial and local streets, and information about the multimodal connections (station areas) in the light rail network; arterial and local street analysis, which focused on intersection operations and safety analysis
- Impacts on parking in terms of any removal, replacement, or addition
- Impacts on nonmotorized facilities, which includes pedestrian and bicycle access to the study intersections and potential station locations
- Transit operations, which includes service coverage and circulation, LOS for service frequency, hours of service, passenger load, and on-time reliability

- Impacts on freight movement
- Any indirect impacts on transportation system caused by changes in travel patterns with the project; any potential mitigation measures required to meet jurisdictional standards
- Any cumulative impacts on the transportation system and impacts during construction period

3.0 Affected Environment

The affected environment for transportation, described in the following sections, includes existing conditions for all the transportation system components in the study area. This chapter describes the traffic-related operations and performance on all roadway facilities, transit (road-based and rail), parking, bicycles and pedestrians, and freight. This chapter also describes the safety conditions on the roadways in the study area.

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, or transit).

3.1 Regional Facilities and Travel

This section describes the regional travel conditions in the study area, which is served by two north-south highway facilities, State Route (SR) 99 and Interstate 5 (I-5). East-west connections are mainly major arterial roadways such as Kent-Des Moines Road, S 272nd Street, and S 320th Street. These arterials provide connections within the study area and to/from the highways and areas to the west and east.

Travel times in the Federal Way Link Extension (FWLE) corridor are unreliable for many hours of the day because congestion that occurs in the AM and PM peak periods (6:30 a.m. to 9:30 a.m. and 3:30 p.m. to 6:30 p.m., respectively) is extending the congestion period outside of these typical commuting hours. To travel between Federal Way and Downtown Seattle (approximately 22 miles) during morning and afternoon peak periods, when congestion is high and delays are unpredictable, a commuter must allow 56 minutes in the AM peak period and 46 minutes in the PM peak period to ensure arriving on time 95 percent of the time. These peak period travel times are expected to increase by nearly 20 percent over the next 20 years with the projected population and employment growth in the region, thus resulting in a travel time of over an hour to ensure arriving on time 95 percent of the time, for the trips between Federal Way and Downtown Seattle during peak periods. Projected growth will continue to worsen traffic congestion on both I-5 and SR 99 and other key arterials in the study area and will affect bus service.

Different transit agencies provide transit services in the Puget Sound Region, including Sound Transit, King County Metro Transit (Metro), and Pierce Transit within the FWLE corridor. These agencies offer long-distance services between the major urban centers in the region and also serve several transit centers, park-and-ride facilities, neighborhoods, and activity centers.

For I-5 ramp terminal operations, refer to Section 3.3.2, Intersection Operations and Level of Service. Existing I-5 mainline and ramp safety is documented in Section 3.4, Safety.

3.1.1 Vehicle Miles Traveled and Vehicle Hours Traveled

VMT and VHT are systemwide measures that are useful primarily for comparison purposes. In this report they are used to compare to future conditions with and without the FWLE to indicate travel growth in the region and the effect of the project on that growth. Today, over 85 million VMT occur daily within the central Puget Sound Region (which includes King, Kitsap, Pierce, and Snohomish counties). This results in over 2.5 million VHT and approximately 300,000 VHD for all users of the transportation system. Table 3-1 shows the daily VMT and VHT for the Puget Sound Region for the existing year by mode.

TABLE 3-1
Existing Regional Travel – Daily VMT and VHT by Mode

Mode	Vehicle Mode Split %	VMT	VHT
Passenger Vehicles (including high-occupancy vehicles [HOV])	96.4%	83,767,000	2,553,000
Heavy Vehicles	3.5%	3,759,000	91,000
Vanpools	< 0.1%	82,000	2,400
Transit Buses	< 0.1%	260,000	18,000
Light Rail Vehicles	< 0.1%	10,000	<1,000
Commuter Rail Vehicles	< 0.1%	5,000	<500
Total	**-**	**87,883,000**	**2,665,000**

Source: PSRC, 2012b; NTD, 2012.

3.1.2 Regional Roadways

There are few regional highways that directly connect the study area to the region's major population and employment areas, and travel is constrained during the peak periods. Exhibit 3-1 shows the existing conditions on

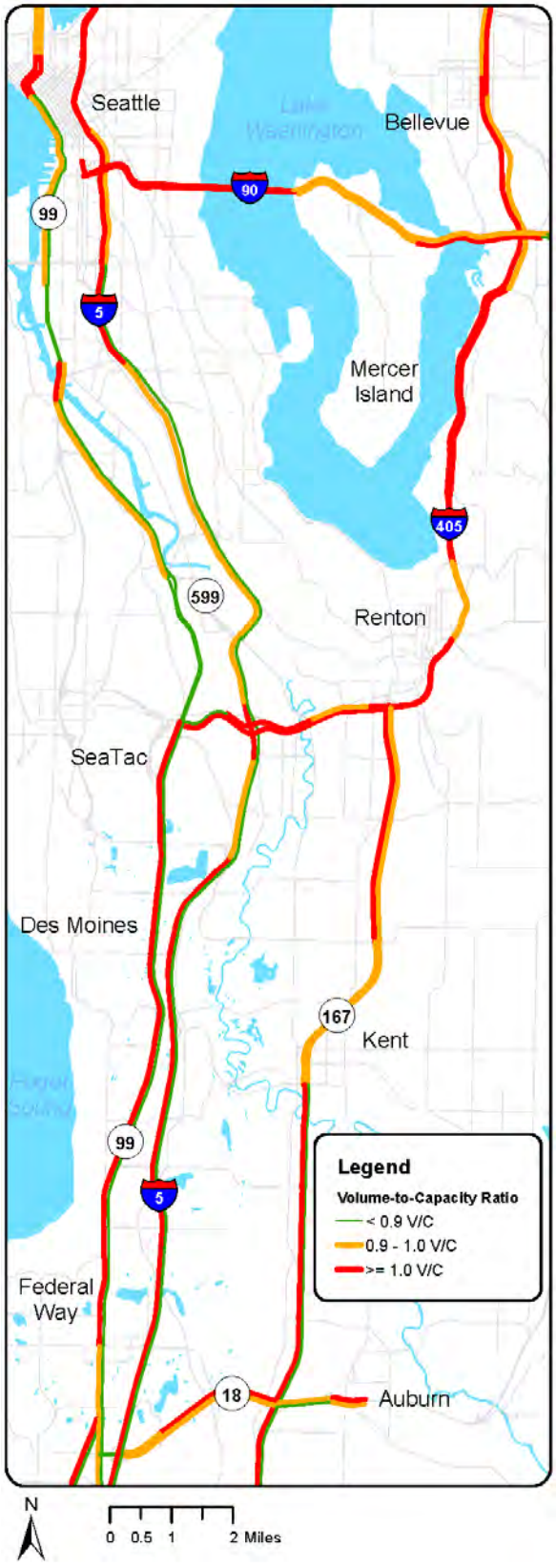


EXHIBIT 3-1
Existing PM Highway Volume-to-Capacity Ratios

regional highways in the Puget Sound Region based on the v/c ratio. Vehicle v/c is a ratio of the vehicle demand compared to the roadway capacity and is used as the performance measure to assess travel conditions on the regional facilities in the study area. Capacity deficiencies might exist when a v/c ratio exceeds 0.9. A v/c ratio over 1.0 suggests that demand exceeds capacity and congestion could be prohibiting efficient movement of people and goods.

Currently, the traffic demand on SR 99 and I-5 is at or over capacity during the PM peak period. In the future, congestion would continue to worsen as v/c ratios approach 1.0 on other congested roads. Without a more reliable transportation alternative, all modes will be affected, including high-occupancy vehicles (HOV) and transit (both bus and rail).

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 inventoried and discussed in Section 3.3.

TABLE 3-2
Existing Major 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	No	Yes
I-5	Freeway	8–10	60	176,000–206,000[b]	No	No
Kent-Des Moines Road (SR 516)	Principal Arterial	4	45	30,000–35,000	No	Partial

[a] ADT is based on 2013 traffic count information where available, otherwise 2012 counts with one year growth were used.
[b] Value based on Washington State Department of Transportation *Ramp and Roadway 2012* (WSDOT, 2012).
mph = miles per hour

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 Statewide 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.

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 an HSS and is part of the NHS. This road is the 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 is called 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 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 non-HSS and is part of the NHS. The road provides connections to Downtown Kent, the Kent Manufacturing/Industrial Center, and Downtown Des Moines. The road is classified as a principal arterial serving 30,000 ADT. There are two general-purpose lanes in each direction.

3.1.3 Screenline Performance for All Modes

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. Mode share information provided from the Puget Sound Regional Council (PSRC) and Sound Transit travel demand models allocates the vehicle demand on a roadway by vehicle type, which includes single-occupancy vehicles (SOVs), HOVs, and transit. Exhibit 1-2 shows the project's three screenline locations:

1. South of S 200th Street
2. North of S 272nd Street
3. South of S 312th Street

Table 3-3 shows the performance at screenlines for the existing PM peak-hour conditions. The three screenlines cross areas with volumes close to capacity, which indicates substantial congestion in the southbound direction (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 congestion and has volume to capacity ratios between 0.45 and 0.58. This indicates on aggregate these roads (SR 99, I-5, and Military Road) have available capacity in the northbound direction of travel. A substantial portion of the existing northbound traffic is from south corridor employment centers, such as Tacoma, Federal Way, and Kent. Transit mode share at the three screenlines in the northbound direction is only 2 to 3 percent, but is as high as 8 percent in the southbound direction. Overall, the SOV mode is the dominant mode choice, with more than 70 percent in the northbound direction and about 55 percent in the southbound direction. The HOV share is about 20 to 25 percent in northbound direction and about 40 percent in southbound direction. The remaining mode share is transit representing up to 3 percent of person travel in the northbound direction and up to 8 percent of person travel in the southbound direction.

TABLE 3-3
Existing PM Peak-Hour Screenline Performance (4:30 p.m. to 5:30 p.m.)

Screenline Location	v/c Ratio		Vehicle Volume		Persons		Travel Mode Share Percent					
							SOV		HOV		Transit	
	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB
South of S 200th Street	0.58	0.9	7,800	12,900	9,200	18,300	76	55	21	37	3	8
North of S 272th Street	0.52	0.91	7,900	13,900	9,400	19,500	74	56	23	37	2	7
South of S 312th Street	0.45	0.74	7,200	12,000	8,700	16,700	72	56	26	37	2	7

Source: PSRC, 2012b.
NB = northbound; SB = southbound

3.2 Transit Operations

This section describes existing conditions of regional and local transit facilities, operations, and services within the study area.

3.2.1 Regional Transit Performance

Transit services within the study area are provided by Sound Transit, Metro, and Pierce Transit, with connections to the regional urban centers. Table 3-4 shows the existing daily boardings and transit trips served by regional transit. The regional transit system serves riders with over 0.5 million daily boardings.

TABLE 3-4
Existing Weekday Transit Ridership

Measure of Effectiveness	Existing
Total Regional Systemwide Daily Boardings	516,000
Total Daily Transit Trips	384,000

Source: Sound Transit, 2012.

3.2.2 Transit Service and Facilities

Transit centers and park-and-ride facilities are the major transit facilities within the study area. 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 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. Table 3-5 lists the existing transit facilities in the study area. Approximately 3,700 park-and-ride spaces are provided at these transit facilities in the study area.

TABLE 3-5
Existing Transit Facilities in FWLE Transportation Study Area

Transit Facility	Facility Type	Served by Routes	Park-and-Ride Spaces
Kent-Des Moines Park-and-Ride and Freeway Station	Park-and-ride, freeway station	Metro 158, 159, 166, 173, 192, 193, 197 ST 574	370
Star Lake Park-and-Ride and Freeway Station	Park-and-ride	Metro 152, 173, 183, 190, 192, 193, 197 ST 574	540
Redondo Heights Park-and-Ride	Park-and-ride	Metro 173, 190; RapidRide A Line	697
Federal Way Transit Center	Transit center, park-and-ride	Metro 173, 179, 181, 182, 183, 187, 193, 197, 901, 903; Metro RapidRide A Line PT 402, 500, 501 ST 574, 577, 578	1,190
Federal Way/S 320th Street Park-and-Ride	Park-and-ride	Metro 177, 178, 193 PT 402, 500, 501	877

Source: Metro, 2012a.
PT = Pierce Transit; ST = Sound Transit

As of spring 2012, 33 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 local feeder service from surrounding communities. Bus frequency and hours of service are discussed below in Section 3.2.4, Transit Level of Service.

Within the study area, Sound Transit's Regional Express buses have an approximate average headway (how often a vehicle passes by a particular point along the route) of 30 minutes in the peak periods. Sound Transit (ST) route 577 between Federal Way to Seattle offers more frequent service, with headways of 15 minutes, but this is a peak-only route. In general, during the peak periods, the number of buses and routes in the peak direction are greater than the number of buses running in the opposite "reverse-peak" direction. The RapidRide A Line operates along SR 99 frequently all day for both weekdays and weekends, but most other Metro routes in the study area offer limited to no existing transit service during off-peak periods and on weekends. Routes that do operate during these times operate with less frequent service, generally about one bus per hour. Existing bus routes within the study area are listed in Table 3-6.

TABLE 3-6
Existing Transit Services in FWLE Transportation Study Area

Route	Service Period	Peak Headway	Off-Peak Headway	Service Area
Metro 121	Peak	60 minutes	-	Downtown Seattle, Burien Transit Center, Normandy Park, Highline College
Metro 122	Peak	45 minutes	-	Downtown Seattle, Burien Transit Center, Des Moines Memorial Drive, Highline College
Metro 131	Daily	60 minutes	60 minutes	Downtown Seattle, Georgetown, Olson/Myers Park-and-Ride, Burien Transit Center, Normandy Park, Highline College
Metro 132	Daily	30 minutes	60 minutes	Downtown Seattle, South Park, Des Moines Memorial Drive, Normandy Park, Burien Transit Center, Highline College
Metro 134	Peak	60 minutes	-	Downtown Seattle, Georgetown, Olson/Myers Park-and-Ride, Burien Transit Center, Normandy Park, Highline College
Metro 152	Peak	30 minutes	-	Downtown Seattle, Star Lake Freeway Station, Auburn Park-and-Ride, Auburn Commuter Rail Station
Metro 156	Daily	30 minutes	30 minutes	SeaTac Airport, Southcenter
Metro 158	Peak	30 minutes	-	Downtown Seattle, Kent-Des Moines Park-and-Ride and Freeway Station, Kent/James Street Park-and-Ride, Kent Station Transit Center and Park-and-Ride, Lake Meridian, Timberlane
Metro 159	Peak	30 minutes	-	Downtown Seattle, Kent-Des Moines Park-and-Ride and Freeway Station, Kent/James Street Park-and-Ride, Kent Station Transit Center and Park-and-Ride, Lake Meridian, Timberlane
Metro 162	Peak	105 minutes	-	Downtown Seattle, Kent-Des Moines Park-and-Ride and Freeway Station, Kent/James Street Park-and-Ride, Kent Station Transit Center and Park-and-Ride, Lake Meridian, Timberlane
Metro 166	Daily	30 minutes	30 minutes	Kent Station, Kent-Des Moines Park-and-Ride, Highline College
Metro 173	Peak	105 minutes	-	Federal Way Center South, Boeing Industrial, Kent-Des Moines Freeway Station, Star Lake Freeway Station, Redondo Heights Park-and-Ride, Federal Way Transit Center
Metro 175	Peak	60 minutes	-	Downtown Seattle, Kent-Des Moines Park-and-Ride, Midway, Redondo Park-and-Ride, West Federal Way

TABLE 3-6
Existing Transit Services in FWLE Transportation Study Area

Route	Service Period	Peak Headway	Off-Peak Headway	Service Area
Metro 177	Peak	15 minutes	-	Downtown Seattle, Kent-Des Moines Park-and-Ride, Federal Way Transit Center, Federal Way/S 320th Street Park-and-Ride
Metro 178	Peak	30 minutes	-	Downtown Seattle, Kent-Des Moines Park-and-Ride, Federal Way Transit Center, Federal Way/S 320th Street Park-and-Ride, S Federal Way Park-and-Ride
Metro 179	Peak	30 minutes	-	Downtown Seattle, Kent-Des Moines Park-and-Ride, Federal Way Transit Center, Federal Way/S 320th Street Park-and-Ride, Twin Lakes Park-and-Ride
Metro 181	Daily	30 minutes	30 minutes	Twin Lakes Park-and-Ride, Federal Way Transit Center, Auburn Station, Green River Community College
Metro 182	Daily	30 minutes	60 minutes	Federal Way Transit Center, South Federal Way, Tacoma
Metro 183	Daily	30 minutes	60 minutes	Kent Station, Star Lake Park-and-Ride, Federal Way Transit Center
Metro 187	Daily	30 minutes	60 minutes	Federal Way Transit Center, Twin Lakes
Metro 190	Peak	30 minutes	-	Downtown Seattle, Star Lake Freeway Station, Redondo Heights Park-and-Ride
Metro 192	Peak	30 minutes	-	Downtown Seattle, Kent-Des Moines Freeway Station, Star Lake Park-and-Ride
Metro 193	Peak	30 minutes	-	First Hill, Tukwila Park-and-Ride, Kent-Des Moines Park-and-Ride, Star Lake Park-and-Ride, Federal Way Transit Center, Federal Way Park-and-Ride
Metro 197	Peak	30 minutes	-	University District, Kent-Des Moines Freeway Station, Star Lake Freeway Station, Federal Way Transit Center, Twin Lakes Park-and-Ride
Metro 901	Daily	30 minutes	30 minutes	Federal Way Transit Center, Mirror Lake
Metro 903	Daily	30 minutes	30 minutes	Federal Way Transit Center, Twin lakes
PT 402	Daily	60 minutes	60 minutes	Federal Way Transit Center, Puyallup Sounder Station, South Hill Mall Transit Center, Graham, Spanaway, Mountain Highway
PT 500	Daily	60 minutes	60 minutes	Federal Way Transit Center, Fife Business Park, Tacoma Dome Station, Downtown Tacoma
PT 501	Daily	60 minutes	60 minutes	Federal Way Transit Center, Weyerhaeuser Way, Milton, Fife Business Park, Tacoma Dome Station, Downtown Tacoma
ST 574	Daily	30 minutes	30 minutes	Lakewood Park-and-Ride, Star Lake Park-and-Ride, Kent-Des Moines Freeway Station, SR 512 Park-and-Ride, Federal Way Transit Center, Tacoma Dome Station, SeaTac Station, SeaTac Airport
ST 577	Peak	15 minutes	-	Downtown Seattle, Federal Way Transit Center
ST 578	Daily	30 minutes	30 minutes	Downtown Seattle, Auburn Sounder Station, Federal Way Transit Center, Sumner Station, Puyallup Sounder Station
Metro RapidRide A Line	Daily	10 minutes	10 minutes	Tukwila International Boulevard Link Light Rail Station, S 176th Street Sea-Tac Airport Link Light Rail Station, Angle Lake, Highline College, Des Moines, Redondo Heights Park-and-Ride, Federal Way Transit Center

3.2.3 Screenline Performance

The existing PM peak period transit ridership at the three study area screenlines is presented in Table 3-7. This shows the high demand on transit for the southbound commute during the PM peak hour.

TABLE 3-7
Existing PM Peak Period Ridership by Screenline Location (4:30 p.m. to 5:30 p.m.)

Screenline Location	Direction	Existing
South of S 200th Street	Northbound	1,000
	Southbound	5,000
North of S 272th Street	Northbound	500
	Southbound	4,000
South of S 312th Street	Northbound	500
	Southbound	3,500

Source: Sound Transit, 2012.

3.2.4 Transit Levels of Service

Transit LOS performance measures were analyzed for the PM peak period (3:00 p.m. to 7:00 p.m.), unless otherwise noted. Transit LOS is assessed with four performance measures: service frequency, hours of service, passenger load, and reliability. For transit LOS performance, 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.

3.2.4.1 Service Frequency

Service frequency LOS is the number of times within the PM peak hour that a bus or light rail train stops at a specific location. Generally, the shorter the transit headway, the less time a rider has to wait between transit arrivals; hence, the better the service frequency LOS. Transit routes that have headways of less than 10 minutes are considered LOS A, whereas headways longer than 60 minutes reflect LOS F. (Table B-1 in Appendix B, Level of Service Definitions used for Federal Way Link Extension Analysis, shows the thresholds for each LOS level).

Overall, the majority of the transit routes operate with a peak period service frequency that indicates LOS E or worse, meaning average headways (how often transit will pass by a particular point along the route) are 30 minutes or longer. The transit routes between the key origin and destination pairs as a system shows better LOS. Exhibit 3-2 provides a summary of the PM peak period transit frequencies by LOS. 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, provides 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.

3.2.4.2 Hours of Service

Hours of service LOS is the total transit operating hours provided within a 24-hour (daily) period. Hours of service LOS is intended to measure the availability of transit service to riders and potential users. The longer that transit service is provided throughout the day, the better the LOS. (Table B-2 in Appendix B shows the thresholds for each LOS level).

The LOS for hours of service between areas connected by transit is shown in Exhibit 3-3. Other than Downtown Seattle, little to no direct transit service is provided between the study area and key Puget Sound regional employment centers 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 the Federal Way Transit Center and Tukwila, operating at LOS A.

3.2.4.3 Passenger Load

Passenger load LOS is intended to measure passenger comfort and the ability of a rider to find a seat on the bus or train during the PM peak hour. Passenger load LOS also measures crowding in the transit vehicle. On buses, passenger load LOS is defined by the number of passengers per seat (load factor). For light rail, passenger load LOS is a measure of square footage available (standing room) for each standing passenger. Passenger load LOS A indicates that riders are able to spread out on the vehicle along with the potential to use empty seats for carry-on items instead of using their laps or the floor. A passenger load LOS at or worse than LOS D might reflect overcrowding, and the transit service provider might need to increase service frequency to improve LOS. In addition, a large number of passengers can cause the bus to dwell longer at stops as a result of crowded passenger boarding and alighting. The longer dwell time can negatively affect travel time and service reliability. (Tables B-3 and B-4 in Appendix B show the thresholds for each LOS level for bus and light rail, respectively.)

The average weekday PM peak-hour passenger load LOS was calculated for two of the three study area screenlines (south of S 200th Street and south of S 312th Street). At these screenlines, some of the transit routes are crowded, while others have seats available. Table 3-8 shows that at each screenline the average passenger load was LOS B or better, meaning many seats were unoccupied on these routes, thereby allowing passengers the ability to choose where they sit and have some seats available to store carry-on items.

TABLE 3-8
Existing Average Weekday PM Peak-Hour Route Passenger Load (4:30 p.m. to 5:30 p.m.)

	Direction	Average Load	Average Capacity	Load Factor (passengers/seat)	LOS
South of S 200th Street	Northbound	21.4	49.6	0.43	A
	Southbound	29.7	47.7	0.62	B
South of S 312th Street	Northbound	20.4	50.0	0.41	A
	Southbound	28.8	48.8	0.59	B

Source: Metro, 2012b; Sound Transit, 2012.
Note: Screenline average load and average capacity are weighted based on the total number of peak hour vehicles per route.

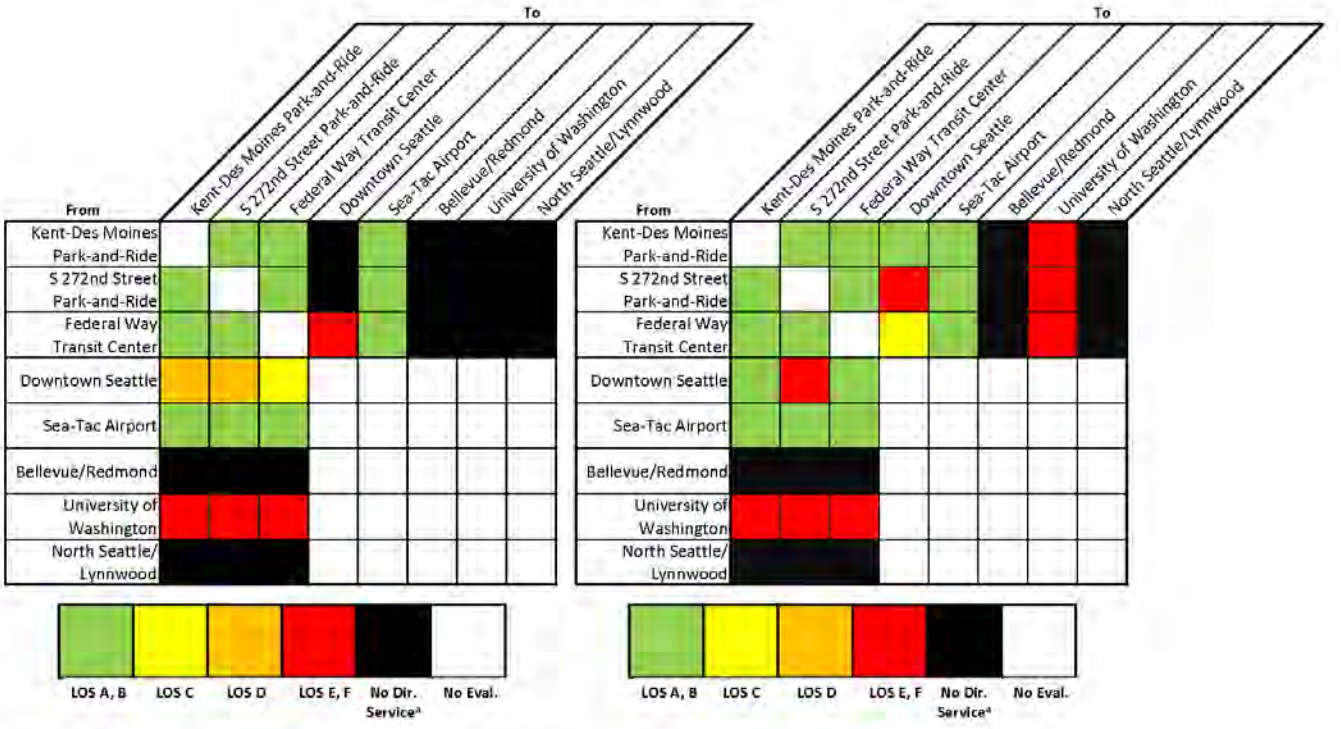


EXHIBIT 3-2
Existing PM Peak-Period Service Frequency Level of Service

EXHIBIT 3-3
Existing Transit Levels of Service for Hours of Service

Metro route 179 that runs southbound during the PM peak has a passenger load factor of 1.02 with LOS D, which reflects overcrowding. A few routes in the southbound direction are running at LOS C during the PM peak period, with passenger load factor close to 1.0. Any increase in ridership on these routes would affect the passenger comfort and worsen to LOS D.

3.2.4.4 On-time Reliability

Reliability of service LOS was analyzed at major transit hubs within the FWLE corridor. The reliability LOS measures the degree to which a transit vehicle meets or misses the scheduled headway at its arrival station. This includes both a transit vehicle arriving late as well as a transit vehicle leaving early from a stop. A bus leaving early would mean that some transit riders would miss their bus.

Two methods were used to determine transit reliability. For transit routes with scheduled headways greater than 10 minutes, on-time reliability was evaluated in terms of on-time performance, defined as being on-time to up to 5 minutes late. For transit routes operating at scheduled headways of 10 minutes or less, headway adherence was used to determine reliability. Reliability was calculated using the *Transit Capacity and Quality of Service Manual* (TCQSM) methodology (TRB, 2013), which compares the standard deviation of actual headways to scheduled headways of transit routes at major transit centers and park-and-ride lots within the study area. (Table B-5 and Table B-6 in Appendix B show the thresholds for each LOS level).

Service reliability at regional transit facilities, including on-time performance and LOS results for the existing PM peak-hour, is shown in Table 3-9. The detailed performance analysis by each route is shown in Table C-2 in Appendix C, Existing and Future Transit Routes and Level of Service. The International District/Chinatown Station was chosen for this analysis because transit service that occurs between the study area and the Downtown Seattle travels through this station. The other four transit hubs selected are key transit destinations within the study area.

Most buses operate with poor on-time performance due to congestion and wide variations in roadway travel times. In general, as buses travel along their route, the on-time percentage decreases. For example, Metro Route 177 in the southbound direction 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.

TABLE 3-9
Existing PM Peak-Hour Transit On-Time Performance and Reliability at Transit Hubs

Transit Hub	On-Time Performance Percentage[a]	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 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.

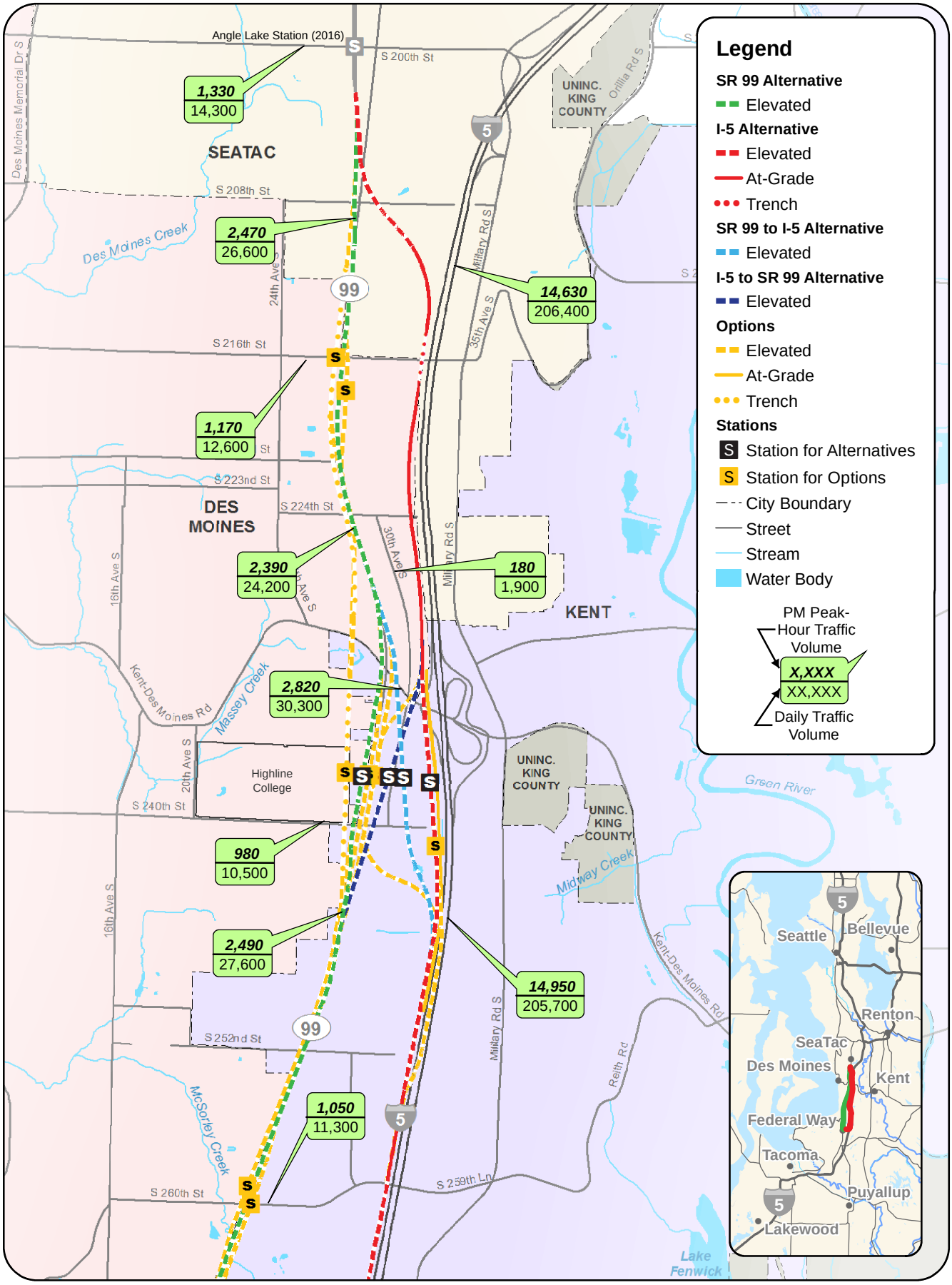
The on-time performance for the transit routes serving the FWLE station areas on average is poor (LOS F), except at Highline College. At this hub, the average is LOS D, with an 82 percent on-time performance.

3.3 Arterial and Local Street Operations

This section describes existing conditions for arterials and local roadway facilities, intersection operations, and traffic safety within the study area.

3.3.1 Arterial and Local Roadways

Exhibits 3-4 and 3-5 show the roadways and volumes in the northern and southern study area, respectively, including the PM peak hour and daily volumes. Local and arterial north-south roads, including Military Road, generally have two travel lanes and speeds between 25 to 40 miles per hour (mph), while east-west roadways have between two and six lanes and speeds under 40 mph.

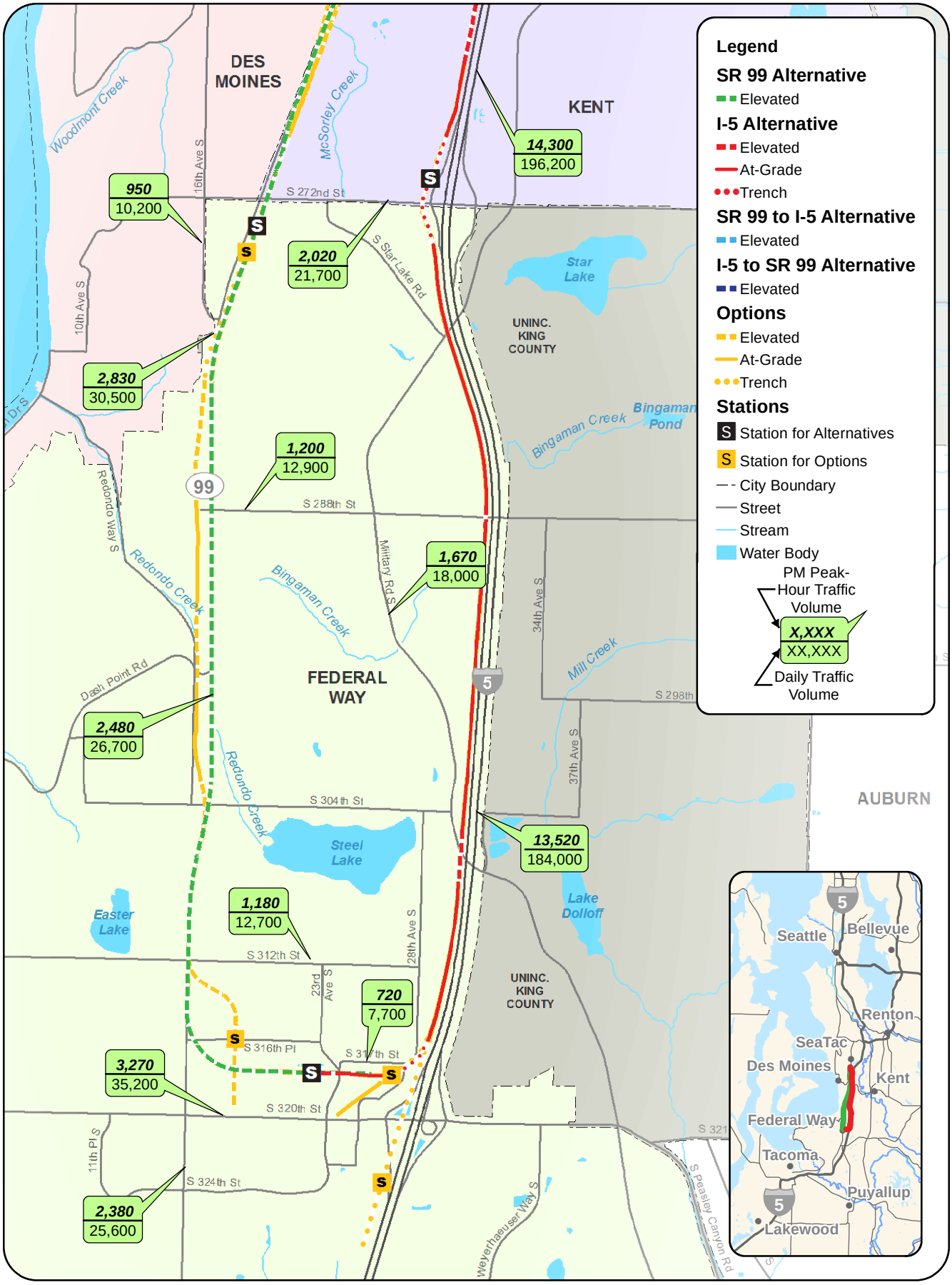


Data Sources: WSDOT (2012a), King County (2013)

N

0 0.25 0.5 1 Miles

EXHIBIT 3-4
Existing PM Peak-Hour and Daily Volumes
Northern Extent
Federal Way Link Extension



Data Sources: WSDOT (2012a), King County (2013)

N

0 0.25 0.5 1 Miles

EXHIBIT 3-5
Existing PM Peak-Hour and Daily Volumes
Southern Extent
Federal Way Link Extension

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 for major roadways in the FWLE corridor are shown in Table 3-10.

TABLE 3-10
Existing Local Roadway Facilities

Roadway	Arterial Classification	Number of Lanes	Speed Limit (mph)	ADT[a]	Bike Lanes	Sidewalk
East-West Roadways						
S 200th Street	Principal arterial	4	35	14,300	N	Y
S 208th Street	Collector arterial	2	25	3,000	N	N
S 216th Street	Minor arterial	2-3	35	12,600	Partial	Partial
S 240th Street	Minor arterial	2	35	10,500	N	Partial
S 260th Street	Minor arterial	2-3	35	11,300	Partial	Y
S 272nd Street	Principal arterial	4	35	21,700	N	Y
S Star Lake Road	Principal collector	2	35	6,000	N	Partial
S 288th Street	Minor arterial	4	35	12,900	N	Y
Dash Point Road	Principal arterial	2	40	16,000	N	Partial
S 312th Street	Minor arterial	4	35	9,000–13,000	N	Partial
S 320th Street	Principal arterial	6	35	27,000–43,000	N	Y
S 324th Street	Minor arterial	3	30	11,000	Partial	Y
North-South Roadways						
Military Road S	Principal Arterial	2	35-40	11,000–18,000	Partial	Partial
24th Ave. S	Collector arterial	2	30	5,000	Partial	Partial
30th Ave. S	Neighborhood collector	2	25	1,900	N	N
16th Ave. S	Minor arterial	2	25-35	10,200	Partial	Partial
28th Ave. S/S 317th Street	Minor arterial	2	30-35	6,000	Partial	Partial

Note: Table only includes local roads and roads classified as arterial and above.
[a] ADT based on latest available traffic count information unless otherwise noted.
N = no; Y = yes

3.3.2 Intersection Operations and Level of Service

Key intersections in the study area were analyzed to understand their operating conditions. All key intersections identified were analyzed for the PM peak hour (4:45 to 5:45 PM). For the AM peak hour (7:00 to 8:00 AM), however, only a subset of PM study intersections, which includes all ramp terminals and critical intersections near the station areas, were analyzed.

The quality of traffic operations is also described in LOS terms for signalized and unsignalized intersections. LOS ratings range from LOS A to LOS F; LOS A represents the best operations and LOS F the poorest operation. LOS was calculated for all study intersections. Intersection results at signalized intersections are the average delay of all vehicles. Appendix B shows the level of service definitions for signalized and unsignalized intersections.

Furthermore, intersections are considered failing when they do not operate at or better than the agency's intersection LOS standard. Failing LOS standards indicate that vehicles incur substantial delay and vehicle queuing is evident. Table 3-11 lists the LOS standards, or lowest acceptable LOS threshold, for each of the affected jurisdictions in the study area.

Many jurisdictions in the study area maintain a consistent LOS standard for a given facility type; however, the cities of SeaTac, Des Moines, and Kent allow exceptions along SR 99, as indicated in Table 3-11. For facilities that are owned by WSDOT (such as SR 99) but are maintained by the local jurisdictions, the WSDOT standards, which are the most conservative, were used as the basis of comparison. For ramp terminal intersections, the WSDOT LOS standard was assumed because those intersections are within WSDOT jurisdiction.

TABLE 3-11
LOS Standards for Affected Agencies

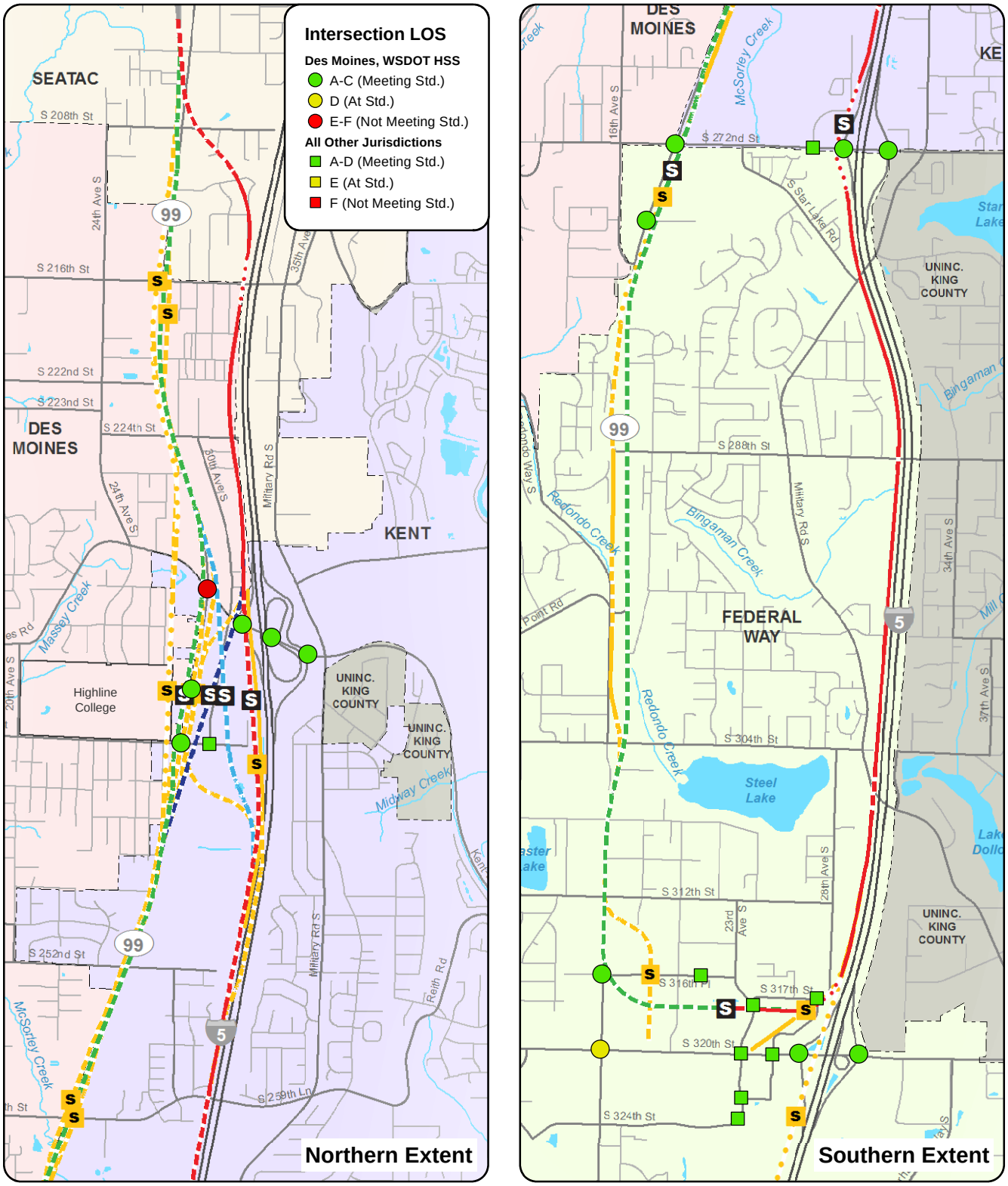
Agency/Jurisdiction	LOS Standard
Washington State Department of Transportation	LOS D for highways of statewide significance (HSS) LOS E/mitigated for regionally significant state highways (non-HSS)
City of SeaTac	LOS E for principal and minor arterials LOS D for collector and lower classification streets LOS F exemptions provided at the following intersections with SR 99: - S 188th Street - 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: - S 216th Street (LOS F, v/c<1.0) - Kent-Des Moines Road (LOS F, v/c<1.2) - S 220th Street (LOS E, v/c<1.0) - S 224th Street (LOS E, v/c<1.0)
City of Kent	LOS E for non-SR 99 intersections 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 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 use the threshold for 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).

Results for the AM peak hour are shown in Exhibit 3-6, and the PM peak hour results are shown in Exhibits 3-7 and 3-8.

All of the intersections currently meet the respective jurisdictions' mobility standards except for Kent-Des Moines Road and I-5 southbound ramps during the PM peak hour, and Kent-Des Moines Road and SR 99 during both the AM and PM peak hours. These intersections do not meet the WSDOT standard of LOS D for HSS facilities.

Table D-1 in Appendix D, Existing and Future Intersection Level of Service Results, 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.



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
- Station for Alternatives
- Station for Options

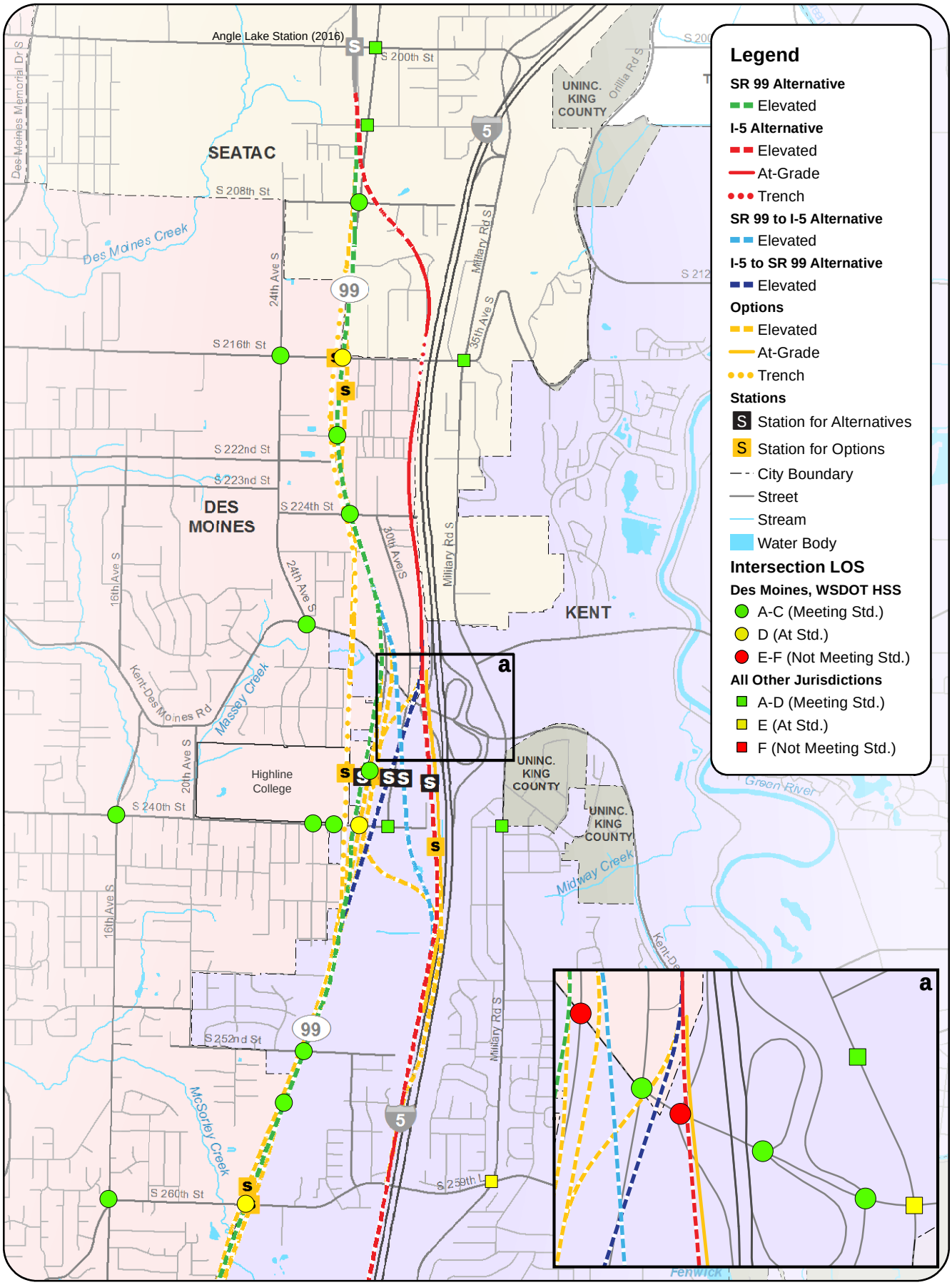
- City Boundary
- Street
- Stream
- Water Body

Data Sources: King County (2013)
HSS = Highway of Statewide Significance

N

0 0.25 0.5 1 Miles

EXHIBIT 3-6
Existing AM Intersection Level of Service
Northern and Southern Study Area Extents
Federal Way Link Extension

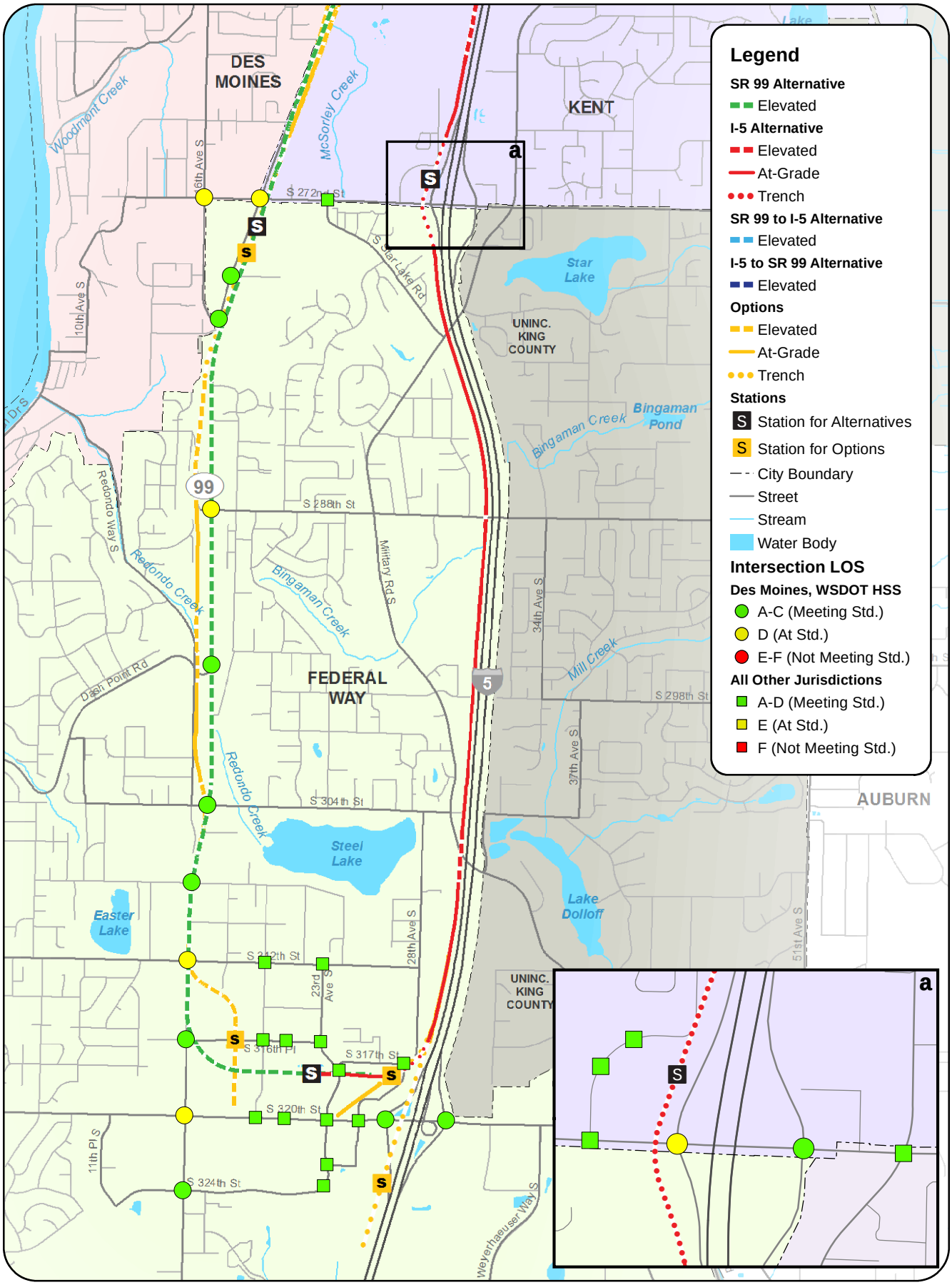


Data Sources: King County (2013)
HSS = Highway of Statewide Significance

N

0 0.25 0.5 1 Miles

EXHIBIT 3-7
Existing PM Intersection Level of Service
Northern Study Area Extent
Federal Way Link Extension



Data Sources: King County (2013)
HSS = Highway of Statewide Significance

N

0 0.25 0.5 1 Miles

EXHIBIT 3-8
Existing PM Intersection Level of Service
Southern Study Area Extent
Federal Way Link Extension

3.4 Safety

This section discusses current safety-related conditions in the FWLE corridor. This includes a review of crash data records for roadways in the study area and an assessment of locations along the I-5 southbound lanes where clear zones and/or guardrails currently exist.

3.4.1 Crash Analysis

Crash data records were collected for a 5-year period between 2007 and 2011 from WSDOT for intersections, arterials, I-5 ramps, and the I-5 mainline within the study area. The majority of the crashes in the study area occurred at intersections (as opposed to corridors).

The safety analysis completed for arterials includes intersection-related and non-intersection-related crashes. Intersection-related crashes include those occurring at an intersection or those caused by intersection operations (e.g., rear-ends resulting from vehicle queuing). The non-intersection-related analysis, or corridor analysis, includes those crashes that occur between intersections and may include crashes caused by driveways. For I-5, the crash analysis includes crashes that occurred on the I-5 mainline between interchanges, including both the general purpose and HOV lanes. I-5 ramp crashes were also documented and include those crashes that occurred on the ramps but are not intersection-related.

Crash rates were calculated for the study area intersections as the number of crashes per million entering vehicles (MEV). The intersection of SR 99 and Kent-Des Moines Road had the greatest number of crashes (193) and the highest intersection crash rate of 2.16 crashes per MEV within the study period. Table 3-12 shows the intersection locations by jurisdiction and indicates intersection traffic entering volumes, crash numbers by type, and crash rates for the intersections.

TABLE 3-12
Existing Intersection Crash Analysis Results (2007–2011)

Jurisdiction/Intersection	ADT (Entering Volume)	2007–2011 Crash Frequency (# of crashes)				Crash Rate (crashes/MEV)
		Property Damage Only	Injuries	Fatality	Total	
City of SeaTac						
SR 99 and S 200th Street	39,550	32	16	0	48	0.68
SR 99 and S 204th Street	30,150	8	7	0	15	0.31
SR 99 and S 208th Street	30,550	12	12	0	24	0.43
SR 99 and S 216th Street	35,900	40	18	0	58	0.90
City of Des Moines						
24th Ave. S and S 216th Street	14,900	4	2	0	6	0.22
SR 99 and S 220th Street	24,800	12	5	0	17	0.38
SR 99 and S 224th Street	25,100	15	12	0	27	0.59
SR 99 and Kent-Des Moines Road	50,050	126	67	0	193	2.16
30th Ave. S and Kent-Des Moines Road	31,750	6	2	0	8	0.14
16th Ave. S and S 272nd Street	17,050	11	1	0	12	0.39

TABLE 3-12

Existing Intersection Crash Analysis Results (2007–2011)

Jurisdiction/Intersection	ADT (Entering Volume)	2007–2011 Crash Frequency (# of crashes)				Crash Rate (crashes/MEV)
		Property Damage Only	Injuries	Fatality	Total	
City of Kent						
Military Road S and Kent-Des Moines Park-and-Ride	16,950	9	2	0	11	0.39
I-5 SB on-/off-ramp and Kent-Des Moines Road	42,950	69	34	0	103	1.33
I-5 NB on-/off-ramp and Kent-Des Moines Road	38,450	39	22	0	61	0.87
I-5 NB off-ramp and Kent-Des Moines Road	34,700	21	11	0	32	0.51
Military Road S and Kent-Des Moines Road	44,250	69	24	0	93	1.16
SR 99 and S 240th Street	34,300	27	23	0	50	0.81
SR 99 and S 252nd Street	28,600	18	7	0	25	0.50
SR 99 and Fred Meyer driveway	31,650	8	7	0	15	0.26
SR 99 and S 260th Street	36,100	32	20	0	52	0.81
SR 99 and S 272nd Street	46,450	54	39	0	93	1.11
S Star Lake Road and S 272nd Street	24,850	39	17	0	56	1.24
26th Ave. S and S 272nd Street	22,650	8	11	0	19	0.46
I-5 SB on-/off-ramp and S 272nd Street	30,750	33	13	0	46	0.82
I-5 NB on-/off-ramp and S 272nd Street	28,150	37	12	0	49	0.99
City of Federal Way						
SR 99 and S 276th Street	32,300	6	9	0	15	0.25
SR 99 and 16th Ave. S	35,400	26	9	0	35	0.56
SR 99 and S 288th Street	39,950	19	22	0	41	0.56
SR 99 and Dash Point Road	36,200	19	13	0	32	0.48
SR 99 and S 304th Street	27,950	26	19	0	45	0.88
SR 99 and S 308th Street	28,650	12	13	0	25	0.48
SR 99 and S 312th Street	39,000	57	32	0	89	1.25
20th Ave. S and S 312th Street	15,700	11	4	0	15	0.52
23rd Ave. S and S 312th Street	12,900	5	1	0	6	0.25
SR 99 and S 316th Street	33,450	23	19	0	42	0.69
20th Ave. S and S 316th Street	12,050	8	3	0	11	0.50
23rd Ave. S and S 316th Street	9,850	2	5	0	7	0.39
23rd Ave. S and S 317th Street	16,650	6	3	0	9	0.30
28th Ave. S and S 317th Street	10,150	3	0	0	3	0.16
SR 99 and S 320th Street	59,100	86	48	1	135	1.26

TABLE 3-12
Existing Intersection Crash Analysis Results (2007–2011)

Jurisdiction/Intersection	ADT (Entering Volume)	2007–2011 Crash Frequency (# of crashes)				Crash Rate (crashes/MEV)
		Property Damage Only	Injuries	Fatality	Total	
20th Ave. S and S 320th Street	37,550	21	20	0	41	0.60
23rd Ave. S and S 320th Street	48,050	50	16	0	66	0.75
I-5 SB on-/off-ramp and S 320th Street	50,100	76	39	0	115	1.28
I-5 NB on-/off-ramp and S 320th Street	33,050	19	13	0	32	0.53

Source: WSDOT, 2013.
FAT = fatality; INJ = injury; MEV = million entering vehicles; NB = northbound; PDO = property damage only; SB = southbound; TOT = total

Corridor crash rates were calculated for the study area corridor as the number of crashes per million vehicle miles traveled (MVMT). As mentioned above, the corridor crash rates do not include any crashes that occurred at intersections. The 2011 statewide collision average for principal arterials within WSDOT's jurisdiction in urban areas is 2.07 crashes per MVMT. Two sections of SR 99 in the study area were above this average: S 216th Street to Kent-Des Moines Road in Des Moines and S 288th Street to S 320th Street in Federal Way. South 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 MVMT. The other section of the corridor above the statewide collision average is S 272nd Street between SR 99 and I-5, with a crash rate of 2.59. Table 3-13 presents a summary of the crash data collected for roadway sections of the study area corridor extending from the S 320th Street to the S 200th Street. This table shows the corridor segment locations and indicates corridor traffic volumes (as ADT), crash numbers by type, and crash rates for the corridor segments.

TABLE 3-13
Existing (2007–2011) Corridor Crash Analysis Results

Corridor Segment		ADT	2007–2011 Crash Frequency (# of crashes)				Crash Rate (crashes/MVMT)
			Property Damage Only	Injuries	Fatality	Total	
SR 99	S 200th Street to S 216th Street	26,600	21	5	0	26	1.81
	S 216th Street to Kent-Des Moines Road	24,200	10	4	0	14	2.55
	Kent-Des Moines Road to S 260th Street	27,550	52	12	0	64	1.74
	S 260th Street to S 288th Street	30,450	44	26	0	70	1.82
	S 288th Street to S 320th Street	26,650	21	8	0	29	2.56
S 200th Street		14,300	9	2	0	11	0.77
S 216th Street		12,550	6	3	0	9	1.12
Kent-Des Moines Road		30,300	30	11	0	41	1.32
S 272nd Street		21,650	54	35	0	89	2.59
S 320th Street		35,150	102	59	0	161	2.99

Source: WSDOT, 2013.

Additionally, WSDOT uses a system of collision analysis corridors (CAC) or collision analysis locations to identify locations with high potential for safety improvements. The CACs include 236 state facilities with the highest expected frequency of fatal and serious injury crashes. In western Washington, these CACs have an expected crash frequency greater than 2.86 crashes per MVMT. Kent-Des Moines Road is the only highway within the study area that has been classified as a CAC; however, the crash rate on the segment of Kent-Des Moines Road within the study area has an accident rate around 1.3 crashes per MVMT, less than the statewide average for urban arterials (2.07 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. A summary of the mainline crashes and crash rates by direction and severity is included in Table 3-14. 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. In addition, 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 at this time.

There were a total of 378 crashes on the I-5 ramps in the study area between 2007 and 2011. A summary of the ramp crashes by direction and severity is included in Table 3-14. WSDOT does not report average collision rates for interstate ramps. The southbound off-ramp to S 320th Street had 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. The northbound HOV on-ramp from S 317th Street had the lowest crash frequency with zero crashes per year. This ramp has one of the lower ramp volumes of any in the study area.

TABLE 3-14
Existing (2007–2011) I-5 Mainline and Ramp Crash Analysis Results

Mainline or Ramp Segment	ADT	2007–2011 Crash Frequency (# of crashes)				Crash Rate (crashes/MVMT)
		Property Damage Only	Injuries	Fatality	Total	
I-5 Northbound Mainline						
S 200th St to S 216th St	98,800	62	32	1	95	0.63
S 216th St to S Kent-Des Moines Road	103,300	171	46	1	218	0.60
S Kent-Des Moines Road to S 260th St	101,900	53	23	0	76	0.55
S 260th St to S 272nd St	97,100	119	59	0	178	0.87
S 272nd St to S 320th St	90,900	219	111	0	330	0.57
I-5 Southbound Mainline						
S 200th St to S 216th St	98,450	54	32	0	86	0.57
S 216th St to S Kent-Des Moines Road	103,100	127	64	0	191	0.53
S Kent-Des Moines Road to S 260th St	103,750	26	16	2	44	0.31
S 260th St to S 272nd St	99,050	71	32	0	103	0.50
S 272nd St to S 320th St	93,050	255	127	2	384	0.65

TABLE 3-14
Existing (2007–2011) I-5 Mainline and Ramp Crash Analysis Results

Mainline or Ramp Segment	ADT	2007–2011 Crash Frequency (# of crashes)				Crash Rate (crashes/MVMT)
		Property Damage Only	Injuries	Fatality	Total	
I-5 Northbound Ramps						
On-Ramp from Westbound Kent-Des Moines Rd	6,210	3	4	0	7	2.06
Off-Ramp to Westbound Kent-Des Moines Rd	3,920	47	23	0	70	42.54
On-Ramp from Eastbound Kent-Des Moines Rd	8,880	8	1	0	9	1.85
Off-Ramp to Eastbound Kent-Des Moines Rd	5,120	11	5	0	16	5.35
On-Ramp from S 272nd St	12,020	15	5	0	20	2.85
Off-Ramp to S 272nd St	6,160	25	2	0	27	8.01
On-Ramp (HOV) from S 317th St	1,830	0	0	0	0	0.00
On-Ramp from Westbound S 320th St	2,890	3	0	0	3	1.16
On-Ramp from Eastbound S 320th St	10,150	24	9	0	33	4.69
Off-Ramp (HOV) to S 317th St	1,330	0	1	0	1	1.25
Off-Ramp to S 320th St	8,690	6	9	0	15	3.94
I-5 Southbound Ramps						
Off-Ramp to Kent-Des Moines Rd	13,210	33	24	0	57	10.75
On-Ramp from Kent-Des Moines Rd	9,350	1	0	0	1	0.37
Off-Ramp to S 272nd St	11,440	14	6	0	20	3.19
On-Ramp from S 272nd St	5,940	2	0	0	2	0.88
Off-Ramp (HOV) to S 317th St	1,830	4	1	0	5	6.24
On-Ramp (HOV) from S 317th St	1,210	4	0	0	4	8.23
Off-Ramp to S 320th St	14,550	59	24	0	83	10.42
On-Ramp to S 320th St	9,530	4	1	0	5	0.76

Source: WSDOT, 2013.

3.4.2 I-5 Clear Zone

A minimum clear zone is defined by geometric considerations, including if a recoverable slope is present and if the area is free of fixed objects so an errant vehicle can recover. 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 project corridor. The clear zone is a function of posted speed limits, sideslope, and traffic volumes.

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. Table 3-15 documents the southbound I-5 roadside conditions. The table includes the length of available clear zone along I-5 and where barriers along I-5 are located for safety (e.g., grade-separated crossings). In areas where minimum clear zone conditions

are not currently, these barriers (guardrail, barrier, or walls) or impact attenuators are provided to "shield" vehicles from roadside hazards. These hazards generally include:

- Nonrecoverable slopes (slopes steeper than 1 foot vertical to 4 feet horizontal)
- Tree stands
- Signs and signal supports
- Communications cabinets
- Power poles
- Other landscaping elements
- Street grade-separation

A detailed inventory of existing and potential clear zone locations is provided in Appendix H, I-5 Clear Zone Analysis. Exhibit 3-9 shows the inventory of existing barrier locations.

TABLE 3-15
Southbound I-5 Existing Clear Zone Summary (Between S 211th Street and S 317th Street)

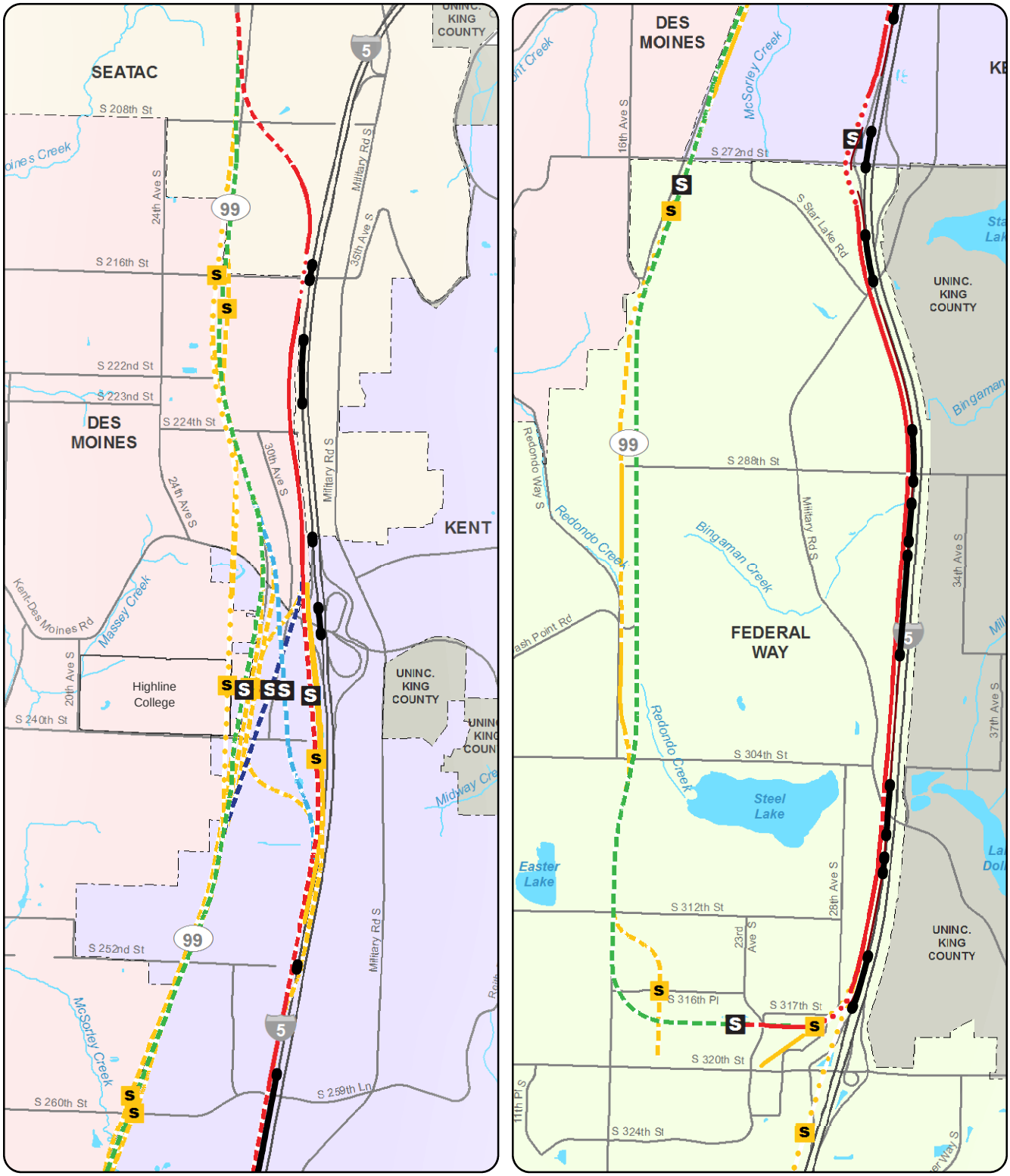
I-5 Roadside Condition	Length of Segment (feet)
	Existing Conditions
Available Clear Zone[a]	22,900
Barrier Provided[b]	11,500
Total Length	34,400

[a] Represents areas where existing conditions meet the definition of a clear zone.
[b] Represents areas where barriers currently exist. These areas include shielding to protect highway infrastructure, tree stands, steep sideslopes, and other landscaping elements or are used to protect grade-separated crossings.

Within the FWLE study area, 22,900 feet of existing clear zone (approximately 2/3rd of the total length) is present along the I-5 southbound mainline. The remaining 1/3 (11,500 feet) is currently shielded by guardrail, walls, or barrier. The shielded segments of the southbound I-5 roadside include 9,300 feet where WSDOT could potentially create a clear zone by alteration, removal, or relocation of the roadside hazards described above. Approximately 2,200 feet of barrier would shield grade-separated streets and a clear zone cannot be created.

Median horizontal clearances were also analyzed for the potential of an errant vehicle to cross the median and encounter oncoming traffic. In general, median barriers are present on limited access facilities with posted speed limits of 45 miles per hour (mph) or higher and have median widths less than 50 feet. Within the FWLE study area, the I-5 median horizontal clearance was also assessed between S 244th Street and S 256th Street (approximately 2/3 mile), near the Midway Landfill.

The median is approximately 55 feet wide from the edge of the northbound and southbound travel way. Between approximately S 244th Street and S 248th Street, the median along the southbound I-5 traveled way is shielded with a Jersey barrier, and between S 248th Street and S 256th Street, the



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
- Existing Barrier

- City Boundary
- Street
- Stream
- Water Body

Data Sources: King County (2013)

N

0 0.125 0.25 0.5 Miles

EXHIBIT 3-9
Existing Southbound I-5
Roadside Barrier Locations
Federal Way Link Extension

median is shielded by a guardrail along the northbound traveled way. A small break is provided in the median at approximately S 248th Street for emergency vehicle access.

3.5 Parking

Existing on-street parking supply and utilization information was collected for the areas surrounding the FWLE station areas and is provided in Table 3-16. On-street parking supply and demand data were collected in the spring of 2012 on all roads within a 1/4-mile radius of each FWLE station area. The park-and-ride utilization data are from fall of 2012. Among the proposed station areas, the Federal Way Transit Center has the highest on-street parking utilization rate (43 percent) but only has 21 on-street unrestricted parking stalls. The potential additional S 216th Street West or East station option area has similar on-street parking utilization rate, with 33 percent and 51 on-street unrestricted parking stalls. The other station areas have much lower rates, which indicates that there is generally on-street parking available in the station areas.

The park-and-rides near the station areas have a utilization rate of 45 percent or more, except the Redondo Heights Park-and-Ride, which has an 8 percent utilization rate. The Star Lake Park-and-Ride, located adjacent to I-5 near S 272nd Street, has a 58 percent utilization rate. The only park-and-ride near the Kent/Des Moines Station area is located east of I-5 and would not likely be used by any station area users west of the freeway. Currently, there are no privately operated parking facilities near the FWLE station areas.

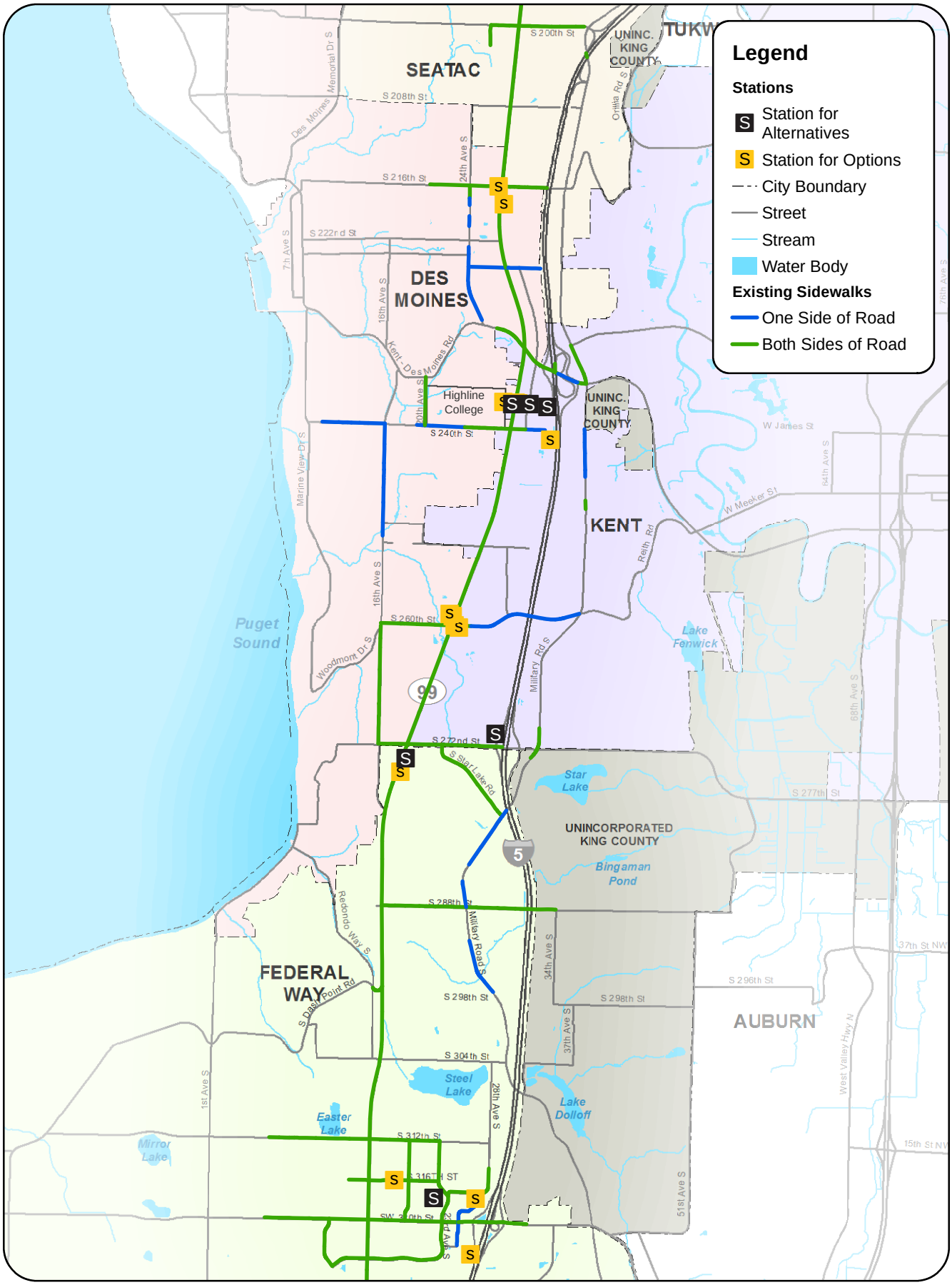
Most parking stalls surrounding the Kent/Des Moines Station area are located in residential neighborhoods. These stalls are signed as residential parking only. While on-street parking is provided east of I-5, this parking was not considered because the total walking distance would be substantially greater than 1/4 mile from the station, the distance most pedestrians are willing to walk to access transit service. The Star Lake Park-and Ride adjacent to I-5 has some unrestricted on-street parking located north of the park-and-ride facility. The parking at nearby multi-family housing is restricted to residents. The Federal Way Transit Center Station area has limited on-street parking.

In addition to on-street parking and park-and-ride facilities, there are a few other parking facilities in the study area. In the Kent/Des Moines Station area, Highline College (HC) has several parking lots, but these are restricted to students and faculty with a permit. There are two relatively small leased park-and-ride lots (All Saints' Lutheran Church and Saint Columba's Episcopal Church) near the Star Lake Park-and-Ride east of I-5. In the Federal Way Transit Center Station area, the Commons Mall area has a substantial amount of parking, but it is private parking for mall patrons only.

TABLE 3-16
Existing Weekday Parking Supply and Utilization by FWLE Station Area

Station Area	Parking Type	SR 99			I-5		
		Stalls	Demand	% Utilization	Stalls	Demand	% Utilization
S 216th Street	Park-and-Ride	-	-	-	-	-	-
	On-Street Unrestricted	51	17	33	-	-	-
	Total	51	17	33	-	-	-
Kent/Des Moines	Park-and-Ride	370	370	100	370	370	100
	On-Street Unrestricted	0	0	-	0[a]	0[a]	-
	Total	370	370	100	370	370	100
S 260th Street	Park-and-Ride	-	-	-	-	-	-
	On-Street Unrestricted	10	0	0	-	-	-
	Total	10	0	0	-	-	-
S 272nd Street	Park-and-Ride[b] (Redondo & Star Lake)	697	54	8	540	311	58
	Park-and-Ride (Leased)	-	-	-	90[c]	61	68
	On-Street Unrestricted	15	2	13	24	3	13
	Total	712	56	8	654	375	57
Federal Way Transit Center	Park-and-Ride	1,190	1,179	99	1,190	1,179	99
	On-Street Unrestricted	21	9	43	21	9	43
	Total	1,211	1,188	98	1,211	1,188	98
S 320th Street	Park-and-Ride	-	-	-	877	392	45
	On-Street Unrestricted[d]	-	-	-	21	9	43
	Total	-	-	-	898	401	45
Total	Park-and-Ride	2257	1,603	71	3,067	2,313	75
	On-Street Unrestricted	97	28	29	45	12	27
	Total	3,170	2,006	63	3,112	2,325	75

[a] On-street parking east of I-5 is not included in the parking data due to impractical access to the station.
[b] Redondo Heights Park-and-Ride is in the FWLE SR 99 Alternative S 272nd Redondo Station area, and Star Lake Park-and-Ride is in the FWLE I-5 Alternative S 272nd Star Lake Station area.
[c] Includes All Saints' Lutheran Church and St. Columba's Episcopal Church leased lots.
[d] The on-street parking for both Federal Way Transit Center and S 320th Street Park-and-Ride are is considered to be same as the surrounding area, with available on-street parking overlaps for both the locations.



Data Sources: King County (2013)

N

0 0.5 1 2 Miles

EXHIBIT 3-10
Existing Sidewalk Locations

Federal Way Link Extension

3.6 Nonmotorized Facilities

This section describes the existing nonmotorized facilities within the study area.

3.6.1 Sidewalks

Existing sidewalks were inventoried on all study area arterials, as shown in Exhibit 3-10. The inventory includes streets classified as arterials, collector arterials, and collectors. 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 but generally have lower volumes and less pedestrian activity.

Pedestrian mobility between the station areas and east of I-5 occur 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, nonmotorized travel through these areas is difficult and uncomfortable.

3.6.2 Bicycle Facilities and Multi-use Trails

There are only a few bicycle facilities in the study area, as shown in Exhibit 3-11. 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. The remaining bicycle lanes/paths are generally shorter in length and connect to signed bicycle routes along other roadways. 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 (BPA) Trail 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. The BPA Trail begins at S 324th Street and 11th Place S in Federal Way.

Data Sources: King County (2013)

N

0 0.5 1 2 Miles

EXHIBIT 3-11
Existing Bicycle Facilities and Routes

Federal Way Link Extension

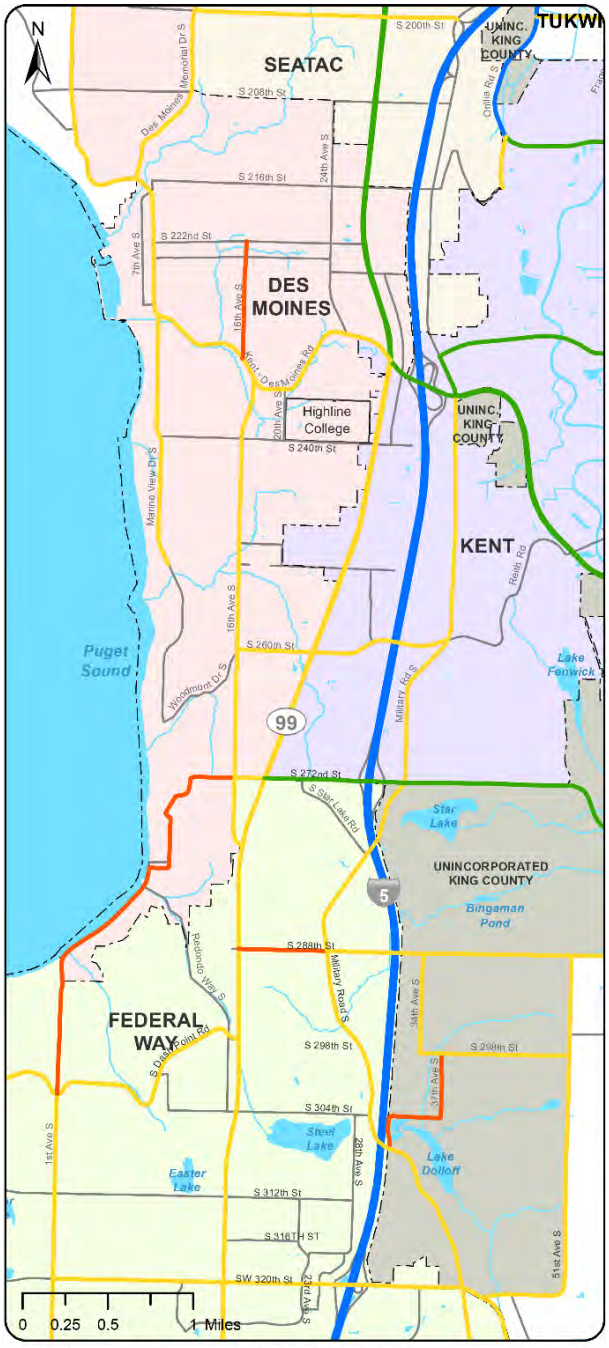
3.7 Freight Mobility and Access

Truck mobility within the Puget Sound Region is largely supported by a system of designated freight routes (Exhibit 3-12) that consist of freeways and arterial streets connecting major freight destinations. To prioritize truck routes, WSDOT adopted the Freight Goods Transportation System (FGTS), which classifies roadways according to the amount of annual tonnage transportation (T1–T5). The classifications range from roadways that carry more than 20,000 tons in 60 days to those that carry more than 10,000,000 tons annually (Table 3-17). Jurisdictions determine their designated truck route system on arterial streets according to the FGTS classifications. 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.

TABLE 3-17
Freight and Goods Transportation System Classifications

FGTS Classification	Annual Gross Tonnage
T-1	Over 10,000,000
T-2	4,000,000 to 10,000,000
T-3	300,000 to 4,000,000
T-4	100,000 to 300,000
T-5	Over 20,000 in 60 days

Source: Washington State Legislative Transportation Committee, 1995.



Data Sources: WSDOT (2014), King County (2013)

Legend

- City Boundary
- Street
- Stream
- Water Body

Freight Classification (FGTS) (Annual Gross Tonnage)

- T-1 (over 10,000,000)
- T-2 (4,000,000 - 10,000,000)
- T-3 (300,000 - 4,000,000)
- T-4 (100,000 - 300,000)
- T-5 (over 20,000 in 60 days)

EXHIBIT 3-12
Existing Freight Routes and Classifications

As shown in Table 3-18, 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 annually on I-5. About 8 percent of the 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 2013. 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/or the Kent Manufacturing Industrial Center. Truck travel on these two roadways occurs throughout the day, with most trucks travelling outside of the AM and PM peak periods to avoid the more heavily congested times of day.

TABLE 3-18
Freight and Goods Transportation System Classification for Key Highways in FWLE Transportation Study Area

Route	Description	Length (miles)	FGTS Class	2013 Tonnage
I-5	King/Pierce County line to SR 599	16.44	T-1	72,630,000
SR 99	SR 18 to Kent-Des Moines Road	7.35	T-3	2,360,000
SR 99	Kent-Des Moines Road to SR 518	4.94	T-2	3,660,000
Kent-Des Moines Road	Marine View Drive to SR 99	1.79	T-3	1,050,000
Kent-Des Moines Road	SR 99 to SR 169	14.70	T-2	3,780,000

Source: WSDOT, 2014.

Most of the arterials in the study area are classified as either T-2 or T-3 routes. S 272nd Street and is classified as a T-2 freight route. S 200th Street, Kent-Des Moines Road, S 260th Street, S 288th Street, Dash Point Road, and S 320th Street are all designated as T-3 routes. S 216th Street, S 240th Street, and S 312th Street are the only east-west arterials in the study area that are not classified on the FGTS system. Beyond SR 99 and I-5 in the study area, only Military Road S (T-3 freight route) is a north-south oriented roadway classified in the state's FGTS system.

4.0 Environmental Impacts

The future long-term effects described in this chapter are a comparison of the No Build Alternative and Federal Way Link Extension (FWLE) build alternatives conditions for the year 2035. This chapter discusses changes in regional facilities and travel, transit operations, arterial and local street operations, safety, parking, nonmotorized facilities, and freight mobility and access. Changes to Interstate 5 (I-5) highway operations and safety are addressed in sections pertaining to regional facilities and travel (screenline performance), arterials and local street operations (I-5 ramp terminal intersection operations and off-ramp queues), and safety.

The effects of the build alternatives were analyzed assuming that light rail would extend to the Federal Way Transit Center, with potential interim termini locations at the Kent/Des Moines Station and S 272nd Street Stations (Star Lake or Redondo). This chapter is organized to assess how the transportation network would change compared to the No Build Alternative with the build alternatives. For analysis elements where the build alternatives would trigger mitigation, further discussion on proposed mitigation is provided in Chapter 7, Potential Mitigation Measures.

4.1 Regional Facilities and Travel

Regional travel patterns, including projected vehicle forecasts, traffic congestion, and person mode of travel are discussed in detail in this chapter. For I-5 ramp terminal operations and vehicle queuing analysis, refer to Section 4.3.5. For the I-5 safety analysis, refer to Section 4.4. Key findings of note include the following:

- The selected build alternative would reduce overall regional vehicles miles traveled (VMT) by 150,000 miles per day and vehicle hours traveled (VHT) by 10,000 hours per day.
- Volume to capacity (v/c) ratios and screenline volumes would be reduced slightly with any of the build alternatives.
- While vehicle trips are expected to decrease, person trips would increase with any of the build alternatives through the corridor. The percentage of these trips using transit is expected to increase by 1 to 4 percentage points compared to the No Build Alternative.

The future arterial and local street system within the FWLE transportation study area (study area) includes a variety of roadway and transit projects that are planned and have identified sources of funding for construction. These reasonably foreseeable projects and transit service changes were incorporated into the transportation analysis for the 2035 No Build and build alternatives and include both regionally noteworthy projects (i.e., State Route [SR] 520 Bridge Replacement and Alaskan Way Viaduct and Seawall Replacement) and specific local transportation improvement projects. A detailed list of the assumed background projects is provided in Appendix A, Transportation Technical Analysis Methodology. Listed below are highlights of the assumed background projects list:

- Light rail would be extended to Lynnwood Transit Center, Overlake Transit Center, and S 200th Street (Angle Lake Station).
- 28th and 24th Avenues S would be connected between S 200th Street and S 208th Street through SeaTac with a five-lane arterial.
- Military Road would be widened from Kent-Des Moines Road to S 304th Street. Widening would include a center left turn lane and bicycle lanes from Kent-Des Moines Road to S 272nd Street. From S 272nd Street to S 304th Street, the road would widen to four or five lanes.
- The S 320th Street I-5 bridge would be widened, including adding high-occupancy vehicle (HOV) lanes and realigning ramps.

As funding to construct the SR 509 Corridor Completion and Freight Improvement Project has not been identified by the State, this potential project is discussed in Chapter 8, Cumulative Impacts.

The only change to the transportation network included in the FWLE would be the build alternatives and any associated road improvements.

4.1.1 Vehicle Miles Traveled and Vehicle Hours Traveled

Table 4-1 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 between build alternatives; therefore, a representative alternative is highlighted in Table 4-1. With the extension of light rail south to Federal Way, regional VMT is expected to decrease by approximately 150,000 miles on a typical weekday compared to the No Build Alternative because some regional automobile trips are expected to shift to light rail with the FWLE. Almost one-third of this reduction would occur in the study area. The change in regional VMT represents a fairly small change regionally and is generally attributable to approximately 8,000 new transit users.

TABLE 4-1
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, 2012b.
[a] 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. Approximately 20 percent of the regional reduction in VHT would occur within the study area. Forecasted VHD are expected to decrease by approximately 4,000 hours per day regionally.

4.1.2 Traffic Projections

Exhibit 4-1 categorizes the 2035 regional v/c ratios for major highway facilities between Federal Way and Seattle by three ranges. Most of the major facilities are forecasted to carry more trips in 2035 than

today. This increase in traffic volumes will in turn lead to higher levels of congestion in 2035. This increase in congestion is expected to make travel time to and from the study area from regional destinations longer and less reliable in 2035.

4.1.2.1 Traffic Volume Projections

Future year AM and PM peak hour traffic volume forecasts were developed for the FWLE based on the Puget Sound Regional Council's (PSRC) latest population and employment forecasts for the region. 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.

The average weekday projected increase in traffic volumes for all four cities in the study area (SeaTac, Kent, Des Moines, and Federal Way) is shown in Table 4-2. Growth on roadways within the FWLE study area in SeaTac is projected to be lower compared to other jurisdictions due to the completion of the 28th/24th Avenue S arterial. The completion of this will result in a shift of traffic from study area intersections along SR 99 to that corridor.

TABLE 4-2
2013 to 2035 Average Weekday Annual Volume Growth

City/Jurisdiction	AM Peak Hour	PM Peak Hour
Study Area	0.74%	0.70%
SeaTac	N/A	0.26%
Kent	0.89%	0.70%
Des Moines	0.98%	0.90%
Federal Way	0.53%	0.70%

Source: PSRC, 2012b.
N/A = not applicable

4.1.2.2 Facility Screenline Traffic Volume Projections

The AM and PM peak hour, daily traffic volumes, and v/c ratios for three selected locations within the study area were analyzed to understand the relative differences in

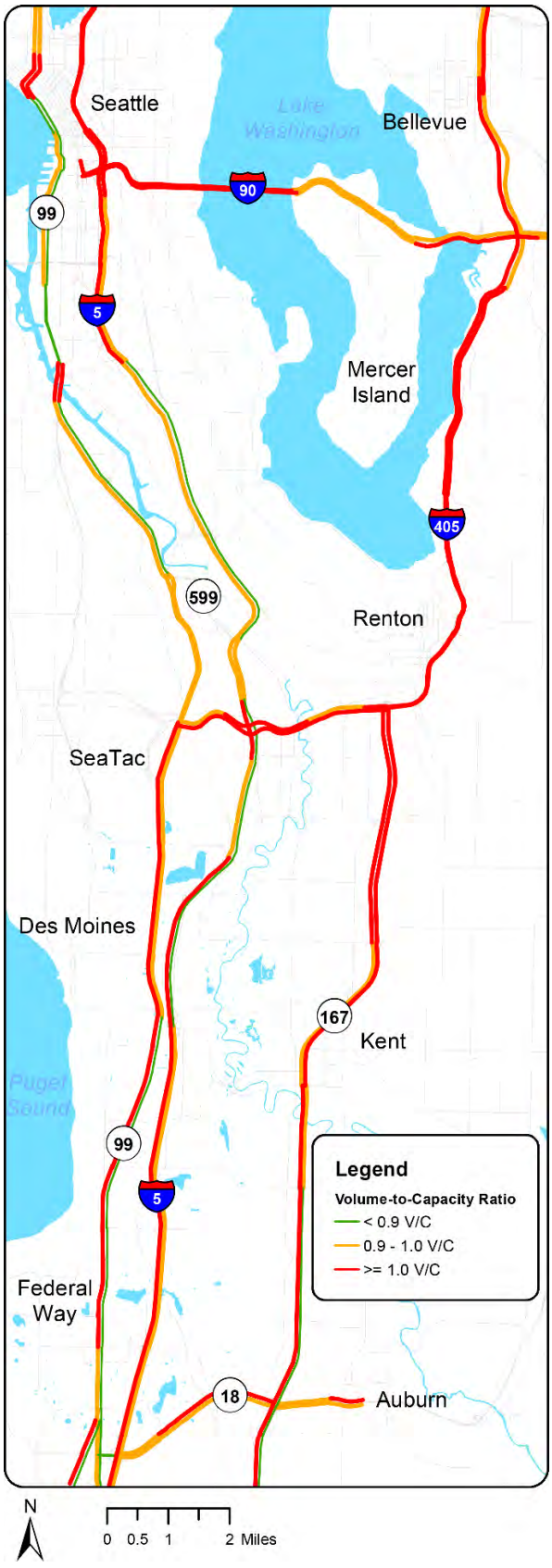


EXHIBIT 4-1
2030 No Build PM Highway Volume-to-Capacity Ratios

travel between the No Build and build alternatives. Exhibit 4-2 shows the project's three screenline locations.

Screenline results are similar between all build alternatives; therefore, a representative value is provided in Table 4-3. In general, extending light rail to Federal Way would attract more persons to transit, thereby resulting in minor decreases in traffic volumes and congestion across all three screenlines in the FWLE corridor. Modest traffic volume decreases are expected in both the peak and off-peak directions of travel; however, most roads across the screenlines would still operate at or near capacity in the peak direction of travel with and without the extension of light rail under any of the build alternatives.

TABLE 4-3
2035 AM Peak/PM Peak/Daily 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	Build Alternatives[a]
		Volume (veh)	V/C	Volume (veh)	V/C	Volume (veh)	V/C	Volume (veh)	V/C	Volume (veh)	Volume (veh)
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

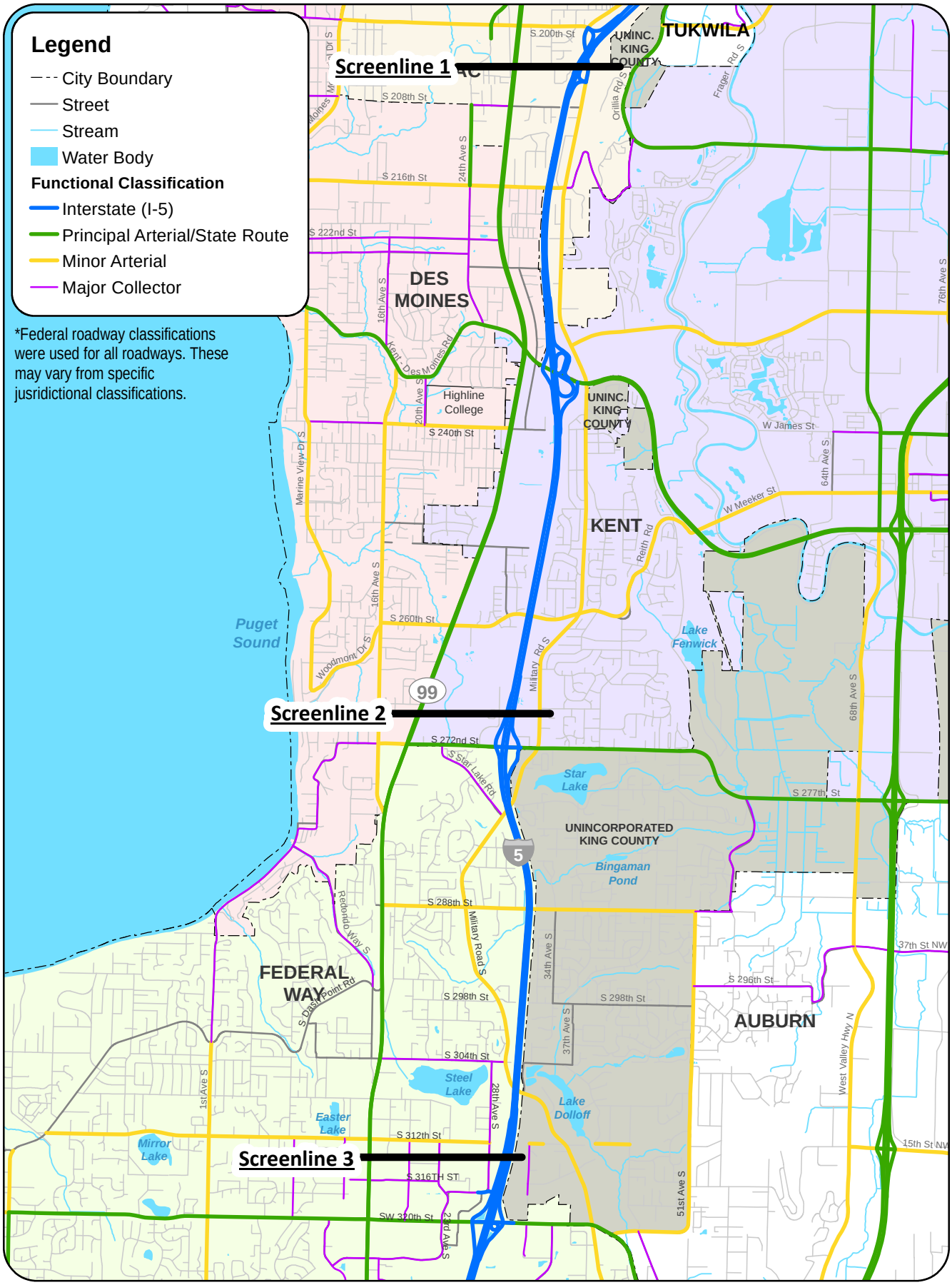
Source: PSRC, 2012b.
[a] SR 99 Alternative is documented for comparison purposes. The other FWLE alternatives and station options would have the same regional impacts.
NB = northbound; SB = southbound; veh = vehicles

4.1.2.3 I-5 Screenline Traffic Volume Projections

Table 4-4 shows the projected peak hour and daily traffic volumes on the I-5 mainline under the No Build and build alternatives. Values presented in this table are a subset of the volumes shown in Table 4-3. Extension of light rail to Federal Way would result in a small decrease (less than 2 percent) in traffic volumes across I-5 in all three screenlines. This small decrease in traffic on I-5 would result in similar to slightly better traffic performance of I-5; therefore, traffic impacts on the I-5 mainline are not expected with any of the build alternatives.

4.1.2.4 Screenline Mode of Travel

Table 4-5 shows the total person demand and their mode of travel at the three screenline locations during the PM peak hour. The mode share for persons in the AM peak hour would be similar to the PM peak hour with the peak direction of travel in the northbound direction.



Data Sources: King County (2013)

N

0 0.5 1 2 Miles

EXHIBIT 4-2
FWLE Transportation Study Area
Screenline Locations
Federal Way Link Extension

TABLE 4-4
2035 AM Peak/PM Peak/Daily I-5 Screenline Volumes (Vehicles)

Screenline	Direction	Travel Lane	AM Peak Hour (veh)		PM Peak Hour (veh)		Daily (veh)	
			No Build	Build Alternatives[a]	No Build	Build Alternatives[a]	No Build	Build Alternatives[a]
South of S 200th Street	NB	GP	7,900	7,900	6,400	6,300	109,300	108,500
		HOV	2,200	2,100	500	500	16,600	16,200
	SB	GP	4,900	4,900	7,900	7,900	103,200	102,400
		HOV	200	200	1,800	1,800	13,800	13,400
North of S 272nd Street	NB	GP	8,100	8,000	6,300	6,200	109,600	108,800
		HOV	2,200	2,200	600	600	18,200	17,900
	SB	GP	5,100	5,100	8,300	8,300	108,900	108,000
		HOV	200	200	1,900	1,900	15,900	15,600
South of S 312th Street	NB	GP	7,900	7,800	6,200	6,100	105,900	105,100
		HOV	2,000	2,000	500	500	15,400	15,200
	SB	GP	5,000	5,000	8,100	8,100	107,000	106,300
		HOV	200	100	1,700	1,700	12,700	12,400

Source: PSRC, 2012b.
[a] SR 99 Alternative is documented for comparison purposes. The other FWLE alternatives and station options would have the same regional impacts.
GP = general purpose lane; NB = northbound: SB = southbound

TABLE 4-5
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, 2012b.
Note: Numbers may not add to 100 percent due to rounding.
[a] SR 99 Alternative is documented for comparison purposes. The other FWLE alternatives and station options would have the same regional impacts.

With the build alternatives, the number of persons traveling through the study area is expected to increase, with a higher proportion on transit modes. A slight decrease in single-occupant vehicle (SOV) and HOV person demand is expected with the build alternatives as people shift from automobiles to light rail and other forms of transit. The transit mode share would increase with the build alternatives,

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.

4.2 Transit Operations

This subsection reviews transit service and circulation, regional and local bus transit, ridership, station area mode of access, transit level of service (LOS), bus and light rail travel time, and transit transfer rates. Key findings and observations include the following:

- Up to 27,500 daily transit riders would use the proposed FWLE.
- Transit LOS measures of effectiveness, including hours of operation and service frequency, would improve from LOS F conditions to LOS A or B.
- The passenger load on buses would improve from standing room only in the No Build Alternative to having adequate seating on both bus and light rail under the build alternatives.
- The build alternatives would provide a comparable travel time to bus service from downtown Seattle to the Federal Way Transit Center and would be noticeably faster from all regional destinations to the north and east of Seattle, due in part to having fewer required transfers.
- The proposed station locations in the study area would accommodate connections with nonmotorized, transit transfer, and automobile access trips.

4.2.1 Transit Service Assumptions

A variety of changes could occur to both transit operations and facility improvements by 2035. These include a new light rail station at Angle Lake and transit route and service modifications reflective of proposed changes within transit agency long-range plans. Local transit agencies have identified conceptual transit bus service plans that could be integrated under the No Build Alternative. The information provided by these agencies represents a potential condition that could meet the foreseeable transit needs of the study area. It should be noted that actual changes to regional and local bus routes would require agency approval prior to implementation. Table 4-6 shows how transit service could operate in the 2035 with the No Build Alternative and build alternatives.

Most transit service that exists today is assumed to exist in 2035 also, with only two routes, King County Metro Transit (Metro) Routes 152 and 173, suggested for elimination. Other transit routes may be truncated or modified and have service frequency increased to better serve the study area. Metro is also proposing two new local transit routes: (1) a route between Des Moines and Federal Way, and (2) a route between Milton and Federal Way. For Pierce Transit routes, service under the No Build Alternative would likely be similar to existing conditions. In addition to changes in bus service, light rail would be extended from its current terminus at Sea-Tac Airport south to S 200th Street (Angle Lake Station). The Angle Lake Station will have 1,050 parking spaces and be the southern terminus of the light rail system until the FWLE is constructed. Regional bus service (Sound Transit Route 574) could be restructured to operate collaboratively with light rail terminating at the Angle Lake Station. This route

would operate as regional feeder service from Pierce County and South King County to serve light rail and would terminate at the Angle Lake Station.

A variety of transit facility improvements are planned with 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, rail, automobiles, pedestrians, and bicyclists in one location. Regional bus service could be restructured to operate collaboratively with light rail within the study area. Transit agencies have identified a preliminary, conceptual transit bus service (transit integration) assumptions that could be implemented along with light rail in the study area. The information provided by these agencies represents a potential future condition where routes might be truncated, eliminated, rerouted, or have their service frequency increased 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. Further discussion on how transit would change with the build alternatives is provided in Section 4.2.2.

TABLE 4-6
2035 Conceptual Transit Routes at Light Rail Stations

2035 No Build			2035 Build Alternatives		
	Headway (min)			Headway (min)	
Agency / Routes	Peak Period	Off-Peak	Transit Service Area	Peak Period	Off-Peak
Metro RapidRide A	8 – 10	12 – 15	Same as No Build	Same as No Build	Same as No Build
Metro 121	30	-	Revised[a]	15 – 30	Same as No Build
Metro 122[b]	45	30	Revised[a]	15 – 30	Same as No Build
Metro 156	15	30	Revised[a]	Same as No Build	Same as No Build
Metro 166	15	15	Revised[a]	Same as No Build	Same as No Build
Metro 179	20 – 30	-	Same as No Build	Same as No Build	Same as No Build
Metro 181	15	30	Same as No Build	Same as No Build	Same as No Build
Metro 182	30	30	Same as No Build	Same as No Build	Same as No Build
Metro 183	15	30	Same as No Build	Same as No Build	Same as No Build
Metro 187	30	30	Same as No Build	Same as No Build	Same as No Build
Metro 190	20 – 30	-	Truncated[c]	Same as No Build	Same as No Build
Metro 192	30	-	Revised	Same as No Build	Same as No Build
Metro 193	20 – 30	-	Revised[a]	Same as No Build	Same as No Build
Metro 197	15 – 30	-	Deleted	Same as No Build	Same as No Build
Metro 901	30	30	Same as No Build	Same as No Build	Same as No Build
Metro 903	30	30	Same as No Build	Same as No Build	Same as No Build
Metro Kent Des Moines – Federal Way[d]	30	60	Same as No Build	Same as No Build	Same as No Build
Metro Milton-Federal Way[e]	30	60	Same as No Build	Same as No Build	Same as No Build
ST 574	30	30	Revised (terminates at interim station)[f]	Same as No Build	Same as No Build
ST 577	10 – 15	-	Same as No Build	Same as No Build	Same as No Build
ST 578	30	30	Same as No Build	Same as No Build	Same as No Build

to operate along S 216th Street and SR 99 and use existing on-street bus zones near the station. The frequency of this route could be increased to supply the higher frequency and capacity of light rail service and provide a direct connection between downtown Des Moines and light rail. Off-street bus stops are not planned at this station.

4.2.2.2 Kent/Des Moines Station Area

The Kent/Des Moines Station could serve as the main transit hub for Highline College and the surrounding land uses. With any of the four build alternatives, local bus routes that currently terminate at the college along S 240th Street (Metro Routes 121/122 and 156) could be extended to serve the Kent/Des Moines Station. Metro Route 166 could be rerouted to the station to provide a connection to light rail. The frequency of these local bus routes, which currently operate every 15 to 30 minutes, could be increased in order to provide more service to light rail. Metro RapidRide A Line stops would still be located along SR 99 for the Kent/Des Moines Station with each alternative but could be relocated to the S 236th Lane intersection to provide better station access. Sound Transit route 574, which serves South King County and Pierce County, currently terminates at the southern terminus of the existing Central Link light rail and could also serve this station.

Station Options

Transit access to most of the station options for the Kent/Des Moines Station area would function similarly to the build alternatives. Local bus routes could be extended to serve any of the station options. The RapidRide A Line would continue to operate along SR 99, with stops provided at the S 236th Lane intersection, except for the I-5 At-Grade Station Option, where the existing stops along S 240th Street would serve the station.

4.2.2.3 S 260th Station Options

With either the potential additional S 260th West or East station option, the only transit service that would serve the station area is the RapidRide A Line, which would continue to operate near the potential station location along SR 99. RapidRide A Line stops could be relocated to facilitate a convenient transfer for riders between bus and light rail. Off-street bus stops are not planned at this station.

4.2.2.4 S 272nd Station Area

The SR 99 and I-5 to SR 99 alternatives would serve the S 272nd Redondo Station. Transit service at the station area could be similar to existing transit operations, with the potential of a new King County Metro route between Des Moines and Federal Way via S 272nd Street. Metro Route 190 could be truncated to terminate at Star Lake. RapidRide A Line would continue to operate with on-street stops along SR 99.

The I-5 and SR 99 to I-5 alternatives would serve the S 272nd Star Lake Station. Transit routes that would operate along S 272nd Street, including Metro Routes 183 and 190 as well as the potential Metro route between Des Moines and Federal Way, could be relocated to a bus loop within the station area. Service frequency on Metro Route 183 could be increased in order to feed the higher frequency and capacity of light rail service while other routes, such as Metro Route 192, could be revised to serve

TABLE 4-6
2035 Conceptual Transit Routes at Light Rail Stations

2035 No Build			2035 Build Alternatives		
	Headway (min)			Headway (min)	
Agency / Routes	Peak Period	Off-Peak	Transit Service Area	Peak Period	Off-Peak
PT 402	60	60	Same as No Build	Same as No Build	Same as No Build
PT 500	60	60	Same as No Build	Same as No Build	Same as No Build
PT 501	60	60	Same as No Build	Same as No Build	Same as No Build

Source: Metro, 2013; Sound Transit, 2013.
[a] Revised – The course of transit routes are revised either to serve a proposed station, better serve neighborhoods, or serve additional transit stops. One or a combination of these is assumed in the revision of a route.
[b] Either Metro Routes 121 or 122 (not both) would be revised to provide midday two-way service to/from Seattle.
[c] Would be revised to begin/end at Star Lake if SR 99 Alternative is selected.
[d] Proposed new Metro route providing service between Des Moines and Federal Way via 16th Avenue S/S 272nd Street/ 51st Avenue S/S 320th Street.
[e] Proposed new Metro route providing service between Milton and Federal Way via Military Road S and S 320th Street.
[f] The ST 574 would terminate at Federal Way Transit Center Station for full build, at Star Lake Station, and at Kent/Des Moines Station for the two interim conditions.
PT = Pierce Transit; ST = Sound Transit

4.2.2 Regional and Local Bus Transit Operations at Light Rail Stations

This section describes how regional and local buses would operate at each of the FWLE light rail station areas. Table 4-7 provides a summary of transit routes serving each station area.

TABLE 4-7
2035 Conceptual Transit Routes at Light Rail Stations

Station Area	Agency / Route
S 216th Street	Metro: RapidRide A Line, 156
Kent/Des Moines	Metro: RapidRide A Line, 121, 122, 156, 166
	ST: 574 (interim)
S 260th Street	Metro: RapidRide A Line
S 272nd Redondo	Metro: RapidRide A Line, Kent/Des Moines - Federal Way[a]
S 272nd Star Lake	Metro: 183, 190, 192, 193, Kent Des Moines–Federal Way[a]
	ST: 574 (interim)
Federal Way Transit Center	Metro: RapidRide A Line, 179, 181, 182, 183, 187, 193, , 901, 903, Milton–Federal Way[b], Kent/Des Moines–Federal Way[a]
	ST: 574, 577, 578
	PT: 402, 500, 501
S 320th Street Park-and-Ride	Metro: RapidRide A Line, 182, 193
	ST: 574
	PT: 402, 500, 501

Source: Metro, 2013; Sound Transit 2013.
[a] Proposed new Metro route providing service between Des Moines and Federal Way via 16th Avenue S/S 272nd St/ 51st Avenue S/S 320th Street.
[b] Proposed new Metro route providing service between Milton and Federal Way via Military Road S and S 320th Street.
PT = Pierce Transit; ST = Sound Transit

4.2.2.1 S 216th Station Options

With either the potential additional S 216th West or East station option, RapidRide A Line would continue to operate near the potential station location along SR 99. Metro Route 156 could be revised

additional neighborhoods near the station. Routes that currently serve the existing park-and-ride and would be considered redundant to light rail and could be eliminated with light rail. RapidRide A Line would continue to operate along SR 99 for these alternatives and would not serve this station. Sound Transit Route 574 could terminate at the S 272nd Star Lake Station if light rail terminates at this location under an interim condition.

4.2.2.5 Federal Way Transit Center Station Area

With any of the four build alternatives, local bus service could still be served by the existing bus loop provided at the Federal Way Transit Center, which is immediately north of where the light rail station would be located. Metro Routes 177, 178, and 197 could be eliminated or truncated. The frequency of service for routes that serve local jurisdictions, including Federal Way (Metro Route 182/187), Auburn (Metro Route 181), and Kent (Metro Route 183), could be increased to supply the higher frequency and capacity of light rail service. Additional bus layover space could be provided to facilitate the increase in transit frequency serving the station.

Station Options

The Federal Way SR 99 and I-5 station options could both operate as extensions to the existing Federal Way Transit Center, with transit routes serving both transit areas. Therefore, the conceptual bus service described for the build alternatives could still apply for either of these options.

With the Federal Way S 320th Park-and-Ride Station Option, the existing Federal Way Transit Center would continue to service bus activity. Therefore, several transit routes could serve both transit areas to create a connection between the transit center and park-and-ride. Bus routes that could serve the S 320th Street Park-and-Ride are listed in Table 4-7.

4.2.3 Transit Travel Time

The following subsections describes transit travel times for bus and rail users between regional destinations in 2035 and discusses the difference in light rail travel times between the build alternatives and station options.

4.2.3.1 Study Area Light Rail Travel Time

Light rail travel times between the Federal Way Transit Center and the Angle Lake Station are presented in Exhibit 4-3 for the build alternatives and the station options. Travel times are expected to range between 12 and 14 minutes, depending on the selected alternative and station options. In general, alignments that are shorter in length and have fewer horizontal curves (e.g., Federal Way SR 99 Station Option and Federal Way I-5 Station Option) would have slightly faster travel times. Travel times would increase approximately 40 seconds with an additional station at either S 216th Street and/or S 260th Street as a result of dwelling time at the station. The Kent/Des Moines SR 99 East Station Option would have the highest travel time due to the longer distance to travel between I-5 and SR 99.

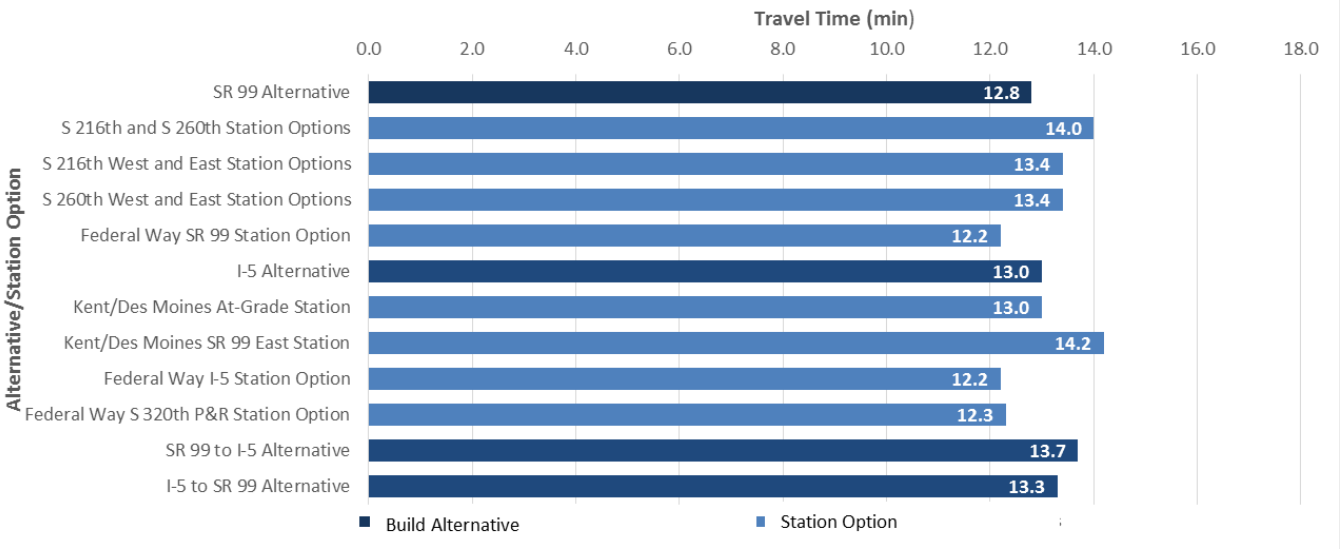


EXHIBIT 4-3
2035 FWLE Alternatives and Station Options Light Rail Travel Times: Angle Lake to Federal Way Transit Center

4.2.3.2 Transit Travel Time to Regional Destinations

Table 4-8 shows the estimated year 2035 PM peak-period transit travel times between Federal Way and key regional Puget Sound destinations. Bus travel times are based on the 95th percentile travel times from Sea-Tac Airport and Downtown Seattle (International District) to Federal Way. No Build travel times between Federal Way and regional centers east of Seattle (Bellevue and Overlake) include the travel time to Downtown Seattle via bus and then a transfer to the Link system at the International District/Chinatown Station. The travel time estimates include time required to make that transfer. The future light rail travel times account for factors such as station boarding and alighting times, transit transfer wait times, light rail train acceleration and deceleration, and system operating speeds.

TABLE 4-8
2035 PM Peak Period Transit Travel Times (minutes) and Transfers between Federal Way and Regional Centers

Origin	No Build Alternative		Build Alternatives	
	Travel Time (minutes)	# of Transfers	Travel Time (minutes)	# 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 Transit Center	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 (PSRC, 2012b). 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.

As noted, bus travel time estimates are based on the 95th percentile travel time, which reflects a travel time that is achieved in 19 out of every 20 trips. Large variations between the average travel time and the 95th percentile travel time is a reflection of the overall reliability of a trip. Use of the 95th percentile travel time also allows for a more direct comparison to highway travel times published by the Washington State Department of Transportation (WSDOT) (which reflect 95th percentile times).

A comparison of travel times for the No Build and build alternatives shows a range of travel time savings for commuting between many regional destinations. The light rail travel time between Downtown Seattle to Federal Way would be 2 minutes faster than under the No Build Alternative, and the travel time savings between Federal Way and Bellevue would be close to 7 minutes. The largest travel time improvement would be between the Sea-Tac Airport and Federal Way. The travel time from Federal Way to SeaTac Airport is forecasted to be 42 minutes 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 impaired by vehicular traffic, resulting in a 16-minute travel time in the build alternatives.

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 can involve transfer.
- Project Riders – Total boardings and alightings that occur in the study area
- New Transit Riders – Any person who shifted to transit from a non-transit mode.

Express bus service between Federal Way and Downtown Seattle (International District) would have a 49-minute travel time with the No Build Alternative. These routes have infrequent stops and use I-5 exclusively to 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. Transit travel times between Eastside destinations and the Federal Way Transit Center would improve under the light rail alternatives by 6 to 7 minutes. A transfer would be required in the No Build Alternative and build alternatives for Eastside destinations; however, the transfer between Central Link and East Link light rail would occur inside the Downtown Seattle Transit Tunnel, resulting in a shorter and more desirable transfer. A comparable bus to rail transfer would occur between the surface streets and the tunnel by 2035 because the tunnel will be used for light rail only.

While travel times from the Federal Way Transit Center to the International District are documented in Table 4-8, a greater travel time savings would be realized as light rail continues north and serves 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 further slowed by traffic signals and congestion, which could result in higher travel times compared with light rail.

For Seattle destinations north of downtown, such as the University of Washington and Northgate, light rail would save at least a 10 minutes of travel time 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.

4.2.4 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 at the time the environmental analysis was being conducted. 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.

Therefore, the land use data used in the PSRC travel demand model represent 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 the 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.

4.2.4.1 Full Length Alternatives

Table 4-9 shows the 2035 daily transit ridership for the No Build Alternative and build alternatives in the project corridor. Table 4-9 also documents the expected daily ridership and change in the number of new transit riders with the build alternatives. Total daily trips (ridership) account for riders on the FWLE, regardless of where they would board the train.

TABLE 4-9
2035 FWLE Weekday Daily 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 Daily Transit Trips[c]	602,000	609,500	609,500	609,500	609,500	609,500–610,000	610,000
Total Daily Systemwide 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
2035 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] Total daily system-wide boardings includes transfers between FWLE and the East Link. Therefore, the change in total boardings between the No Build Alternative and build alternatives is higher than the change in total boardings at the proposed FWLE stations.
n/a = not applicable

The FWLE would generate between 25,500 and 27,500 daily riders and up to 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.

Average 2035 weekday and PM peak period (3 p.m. to 6 p.m.) station boardings are shown in Exhibit 4-4 for the build alternatives and in Exhibit 4-5 for the 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 4-9 include all trips to or from any FWLE station. In these exhibits, potential stations are listed north to south, and the size of the circle represents the estimated number of the boardings at each station. The ridership at each station would vary, depending on the alternative and combination of stations.

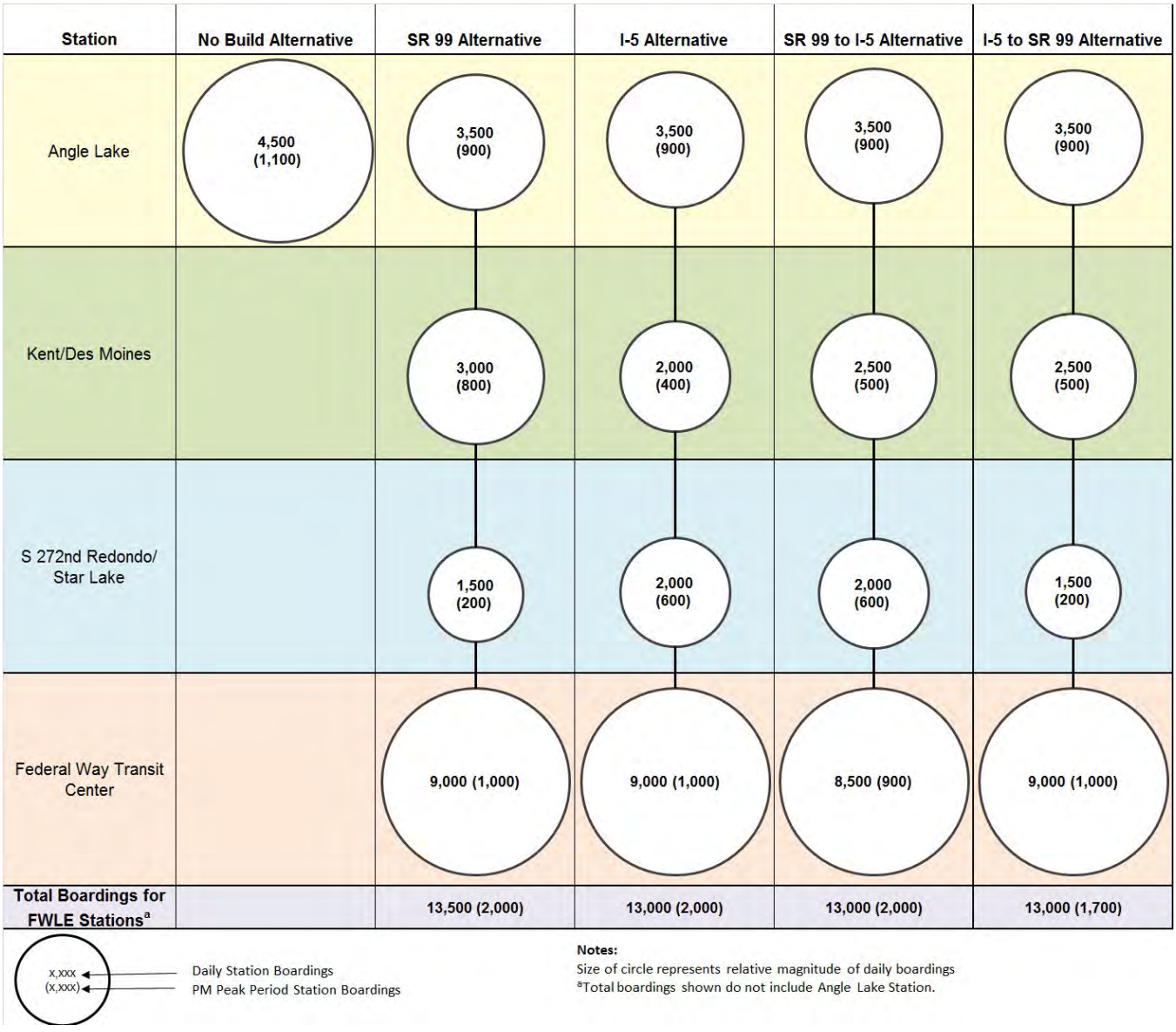


EXHIBIT 4-4
2035 FWLE Build Alternative Weekday Station Boardings

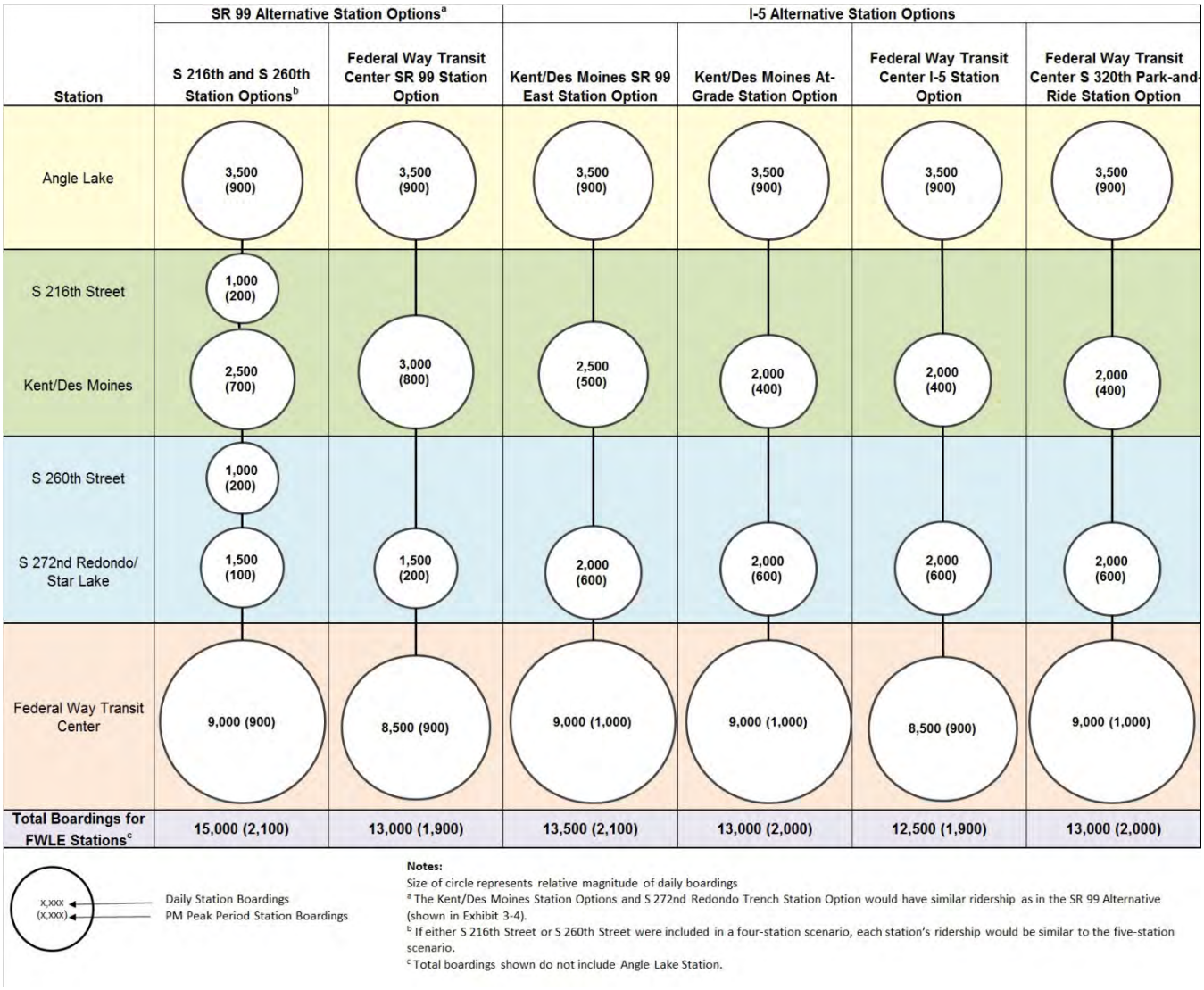


EXHIBIT 4-5
2035 FWLE Light Rail Station Options Weekday Station Boardings

For the build alternatives, total daily boardings in the study corridor would range from 13,000 to 13,500 boardings per day (see Exhibit 4-4). At the Angle Lake Station, daily station boardings is expected to be 4,500 boardings per day (1,100 boardings in PM peak period) under the No Build Alternative and daily station boardings is expected to be 3,500 boardings per day with any of the build alternatives or station options, a decrease of 1,000 boardings per day compared with the No Build Alternative. There would be minimal differences between the alternatives because they would have the same number of stations and the lengths are similar. When considering station options, the highest ridership potential would occur with the SR 99 Alternative with five stations, with 15,000 boardings per day, and the lowest would be the I-5 Alternative with the Federal Way I-5 Station Option, with 12,500 boardings per day (see Exhibit 4-5). Although the addition of stations would add to the overall ridership, a portion of those additional station boardings would come from the other stations.

The differences in boardings among the build alternatives and station options would be influenced by a combination of factors, including the density of population and employment around the station, local

and regional transit service connectivity, proximity to Metro RapidRide stops, station access and walkability, the amount of parking stalls at the station facilities, and the expected light rail operating speeds. In general, the ridership forecasts for the build alternatives are relatively similar because the station locations and their features, transit service connections, and light rail travel times would be similar, although there are a few exceptions. For example, the station boardings for the I-5 station options at the Kent/Des Moines Station area would generally be two-thirds of the boardings at the SR 99 Alternative station options. This would be due primarily to the longer walking distance from the I-5 Kent/Des Moines Station to SR 99 and Highline College.. Furthermore, as noted in Section 4.2.1, the RapidRide A Line would continue to operate on SR 99 and not directly serve the I-5 Kent/Des Moines Station. While RapidRide A Line riders may not access the Link system at the I-5 Kent/Des Moines Station, they would likely continue to use transit and access the Link system at another nearby station. In a comparison, 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 4-4).

4.2.4.2 Interim Terminus Conditions

Tables 4-10 and 4-11 document the expected corridor transit ridership and change in new transit riders with the build alternatives in the Kent/Des Moines Station and S 272nd Station interim conditions, respectively. Under all the FWLE interim terminus conditions, the number of regional transit trips would increase slightly. With a Kent/Des Moines interim terminus station, up to 1,000 new transit riders would be expected, and up to 2,000 new transit riders would be expected with the S 272nd Street interim terminus stations. The SR 99 Alternative would have the highest total corridor project riders (9,000), and the I-5 Alternative would have the lowest boardings (5,500). Under the S 272nd Street Station interim terminus condition, the SR 99, SR 99 to I-5, and I-5 to SR 99 alternatives would have slightly more project riders (12,500) than the I-5 Alternative (10,000).

TABLE 4-10
2035 Kent/Des Moines Station Interim Terminus Weekday Ridership and Project Riders

Measure	2035 No Build	2035 Build Alternative			
		Kent/Des Moines Station Interim Terminus			
		SR 99	I-5	SR 99 to I-5	I-5 to SR 99
Daily Transit Trips	602,000	603,000	603,000	603,000	603,000
Daily Systemwide Link Boardings	280,000	284,000	283,000	284,000	284,000
FWLE 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 4-11
2035 S 272nd Station Interim Terminus Weekday Ridership and Project Riders

Measure	2035 No Build	2035 Build Alternative			
		S 272nd Station Interim Terminus			
		SR 99	I-5	SR 99 to I-5	I-5 to SR 99
Daily Transit Trips	602,000	603,500	603,500	604,000	604,000
Daily Systemwide Link Boardings	280,00	288,000	286,000	288,000	288,000
FWLE 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

Table 4-12 presents the 2035 interim terminus station boardings for the four build alternatives. The expected boardings under the Kent/Des Moines Station interim terminus condition would vary between 3,000 and 4,500, depending on the build alternatives. The build alternatives with a station located closer to SR 99 would facilitate a more convenient transfer between light rail and the RapidRide A Line, thereby increasing light rail ridership. For example, with the I-5 Alternative's SR 99 East Station option (not shown in Table 4-12), the expected boardings would be similar to the SR 99 Alternative and its station options.

TABLE 4-12
2035 Interim Terminus Weekday Station Boardings

Interim Terminus Station	Build Alternative	Station Boardings	
		Kent/Des Moines[a]	S 272nd (Redondo or Star Lake)
Kent/Des Moines	I-5	3,000 – 3,500	n/a
	SR 99	4,500	n/a
	I-5 to SR 99	4,500	n/a
	SR 99 to I-5	4,500	n/a
S 272nd (Redondo or Star Lake Stations)	I-5	1,500	4,000
	SR 99	3,000	3,500
	I-5 to SR 99	3,000	4,000
	SR 99 to I-5	3,000	4,000

Source: Sound Transit, 2012.

[a] The I-5 Alternative with the Kent/Des Moines SR 99 East Station Option would have higher boardings than the other Kent/Des Moines I-5 Station Options and be similar to the Kent/Des Moines boardings with the SR 99 Alternative. All other Kent/Des Moines station options would have similar station boardings as shown for the respective SR 99 or I-5 alternatives

Under the S 272nd Street Station interim condition, the Redondo and Star Lake Stations would have similar boardings (3,500 to 4,000) with any of the build alternatives. Similar to the full length project scenarios, the difference in boardings between the 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, station access and walkability, the number of parking stalls at the stations, and expected light rail operating speeds.

4.2.5 Station Mode of Access for Full-Length Build Alternatives

Station area travel mode of access was analyzed for each type of person trip at a station. Mode of access can be characterized by the following types of trips:

- Automobile (includes park-and-ride trips as well as passenger drop-off/pick-up)
- Transit (bus to rail, rail to bus and bus to bus)
- Nonmotorized (includes both walking and bicycling to transit)

In addition to station boarding information, the Sound Transit Ridership Model provides an estimate of the various modes of access that would occur at each station except passenger drop-off/pick-up trips. Based on research from the Tukwila International Boulevard Station, it was assumed that 10 percent of all transit (rail and bus) alightings during the PM peak hour would be passenger drop-off/pick-up trips. These trips were reallocated from the other travel modes described above. The model also provides data regarding park-and-ride trips based on the relative attractiveness for automobile access, available parking at the station area, and accessibility.

Exhibit 4-6 shows the expected mode of access to each station area during the PM peak hour for the four build alternatives and also highlights how the mode of access would change with the station options. The pie chart sizes on Exhibit 4-6 are indicative of the relative number of boardings at each station area. The information shown in Exhibit 4-6 represents the total station area activity, including all trips to and from transit, which includes both light rail and buses. These totals are different than those shown in Exhibits 4-4 and 4-5, which only include boardings to light rail. Detailed mode share percentages are provided in Appendix C, Existing and Future Transit Routes and Level of Service.

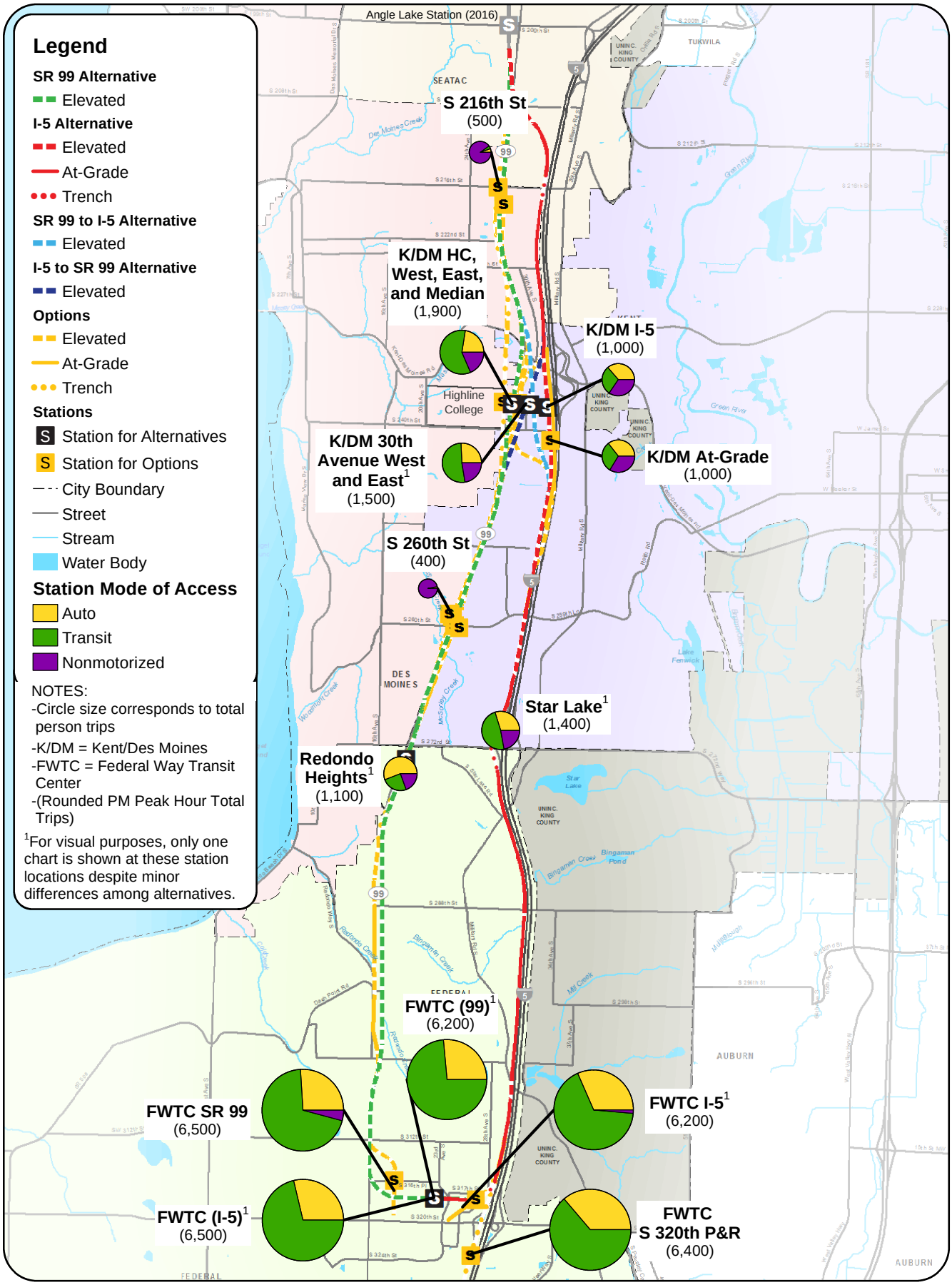
4.2.5.1 S 216th Station Options

The mode of access at either the potential additional S 216th West or East station option is expected to be primarily nonmotorized because transit feeder service to this station area would be limited to two bus routes and no parking is proposed at the station. While some transit transfers would occur at this station, likely riders on these bus routes would choose to transfer to light rail at other light rail stations. As noted above, a small portion of the trips at this station would be passenger drop-off/pick-up trips, representing the only type of automobile access trips at this station.

4.2.5.2 Kent/Des Moines Station

At the Kent/Des Moines Station, a majority of the station activity would involve transit transfers for all station locations except for the I-5 Station and I-5 At-Grade Station Option. This would be due to the proximity of the RapidRide A Line stops adjacent to the station along SR 99 and the local bus feeder routes serving the station area. The I-5 Alternative station would be located approximately 1/4 mile from SR 99 and the RapidRide A Line, making this transit transfer less desirable.

The magnitude of nonmotorized and automobile-based trips is forecasted to be similar across all light rail alternatives at this station area.



Data Sources: King County (2013)

N

0 0.5 1 2 Miles

EXHIBIT 4-6
2035 Build Alternatives Station
PM Peak Hour Mode of Access
Federal Way Link Extension

4.2.5.3 S 260th Station Options

The mode of access at either the potential additional S 260th West or East station option is expected to be predominantly nonmotorized. Transit feeder service to this station area would be limited to the RapidRide A Line. While some transit transfer would occur near this station area, the number of riders who would board between S 272nd and S 260th streets would be limited because of the fairly short distance between the two stations. A small portion of the trips at this station would be passenger drop-off/pick up trips, representing the only type of automobile access trips at this station.

4.2.5.4 S 272nd Star Lake Station

The mode of access to the S 272nd Star Lake Station is expected to be very similar with either the I-5 Alternative or the SR 99 to I-5 Alternative. Similar to the Kent/Des Moines Station, local and regional transit routes would serve this station area either inside the station area or adjacent to the station, with bus stops located on the I-5 southbound off-ramp and I-5 northbound on-ramp with S 272nd Street. Feeder bus service would provide coverage to surrounding neighborhoods and communities. Approximately half of the 1,400 total PM peak hour trips would access the station via transit.

4.2.5.5 S 272nd Redondo Station

The majority of trips that would access the S 272nd Redondo Station would be via auto because of the relatively few transit routes assumed to serve the station. For that reason, the percentage of trips via auto would be more substantial than compared with the S 272nd Star Lake or Kent/Des Moines station options. Transit feeder service at this station would be limited to RapidRide A Line and a planned local Metro bus route, thus resulting in fewer transit transfers. Therefore, there would be fewer overall PM peak hour trips at this station than compared with the S 272nd Star Lake Station (1,100 at Redondo compared to 1,400 at Star Lake).

4.2.5.6 Federal Way Transit Center Station

The Federal Way Transit Center station would continue to serve as a major regional transit center with any of the build alternatives and is forecasted to operate with a very high percentage of transit transfers and automobile-based trips. Although land uses in this station area are forecasted to change from the current commercial focus to more mixed use, the frequent and high level of connecting transit service and connections with the regional highway system, the predominant mode of access at this station would be transit and automobile trips with a smaller share of pedestrian- and bicycle trips. This station would operate as a terminus location and attract more persons who would be willing to drive from south King County and north Pierce County jurisdictions such as Tacoma, Lakewood, and Puyallup. Pedestrian-based trips would be negligible.

The Federal Way SR 99 and I-5 station options would have similar mode of access percentages compared to the Federal Way station options located near the existing Federal Way Transit Center. However, with both of these station options, the proportion of nonmotorized trips would slightly increase due to land uses near the station that could generate higher levels of nonmotorized activity.

The Federal Way S 320th Park-and-Ride Station Option would generate a higher percentage of auto-based trips compared to the other Federal Way station options. At this site, a larger proportion of

parking spaces would be available for light rail users, thus resulting in a higher automobile demand. In addition, fewer feeder transit routes would serve the station area, resulting in a lower percentage of transit transfers.

4.2.6 Station Mode of Access for the Interim Terminus Conditions of the Build Alternatives

Exhibit 4-7 shows the expected mode of access to each station area for the four build alternatives under the interim terminus conditions.

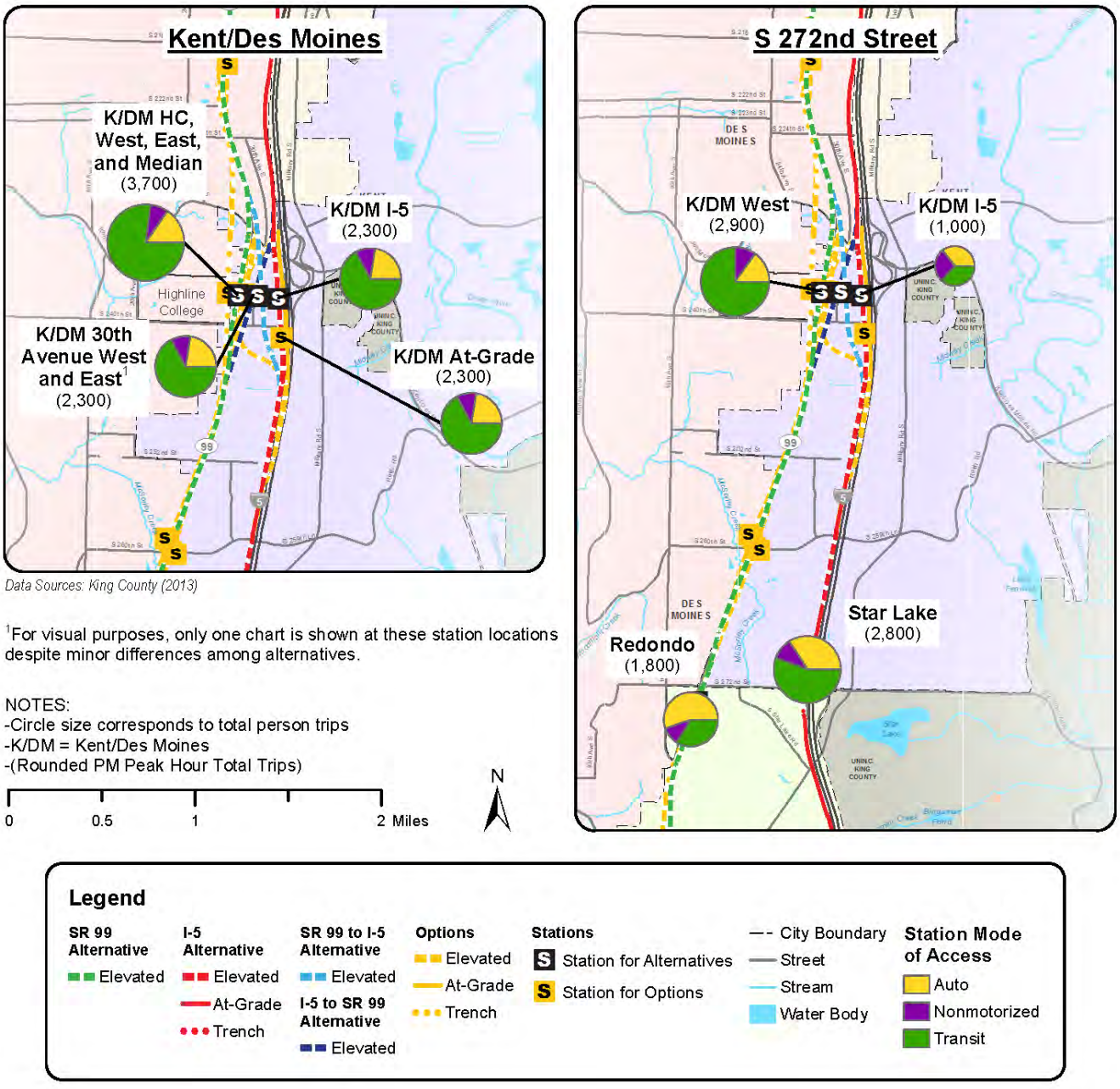


EXHIBIT 4-7
2035 Light Rail Alternatives Interim Terminus Conditions Station Mode of Access Person Trips

4.2.6.1 Kent/Des Moines Station

Under the Kent/Des Moines Station interim terminus condition, the station mode of access would have a greater portion of transit transfer trips compared to the full-length light rail alternatives. More bus-to-rail transfers from feeder bus routes, including the Metro RapidRide A Line and Sound Transit Route 574, would be expected. The park-and-ride capacity at this location would be greater than with the full-length build alternatives; therefore, the magnitude of automobile-based trips would also increase.

4.2.6.2 S 272nd Street Station

Similar to the Kent/Des Moines Station, a greater percentage of trips would be transit transfer trips at the selected S 272nd Street Station (Star Lake or Redondo). The light rail extension to S 272nd Street would likely result in mode of access results at the Kent/Des Moines Station, similar to the full-length build alternatives results at the Kent/Des Moines Station.

4.2.7 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 in Section 3.2.4.

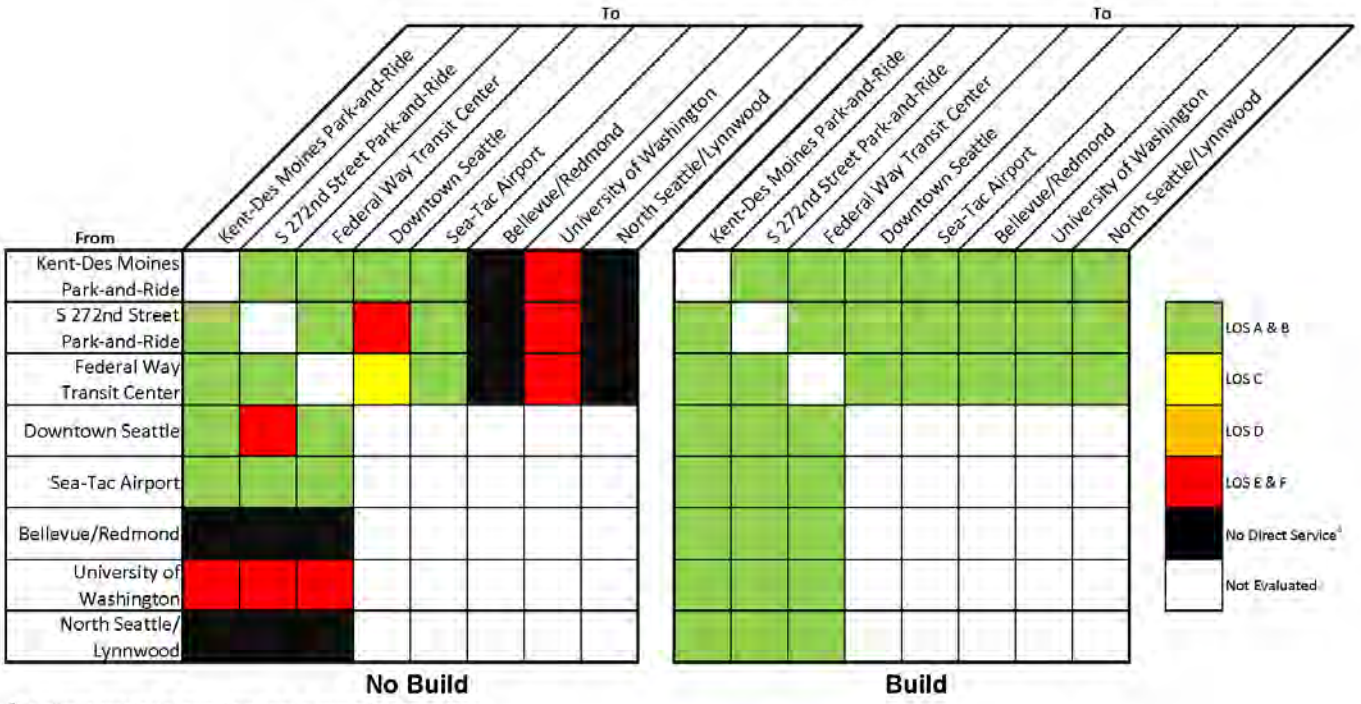
4.2.7.1 Service Frequency

Exhibit 4-8 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 outside of Downtown Seattle would generally be limited and only be provided in the southbound (peak) direction of travel. Direct northbound transit service (not requiring a transfer) between the FWLE study area and North Seattle (University of Washington, Northgate, and Lynnwood) 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.

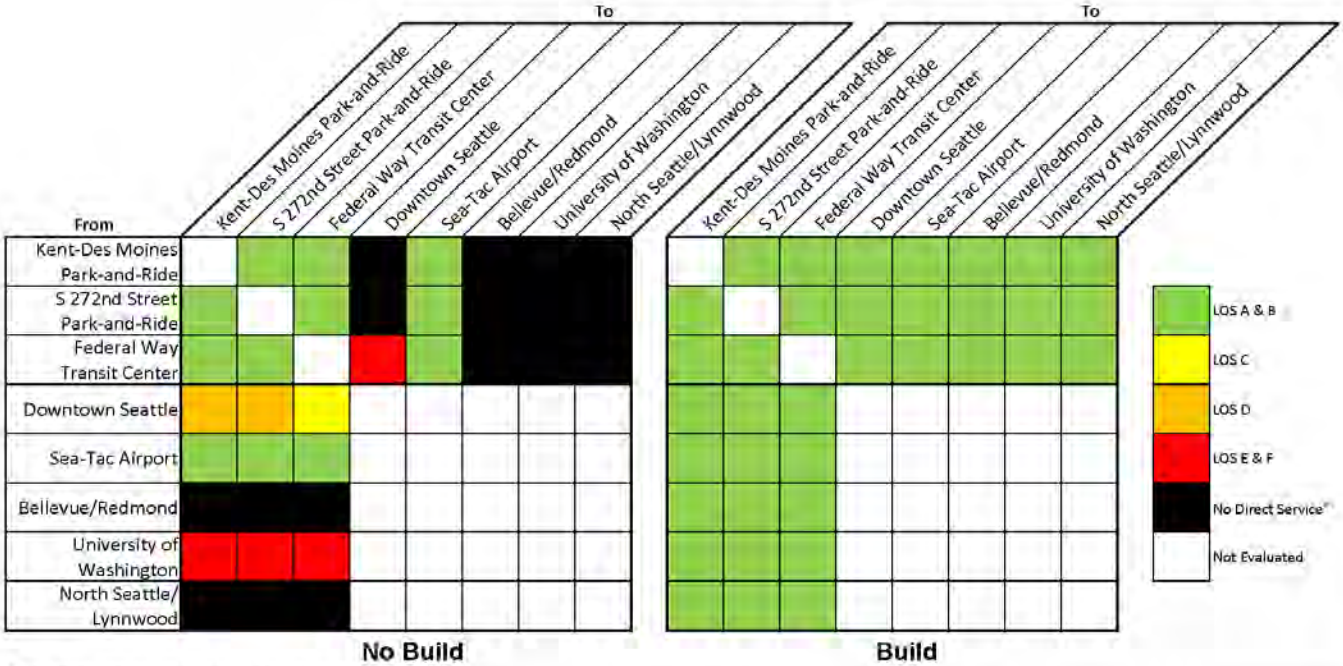
4.2.7.2 Hours of Service

Exhibit 4-9 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. Eastside destinations (Downtown Bellevue and Redmond) and North Seattle/Lynnwood would not have direct transit service with the No Build Alternative. With the build alternatives, continuous, two-way service for 20 hours would result in LOS A for all evaluated origin-destination pairs.



[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 4-8
2035 No Build Alternative and Build Alternatives PM Peak Hour Transit Level of Service for Service Frequency



[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 4-9
2035 No Build Alternative and Build Alternatives Transit Level of Service for Hours of Service

4.2.7.3 Passenger Load

Passenger load LOS for the No Build and build alternatives was analyzed using estimated PM peak period passenger volume forecasts from the Sound Transit ridership model (Sound Transit, 2012). Table 4-13 compares the passenger load LOS for the No Build and build alternatives at the three project screenline locations. Integrating the conceptual bus service plan and estimated passenger loads, a LOS was calculated in accordance with the *Transit Capacity and Quality Service Manual* (TCQSM) guidelines. A detailed assessment of each transit route LOS is also provided in Appendix C, Existing and Future Transit Routes and Level of Service. In the PM peak period under the No Build Alternative, transit passenger load is expected to be at LOS A or LOS B in the northbound direction of travel. Traveling southbound from trip origins such as Downtown Seattle and the University of Washington, the passenger load LOS is expected to be LOS D with the No Build Alternative. On average, buses would exceed their seated capacity during the PM peak period, with many key peak routes from Seattle operating at LOS E or LOS F (e.g., Metro Route 179, Sound Transit Route 574). With the build alternatives, additional transit capacity would be provided that accommodates the expected ridership demand. As a result, bus transit service is expected to have a passenger load LOS A, and light rail would have LOS A to C.

TABLE 4-13
2035 No Build and FWLE PM Peak-Hour Level of Service for Passenger Load

Screenline Location	Direction	No Build Alternative	Build Alternatives	
		Bus LOS	Bus LOS	Light Rail LOS
South of S 200th Street	NB	B	A	A
	SB	D	A	C
North of S 272nd Street	NB	A	A	A
	SB	D	A	C
South of S 312th Street	NB	A	A	A
	SB	D	A	B

Source: Sound Transit, 2012.

4.2.7.4 Reliability and On-time Performance

The future reliability of bus service for the No Build Alternative is expected to degrade compared with existing conditions. Current bus service already operates at LOS F at most transit hubs in the study area during the PM peak hour. 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. Furthermore, crowded buses result in longer boarding and alighting times, and lead to more delay and lower schedule reliability at bus stops. If buses are at capacity, as many are forecasted to be in the future, bus drivers might skip picking up additional passengers. 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 shift to another mode of travel. For routes with more frequent headways, such as the RapidRide A Line, transit reliability problems would be likely.

With the build alternatives, light rail would provide more reliable transit service because it would operate in an exclusive right-of-way with no at-grade vehicle crossing conflicts in the study area. 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.

4.2.7.5 Transit Transfers

Transfers include trips between multiple buses or between a bus and light rail/commuter rail. 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. Transfers can be used successfully in a transit system by providing reliable, quick transfer connections. In general, 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, are considered "multi-centered" route hubs where bus routes converge so transfers can be made to multiple destinations in one location. As shown in Table 4-14, 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.

TABLE 4-14
Transit Transfer Rates for the No Build Alternative and Build Alternatives (2035)

Measure of Effectiveness	No Build Alternative	Build Alternatives		
		Full Length	Interim – Kent/ Des Moines	Interim – S 272nd Street
Daily Transit Boardings	885,500	899,000- 902,500	886,000 - 888,000	889,000- 891,000
Daily Transit Trips	602,000	609,500 - 610,000	603,000	603,500 - 604,000
Transfer Rate	1.47	1.48	1.47	1.48

Source: Sound Transit, 2012.

4.3 Arterial and Local Street Operations

This section describes the effects of the No Build and build alternatives on arterial and local streets in the study area. This section includes 2035 traffic volume forecasts; expected traffic generated at stations; intersection operations; and changes in access, circulation, traffic control, and traffic safety.

Key findings and observations include the following:

- The S 272nd Redondo and S 272nd Star Lake stations 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.
- Vehicle trip generation at stations with park-and-rides would range from approximately 300 additional trips per day at the Kent/Des Moines Station up to 780 additional trips per day with the Federal Way S 320th Park-and-Ride Station Option.

- 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.

Up to seven intersections could operate worse than in the No-Build Alternative 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.

4.3.1 Traffic Forecasts

4.3.1.1 No Build Alternative

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 and were assigned to the 2035 transportation network. Intersection traffic volumes were developed by using National Cooperative Highway Research Program 255 methodology, which uses existing turn movements and growth derived from the regional travel demand model to develop 2035 AM and PM peak hour intersection turning movement volumes. 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. Additional information is provided in Appendix A, Transportation Technical Analysis Methodology.

4.3.1.2 Build Alternatives

For the build alternatives, the anticipated vehicular trip generation was calculated at each station based on information from Sound Transit's Ridership Model (Sound Transit, 2012) and station characteristics. The total trip generation is comprised of three different vehicle trip types: park-and-ride vehicle trips, passenger drop-off/pick-up trips, and any potential changes to bus service. The change in vehicle trips was applied to No Build Alternative traffic volume forecasts (described in Section 4.1) to develop a conservative estimate of the traffic volumes with the build alternatives.

Table 4-15 shows the existing and proposed park-and-ride capacities associated with each station area by build alternative. Park-and-ride lots would be provided at the three main stations, and the potential additional stations at S 216th Street and S 260th Street would not include park-and-ride spaces. At the Kent/Des Moines Station, the assumed parking capacity is expected to change between the interim and full-length conditions. Under the interim condition, approximately 1,000 new parking stalls are assumed. As light rail is extended south beyond the Kent/Des Moines Station, a portion of the station parking area could be redeveloped through the removal of some portion of the interim parking, which could result in approximately 500 total parking stalls at the Kent/Des Moines Station in the long term. For the S 272nd Redondo and Star Lake stations, the increase in parking stalls is assumed to be the same in both the interim and full length conditions.

To provide a conservatively high estimate of traffic impacts near the stations, all stations that include a park-and-ride were assumed to have full parking lots within a 3-hour peak period. For the year 2035, it was assumed that for each improved existing park-and-ride facility, unused spaces in the existing condition that become used under a build alternative, in addition to additional stalls provided by the project, would be available for station users.

TABLE 4-15
Existing and Proposed Park-and-Ride Capacity in spaces and Available Parking for Transit Riders

Station Area	Alternative	Park-and-Ride Capacity			Existing Underutilized Parking[b,c]	Total Available Parking for FWLE[d]
		Existing	Proposed Increase[a]	With FWLE[a]		
S 216th Street[e]	SR 99, SR 99 to I-5	N/A	0	0	N/A	0
Kent/Des Moines	SR 99, I-5, SR 99 to I-5, I-5 to SR 99	N/A	+500 (+1,000)	500 (1,000)	N/A	+500 (+1,000)
S 260th Street[e]	SR 99, I-5 to SR 99	N/A	0	0	N/A	0
S 272nd Redondo	SR 99, I-5 to SR 99	697	+700 (+700)	1,397 (1,397)	643	+1,343 (+1,343)
S 272nd Star Lake	I-5, SR 99 to I-5	540	+700 (+700)	1,240 (1,240)	229	+929 (+929)
Federal Way Transit Center SR 99	SR 99	N/A	+400 (N/A)	400 (N/A)	N/A	+400 (N/A)
Federal Way Transit Center	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)
Federal Way Transit Center I-5	I-5	N/A	+400 (N/A)	400 (N/A)	N/A	+400 (N/A)
Federal Way Transit Center S 320th Park-and-Ride	I-5	877	+400 (N/A)	1,277 (N/A)	485	+885 (N/A)

[a] Full length build alternative parking spaces shown outside parenthesis. Interim conditions park-and-ride capacity shown inside parenthesis.
[b] Source: Metro, 2012b.
[c] These are existing parking spaces not generally occupied at existing park-and-ride facilities.
[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 potential additional stations; only includes passenger drop-off/pickup and bus transit vehicle trips.

Trip generation at each station would not be constant during the 3-hour peak period; rather, more traffic would occur during a peak hour. For this traffic analysis, which analyzed only the worst peak hour, slightly less than half (45 percent) of the total trips were assumed to occur during the peak hour. These rates were determined from a review of existing park-and-ride data in the study area, an assessment of the Tukwila International Boulevard light rail station, and the Institute of Transportation Engineers (ITE) *Trip Generation Manual* (ITE, 2012).

Passenger drop-off/pick-up trips were calculated differently than park-and-ride trips and are dependent on the stations' total ridership and mode of access. Data from the Tukwila International Boulevard Station indicates that approximately 10 percent of light rail riders are dropped off or picked up during the PM peak period. This same percentage was applied to each of the FWLE stations. Bus service at each station was based on the conceptual bus service plans (see Section 4.2.1) developed by Metro and Sound Transit service planners, which included potential changes to bus headways and/or routing to serve the appropriate station areas.

Table 4-16 shows the total vehicle trip generation associated with each station option with the full-length alternatives. Table 4-17 shows the total vehicle trip generation associated with a Kent/Des Moines interim condition, while Table 4-18 shows the total vehicle trip generation associated with a

S 272nd interim condition. In general, station areas that would have the greatest increase in parking supply would also have the greatest increase in vehicular traffic. The number of vehicle trips at the Kent/Des Moines Station would not vary substantially among the build alternatives or station options. as the parking and transit services would be similar among the alternatives and station options. Among the build alternatives, the S 272nd Redondo Station would have the highest increase in vehicle trip generation because it is currently underused and the project is proposing to add 700 stalls to the existing facility. Values listed outside the parenthesis in Tables 4-16 through 4-18 represent the No Build Alternative and the number within the parenthesis represents the change from the No Build with the build alternatives.

TABLE 4-16
AM and PM Peak-Hour Vehicle Trip Generation Summary by Alternative and Station Option (Full Length)

Station Area	Alternative	Station /Station Options	Trip Type	AM Peak Hour			PM Peak Hour		
				In	Out	Total	In	Out	Total
Kent/Des Moines	SR 99	SR 99 West/ Highline College Campus, SR 99 Median, SR 99 East	Park-and-ride	0 (169)	0 (56)	0 (225)	0 (56)	0 (169)	0 (225)
			Drop-off/Pick-Up	0 (41)	0 (41)	0 (82)	0 (41)	0 (41)	0 (82)
			Buses	0 (18)	0 (18)	0 (36)	0 (18)	0 (18)	0 (36)
			Total	**0 (228)**	**0 (115)**	**0 (343)**	**0 (115)**	**0 (228)**	**0 (343)**
	I-5	I-5 /At-Grade	Park-and-ride	0 (169)	0 (56)	0 (225)	0 (56)	0 (169)	0 (225)
			Drop-off/Pick-Up	0 (25)	0 (25)	0 (50)	0 (25)	0 (25)	0 (50)
			Buses	0 (18)	0 (18)	0 (36)	0 (18)	0 (18)	0 (36)
			Total	**0 (212)**	**0 (99)**	**0 (311)**	**0 (99)**	**0 (212)**	**0 (311)**
		SR 99 East	Park-and-ride	0 (169)	0 (56)	0 (225)	0 (56)	0 (169)	0 (225)
			Drop-off/Pick-Up	0 (41)	0 (41)	0 (82)	0 (41)	0 (41)	0 (82)
			Buses	0 (18)	0 (18)	0 (36)	0 (18)	0 (18)	0 (36)
			Total	**0 (228)**	**0 (115)**	**0 (343)**	**0 (115)**	**0 (228)**	**0 (343)**
	SR 99 to I-5	30th Ave. East	Park-and-ride	0 (169)	0 (56)	0 (225)	0 (56)	0 (169)	0 (225)
			Drop-off/Pick-Up	0 (35)	0 (35)	0 (70)	0 (35)	0 (35)	0 (70)
			Buses	0 (18)	0 (18)	0 (36)	0 (18)	0 (18)	0 (36)
			Total	**0 (222)**	**0 (109)**	**0 (331)**	**0 (109)**	**0 (222)**	**0 (331)**
	I-5 to SR 99	30th Ave. West	Park-and-ride	0 (169)	0 (56)	0 (225)	0 (56)	0 (169)	0 (225)
			Drop-off/Pick-Up	0 (32)	0 (32)	0 (64)	0 (32)	0 (32)	0 (64)
			Buses	0 (18)	0 (18)	0 (36)	0 (18)	0 (18)	0 (36)
			Total	**0 (219)**	**0 (106)**	**0 (325)**	**0 (106)**	**0 (219)**	**0 (325)**
S 272nd Redondo	SR 99	S 272nd Redondo	Park-and-ride	20 (453)	7 (153)	27 (604)	7 (153)	20 (453)	27 (604)
			Drop-off/Pick-Up	9 (28)	9 (28)	18 (56)	9 (28)	9 (28)	18 (56)
			Buses	12 (4)	14 (2)	26 (6)	14 (2)	12 (4)	26 (6)
			Total	**41 (485)**	**30 (183)**	**71 (666)**	**30 (183)**	**41 (485)**	**71 (666)**
	I-5 to SR 99	S 272nd Redondo	Park-and-ride	20 (453)	7 (153)	27 (604)	7 (153)	20 (453)	27 (604)
			Drop-off/Pick-Up	9 (29)	9 (29)	18 (58)	9 (29)	9 (29)	18 (58)
			Buses	12 (4)	14 (2)	26 (6)	14 (2)	12 (4)	26 (6)
			Total	**41 (486)**	**30 (184)**	**71 (668)**	**30 (184)**	**20 (486)**	**71 (668)**
S 272nd Star Lake	I-5	S 272nd Star Lake	Park-and-ride	105 (314)	35 (105)	140 (419)	35 (105)	105 (304)	140 (419)
			Drop-off/Pick-Up	4 (31)	4 (31)	8 (62)	4 (31)	4 (31)	8 (62)
			Buses	30 (0)	30 (10)	60 (0)	30 (0)	30 (0)	60 (0)
			Total	**139 (345)**	**69 (136)**	**208 (481)**	**69 (136)**	**139 (345)**	**208 (481)**

TABLE 4-16

AM and PM Peak-Hour Vehicle Trip Generation Summary by Alternative and Station Option (Full Length)

Station Area	Alternative	Station /Station Options	Trip Type	AM Peak Hour			PM Peak Hour		
				In	Out	Total	In	Out	Total
	SR 99 to I-5	S 272nd Star Lake	Park-and-ride	105 (314)	35 (105)	140 (419)	35 (105)	105 (304)	140 (419)
			Drop-off/Pick-Up	4 (29)	4 (29)	8 (58)	4 (29)	4 (29)	8 (58)
			Buses	30 (0)	30 (0)	60 (0)	30 (0)	30 (0)	60 (0)
			Total	**139 (343)**	**69 (134)**	**208 (477)**	**69 (134)**	**139 (343)**	**208 (477)**
Federal Way Transit Center	SR 99	Federal Way Transit Center	Park-and-ride	398 (139)	133 (46)	531 (185)	133 (46)	398(139)	531 (185)
			Drop-off/Pick-Up	32 (163)	32 (163)	63 (326)	32 (163)	32 (163)	63 (326)
			Buses	53 (-10)	57 (-10)	110 (-20)	57 (-10)	53 (-10)	110 (-20)
			Total	**483 (292)**	**222 (199)**	**705 (491)**	**222 (199)**	**483 (292)**	**705 (491)**
		Federal Way SR 99	Park-and-ride	398 (139)	133 (46)	531 (185)	133 (46)	398(139)	531 (185)
			Drop-off/Pick-Up	32 (143)	32 (143)	63 (286)	32 (143)	32 (143)	63 (286)
			Buses	53 (-10)	57 (-10)	110 (-20)	57 (-10)	53 (-10)	110 (-20)
			Total	**483 (272)**	**222 (179)**	**705 (451)**	**222 (179)**	**483 (272)**	**705 (451)**
	I-5	Federal Way Transit Center	Park-and-ride	398 (139)	133 (46)	531 (185)	133 (46)	398(139)	531 (185)
			Drop-off/Pick-Up	32 (173)	32 (173)	63 (346)	32 (173)	32 (173)	63 (346)
			Buses	53 (-10)	57 (-10)	110 (-20)	57 (-10)	53 (-10)	110 (-20)
			Total	**483 (302)**	**222 (209)**	**705 (511)**	**222 (209)**	**483 (302)**	**705 (511)**
		Federal Way I-5	Park-and-ride	398 (139)	133 (46)	531 (185)	133 (46)	398(139)	531 (185)
			Drop-off/Pick-Up	32 (147)	32 (147)	63 (294)	32 (147)	32 (147)	63 (294)
			Buses	53 (-10)	57 (-10)	110 (-20)	57 (-10)	53 (-10)	110 (-20)
			Total	**483 (276)**	**222 (183)**	**705 (459)**	**222 (183)**	**483 (276)**	**705 (459)**
		Federal Way S 320th Park-and-Ride[a]	Park-and-ride	146 (299)	49 (100)	194 (399)	49 (100)	146 (299)	194 (399)
			Drop-off/Pick-Up	27 (186)	27 (186)	54 (372)	27 (186)	27 (186)	54 (372)
			Buses	14 (4)	18 (2)	32 (6)	18 (2)	14 (4)	32 (6)
			Total	**187 (489)**	**94 (288)**	**281 (777)**	**94 (288**	**187 (489)**	**281 (777)**
	SR 99 to I-5	Federal Way Transit Center	Park-and-ride	398 (139)	133 (46)	531 (185)	133 (46)	398 (139)	531 (185)
			Drop-off/Pick-Up	32 (163)	32 (163)	63 (326)	32 (163)	32 (163)	63 (326)
			Buses	53 (-10)	57 (-10)	110 (-20)	57 (-10)	53 (-10)	110 (-20)
			Total	**483 (292)**	**222 (199)**	**705 (491)**	**222 (199)**	**483 (292)**	**705 (491)**
	I-5 to SR 99	Federal Way Transit Center	Park-and-ride	398 (139)	133 (46)	531 (185)	133 (46)	398(139)	531 (185)
			Drop-off/Pick-Up	32 (158)	32 (158)	63 (316)	32 (158)	32 (158)	63 (316)
			Buses	53 (-10)	57 (-10)	110 (-20)	57 (-10)	53 (-10)	110 (-20)
			Total	**483 (287)**	**222 (194)**	**705 (481)**	**222 (194)**	**483 (287)**	**705 (481)**
S 216th Street	SR 99	S 216th West, S 216th East	Drop-off/Pick-Up	0 (11)	0 (11)	0 (22)	0 (11)	0 (11)	0 (22)
			Buses	6 (4)	6 (4)	12 (8)	6 (4)	6 (4)	12 (8)
			Total	**6 (15)**	**6 (15)**	**12 (30)**	**6 (15)**	**6 (15)**	**12 (30)**
S 260th Street	SR 99	S 260th West, S 260th East	Drop-off/Pick-Up	0 (5)	0 (5)	0 (10)	0 (5)	0 (5)	0 (10)
			Buses	6 (0)	6 (0)	12 (0)	6 (0)	6 (0)	12 (0)
			Total	**6 (5)**	**6 (5)**	**12 (10)**	**6 (5)**	**6 (5)**	**12 (10)**

Notes: Values listed outside the parentheses represent the No Build Alternative values while inside the parentheses represents the change from No Build with the FWLE. The trip generation for the build alternatives assumes the park-and-ride lot is full.

[a] Trip generation values represent only the S 320th Street Park-and-Ride. Trip generation at the Federal Way Transit Center is not assumed to change from No Build conditions with this station option

TABLE 4-17

Peak-Hour Vehicle Trip Generation Summary by Stations and Alternative (Kent/Des Moines Interim Terminus Condition)

Station Area	Alternative	Trip Type	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Kent/ Des Moines	SR 99, I-5, SR 99 to I-5, I-5 to SR 99	Park-and-ride	0 (338)	0 (113)	0 (451)	0 (113)	0 (338)	0 (451)
		Drop-off/Pick-Up	0 (59 to 89)	0 (59 to 89)	0 (118 to 179)	0 (59 to 89)	0 (59 to 89)	0 (118 to 179)
		Buses	0 (18)	0 (18)	0 (36)	0 (18)	0 (18)	0 (36)
		Total	**0 (415 to 445)**	**0 (190 to 320)**	**0 (605 to 765)**	**0 (190 to 320)**	**0 (415 to 445)**	**0 (605 to 765)**

Note: Values listed outside the parentheses represent the No Build Alternative values, while inside the parentheses represents the change from No Build. The trip generation for the build alternatives assumes the park-and-ride lot is full.

TABLE 4-18

Peak-Hour Vehicle Trip Generation Summary by Stations and Alternative (S 272nd Interim Terminus Condition)

Station Area	Alternative	Trip Type	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Kent/Des Moines	SR 99, I-5, SR 99 to I-5, I-5 to SR 99	Park-and-ride	0 (169)	0 (56)	0 (225)	0 (56)	0 (169)	0 (225)
		Drop-off/Pick-Up	0 (27 to 70)	0 (27 to 70)	0 (55 to 140)	0 (27 to 70)	0 (27 to 70)	0 (55 to 140)
		Buses	0 (18)	0 (18)	0 (36)	0 (18)	0 (18)	0 (36)
		Total	**0 (214 to 257)**	**0 (101 to 144)**	**0 (316 to 401)**	**0 (101 to 144)**	**0 (214 to 257)**	**0 (316 to 401)**
S 272nd Redondo	SR 99, I-5 to SR 99	Park-and-ride	18 (453)	6 (151)	24 (604)	6 (151)	18 (453)	24 (604)
		Drop-off/Pick-Up	9 (48)	9(48)	18 (96)	9 (48)	9 (48)	18 (96)
		Buses	12 (4)	14 (2)	26 (6)	14 (2)	12 (4)	26 (6)
		Total	**39 (505)**	**29 (201)**	**68 (706)**	**29 (201)**	**39 (505)**	**68 (706)**
S 272nd Star Lake	I-5, SR 99 to I-5	Park-and-ride	105 (105)	35 (314)	140 (419)	35 (105)	105 (314)	140 (419)
		Drop-off/Pick-Up	4 (73)	4 (73)	8 (147)	4 (73)	4 (73)	8 (147)
		Buses	30 (0)	30 (0)	60 (0)	30 (0)	30 (0)	60 (0)
		Total	**139 (178)**	**69 (387)**	**208 (566)**	**69 (178)**	**139 (387)**	**208 (566)**

Note: Values listed outside the parentheses represent the No Build Alternative values, while inside the parentheses represents the change from No Build. The trip generation for the build alternatives assumes the park-and-ride lot is full.

Trip generation at the Federal Way Transit Center is expected to vary, with a modest increase in vehicle trips. However, this station would have a noticeable increase in passenger drop-off/pick-up trips (320 to 350 vehicles per hour) because it is the end-of-the line station. In accordance with the conceptual bus service plan, bus trips at the Federal Way Transit Center are expected to decrease slightly due to the elimination of some bus routes that would duplicate light rail service. The Federal Way S 320th Street Park-and-Ride Station Option would have the highest increase in vehicle activity among the Federal Way City Center station options. The current park-and-ride has 485 unused stalls; therefore, with the additional 400 parking spaces, there would be up to 885 available spaces for station users. The potential additional S 216th and S 260th East and West station options would have the lowest vehicle trip generation because parking would not be provided at these locations.

4.3.1.3 Interim Terminus Conditions

The Kent/Des Moines Station interim terminus condition assumes 1,000 parking stalls. The additional stalls provided in the interim condition and an overall increase in station activity with it being an end-of –the-line station would generate more trips under an interim station condition compared to the full-length condition. 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.

4.3.2 Traffic Circulation, Property Access, and Traffic Control

The build alternatives could have some effect on property access, traffic circulation patterns, and traffic control, depending on the alternative and station options. The traffic circulation, property access, and traffic control discussion in this section is based on the conceptual light rail guideway and station area plans.

4.3.2.1 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 where specific access improvements are identified. These access improvements are described for each Kent/Des Moines station option described below. 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. This alternative would transition to either the west or east side of SR 99 to serve station areas, except for the Kent/Des Moines SR 99 Median Station Option. When light rail operates in the SR 99 median, 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 or improved.

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 and pedestrian volumes across SR 99 would increase around station areas. Some vehicle turn movements (e.g., right turns) would be delayed because of increased pedestrian activity in crosswalks near stations. As a result, traffic signal timings would be modified to accommodate increased pedestrian volumes. No additional traffic control measures are required with the SR 99 Alternative except for a new traffic signal at the SR 99/S 236th Lane intersection, with the various Kent/Des Moines station options described below.

Kent/Des Moines SR 99 West Station

With the Kent/Des Moines SR 99 West Station, S 236th Lane would be reconstructed between Highline College and 30th Avenue S, and a new traffic signal would be provided at S 236th Lane at SR 99 to facilitate all traffic movements at this intersection. 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 to provide station access. Appendix F, Conceptual Design Drawings, of the FWLE Draft Environmental Impact Statement (EIS) shows the extent of roadway improvements near the station area.

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, with full access provided at the SR 99 and S 276th Street intersection and right-in, right-out access provided along S 272nd Street. Internal circulation would be improved with an access road connecting S 272nd Street and S 276th Street. Vehicles could use this road to access S 272nd Street. No changes in traffic control are proposed.

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. The passenger drop-off/pick-up area would have access from 21st Avenue S. No changes to the existing transit center access and circulation are proposed.

Station Options

S 216th Station Options

Access to the potential additional station at S 216th Street (West option) would be provided via a full access driveway along S 216th Street and a right-in, right out driveway along SR 99. The station access road could potentially be used by vehicles traveling east on S 216th Street that turn south onto SR 99 to bypass a traffic signal at the intersection of these two road. Access to the potential additional station at S 216th Street (East option) would be provided along S 216th Street, with a right-in, right-out driveway at 28th Avenue S. Station-related traffic arriving at the station from the east or heading west out of the station would use S 218th Street, S 219th Street, and 29th Avenue S.

Kent/Des Moines Station Options

With the Kent/Des Moines HC Campus Station Option, access and circulation would be similar to the Kent/Des Moines SR 99 West Station, except access would not be provided on S 240th Street. Access to the passenger drop-off/pick-up area would be provided along S 236th Street and SR 99.

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.

With the Kent/Des Moines SR 99 East Station Option, S 236th Lane would be extended between SR 99 and 30th Avenue S and include a new traffic signal at S 236th Lane and SR 99. Access to the parking areas with the SR 99 East Station Option would be provided via S 236th Lane, 30th Avenue S, S 240th Street, and a driveway along SR 99. S 236th Lane and 30th Avenue S would be improved to provide

station access. Appendix F, Conceptual Design Drawings, of the Draft EIS shows the extent of roadway improvements near the station area.

S 260th Station Options

Access to the potential additional S 260th West Station Option would be provided by a full access driveway located on the north side S 260th Street, west of SR 99. Property access, local circulation, and existing traffic control would be maintained. Access to the potential additional S 260th East Station Option would be provided by a full access driveway located on S 260th Street, east of SR 99. Existing property access, local circulation, and traffic control would be maintained.

S 272nd Redondo Trench Station Option

The S 272nd Redondo Trench Station Option would operate in an exclusive right-of-way trench east of SR 99 between S 260th Street and S 276th Street. Access to the station would be similar to the S 272nd Redondo Station, with full access provided along SR 99 at S 276th Street and a right-in, right-out access provided along S 272nd Street. 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. No substantial impacts on property access and circulation are anticipated with this station option.

Federal Way SR 99 Station Option

A new east-west access road would be provided between the existing Federal Way Transit Center and the Federal Way SR 99 Station Option. This access road would allow buses to connect between the two transit facilities. This facility could operate as a transit-only corridor between 19th Avenue S and 21st Avenue S. An access road between S 316th Street and S 314th Street would be provided to allow entry to the station property and passenger drop-off/pick up area north of 316th Street. Access to the 400-stall parking lot would be provided along 20th Avenue S and S 316th Street.

4.3.2.2 I-5 Alternative

The only change in property access, traffic circulation, or signal control that would result from the I-5 Alternative would be for specific improvements to the Kent/Des Moines Station area. The S 272nd Star Lake and Federal Way Transit Center stations would be located at the existing transit facilities, so 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 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 because 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 with the current design of the I-5 Alternative.

Even though most of this alternative alignment would be 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 shoulders would be maintained. This alternative would be located 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 would result.

Kent/Des Moines I-5 Station

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 S 236th Lane and SR 99. 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 to provide station access. Appendix F, Conceptual Design Drawings, of the Draft EIS shows the extent of roadway improvements near the station area. The passenger drop-off/pick up area would be located along a new access road adjacent to the south station entry.

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 provided by 26th Avenue S; however, the road would be reconfigured for the station. Three driveways to the station would be provided from 26th Avenue S—one for a structured park-and-ride garage, another for transit (bus) service, and a third driveway for passenger drop-off/pick-up. In addition, 26th/28th Avenue S would be realigned but would retain the same number of travel lanes after construction. However, no change in property access or circulation is anticipated for properties adjacent to this station.

Federal Way Transit Center Station

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.

Station Options

Kent/Des Moines Station Options

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 and have driveways to the parking areas. Access from SR 99 to S 242nd Street would be provided via a right-in, right-out driveway. An additional access road would be provided to 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 described above for this station option under the SR 99 Alternative.

Landfill Median Alignment Option

With the Landfill Median Alignment Option, the elevated guideway could encroach over the I-5 shoulder and, potentially, the travel lanes in a few locations; however, property access, circulation, and traffic control would not be affected with this option.

With the Landfill Median Alignment Option, in sections of the corridor where guardrail would be required, breaks in the guardrail may be needed to allow access for maintenance equipment. Beyond this, the Landfill Median Alignment Option would not affect property access, circulation, or traffic operations on I-5.

Federal Way City Center Station Options

The Federal Way I-5 Station Option would provide a station east of the existing Federal Way Transit Center. This station would be located south of S 317th Street and east of 23rd Avenue S. Transit and access would be provided along S 317th Street. Access to the parking area would be provided along 23rd Avenue S. Access to the passenger drop-off/pick-up area would be provided along S Gateway Center Plaza. Therefore, drop-off/pick-up trips from the north would be required to travel around the site 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 with this station option.

The Federal Way S 320th Park-and-Ride Station Option would be located at the existing S 320th Street Park-and-Ride. Access to the station would remain along 23rd Avenue S via two full access driveways. Access would also continue to be provided along 25th Avenue S but would be modified so vehicles leaving the station could also use this road. Currently, this street provides bus egress out of the park-and-ride. Roads inside the station area would be modified to provide access to two parking areas and a passenger drop-off/pick up area located on the northeast corner of the station area.

Bus routes accessing this station would use S 320th Street, 23rd Avenue S, and 25th Avenue S. The existing transit-only egress from the southbound I-5 on-ramp would be removed. No changes to access, circulation, or signal control at Federal Way Transit Center are expected with this station option.

4.3.2.3 SR 99 to I-5 Alternative

The SR 99 to I-5 Alternative would have circulation, access, and traffic control similar 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 be the same as the I-5 Alternative south of 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 above 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 under the I-5 Alternative.

Station Options

The SR 99 to I-5 Alternative would have the same potential additional S 216th station options described above under the SR 99 Alternative, and the Federal Way City Center station options described above 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 for the alternatives.

4.3.2.4 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 the Kent-Des Moines Road, this alternative would begin to transition to the west until connecting into 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 above 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 above under the SR 99 Alternative.

Station Options

The I-5 to SR 99 Alternative would include the potential additional S 260th West or East station options, 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 above under the SR 99 Alternative.

4.3.3 Traffic Operations

For the year 2035 traffic operations analysis, the No Build Alternative is compared with 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 1-2 in Chapter 1, Introduction, of this report). These locations include intersections that would be most directly affected by the FWLE, including intersections with changes to channelization, roadway width, or signal control, and those intersections that would be indirectly affected, such as by a change in vehicular or pedestrian activity. Therefore the intersections analyzed are more concentrated around station areas, as these areas would experience an increase in vehicle and/or nonmotorized activity.

A year 2035 AM peak hour analysis was also conducted but with a smaller study area that focused on I-5 ramp terminals and intersections adjacent to stations with park-and-ride locations. The LOS definitions shown for the AM and PM peak hours are based on the standards in the *Highway Capacity Manual* (TRB, 2010); these standards are provided in Appendix B.

Level of service standards, based on vehicle delay, for each jurisdiction are presented in Table 3-11. For locations where a state roadway is within a local jurisdictional boundary, the most conservative LOS standard is considered when determining whether the FWLE would cause any impacts. For the City of

Des Moines and the City of Federal Way, intersection v/c ratios are also used in their LOS standard, and those standards are presented in Appendix B.

In general, intersections near light rail stations are expected to operate at an LOS similar to the No Build Alternative. A few exceptions would occur around the Kent/Des Moines and S 272nd Street station areas. A few other isolated locations show a LOS degradation that would depend on a particular station design option. Exhibits 4-10 through 4-12 present the 2035 AM and PM peak hour intersection LOS for the No Build Alternative and build alternatives.

At I-5 ramp terminals, vehicle queue lengths on the off-ramps were analyzed to assess whether they would extend onto the I-5 mainline. This analysis is presented under *I-5 Ramp Terminal Operations* later in this section.

4.3.3.1 No Build Alternative

For the No Build Alternative analysis, a number of projects were taken into account. Projects include improvements such as additional or widened roadways, intersection improvements, and the addition of traffic signalization. Two intersections show improved intersection operations in the 2035 No Build conditions from existing conditions. The planned addition of a signal at the intersection of SR 99 and S 212th Street would improve intersection operations from LOS B to LOS A under the No Build Alternative. The intersection operations at Military Road S and S Reith Road would also improve in 2035 No Build condition from existing operations as a result of the planned additional left turn pockets at all approaches.

Of the intersections analyzed for the FWLE, the following four intersections would not meet the jurisdictional LOS standard in the No Build condition in the AM or PM peak hour:

- SR 99/S 216th Street (PM Peak only)
- SR 99/Kent-Des Moines Road (AM and PM Peak)
- I-5 southbound ramps/Kent-Des Moines Road (PM Peak only)
- I-5 northbound ramps/S 272nd Street (AM peak only)

4.3.3.2 Full Length Build Alternatives

SR 99 Alternative

The majority of the intersections analyzed for the SR 99 Alternative would operate similarly between the No Build and the SR 99 alternatives. The intersections that would not meet jurisdictional LOS standards in the No Build Alternative would continue to not meet standard under the SR 99 Alternative.

No intersection LOS impacts were identified near the Federal Way Transit Center Station area. There would be no additional impacts on intersection LOS with any of the SR 99 Alternative station or alignment options.

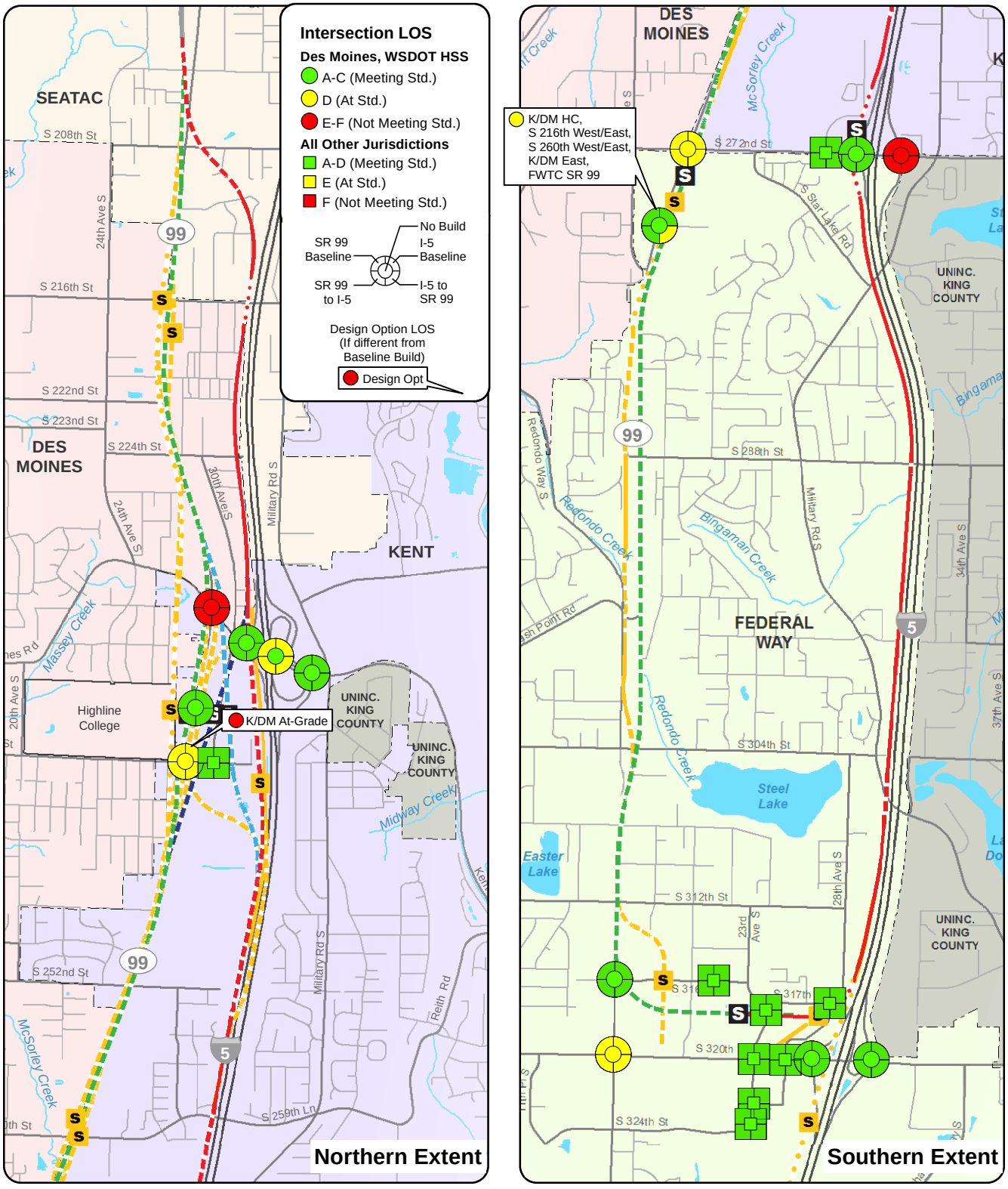
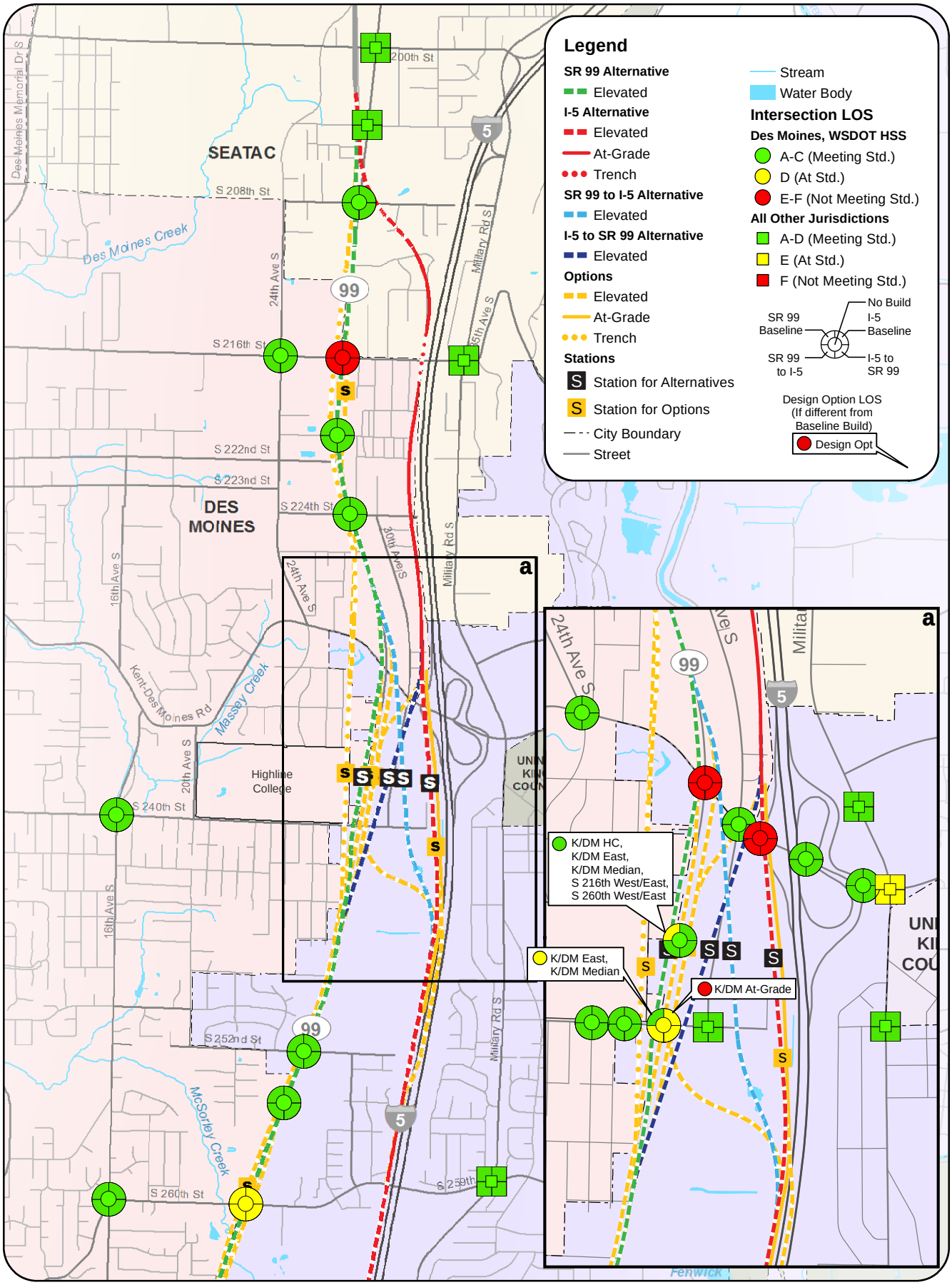


EXHIBIT 4-10
2035 AM No Build and Build Alternatives Level of Service Northern and Southern Study Area Extents
Federal Way Link Extension

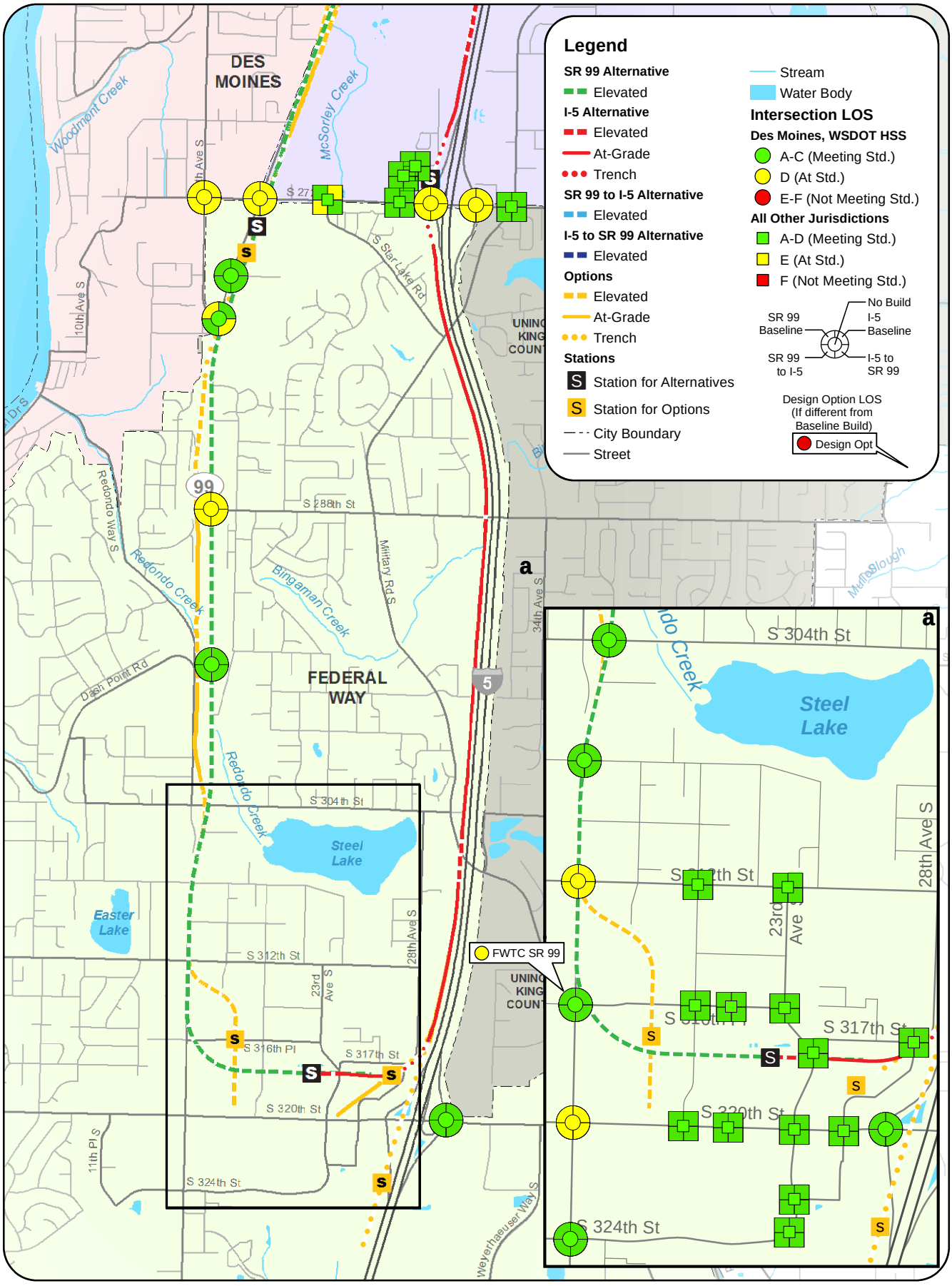


Data Sources: King County (2013)
HSS = Highway of Statewide Significance

N

0 0.25 0.5 1 Miles

EXHIBIT 4-11
2035 PM No Build and Build Alternatives
Level of Service Northern Study Area Extent
Federal Way Link Extension



Data Sources: King County (2013)
HSS = Highway of Statewide Significance

N

0 0.25 0.5 1 Miles

EXHIBIT 4-12
2035 PM No Build and Build Alternatives
Level of Service Southern Study Area Extent
Federal Way Link Extension

Kent/Des Moines Station Area

Intersections analyzed in the Kent/Des Moines Station area would operate similarly to the No Build Alternative. No additional intersections would operate below LOS standard in the Kent/Des Moines Station area. The following intersections would operate below jurisdictional LOS standard in the station area:

- SR 99/S 216th Street (PM Peak only)
- SR 99/Kent-Des Moines Road (AM and PM Peak)
- I-5 southbound ramps/Kent-Des Moines Road (PM Peak only)

At the intersection of SR 99 and S 216th Street, the FWLE would not increase intersection delay from the No Build condition. The other two locations are expected to experience additional delay with the project resulting from increases in traffic volumes traveling to and from the station. Between the station options, each of these three intersections would operate similarly. Table 4-19 provides the AM and PM peak hour LOS for each intersection for each Kent/Des Moines station option under the SR 99 Alternative compared with the No Build Alternative. The potential additional S 216th and S 260th station options were not included in this station area analysis and are discussed later in this subsection.

TABLE 4-19
2035 AM/PM No Build and SR 99 Alternative Intersection Level of Service: Kent/Des Moines Station Area

Intersection	LOS Standard[a]	Alternative/Station Options				
		No Build Alternative, AM LOS (PM LOS)	SR 99 West Station, AM LOS (PM LOS)	HC Campus Station Option, AM LOS (PM LOS)	SR 99 Median Station Option, AM LOS (PM LOS)	SR 99 East Station Option, AM LOS (PM LOS)
SR 99 and S 200th St	E	-- (D)	-- (D)	-- (D)	-- (D)	-- (D)
SR 99 and S 204th St	E	-- (B)	-- (B)	-- (B)	-- (B)	-- (B)
SR 99 and S 208th St	E	-- (B)	-- (B)	-- (B)	-- (B)	-- (B)
Military Rd S and S 216th St	E	-- (D)	-- (D)	-- (D)	-- (D)	-- (D)
24th Ave. S and S 216th St	E	-- (C)	-- (C)	-- (C)	-- (C)	-- (C)
SR 99 and S 216th St	D	-- (E)	-- (E)	-- (E)	-- (E)	-- (E)
S 220th St and SR 99	D	-- (B)	-- (B)	-- (B)	-- (B)	-- (B)
SR 99 and S 224th St	D	-- (B)	-- (B)	-- (B)	-- (B)	-- (B)
25th Ave. S/24th Ave S and Kent-Des Moines Rd	D	-- (B)	-- (B)	-- (B)	-- (B)	-- (B)
SR 99 and Kent-Des Moines Rd	D	F (F)	F (F)	F (F)	F (F)	F (F)
30th Ave. S and Kent-Des Moines Rd	D	-- (B)	-- (B)	-- (B)	-- (B)	-- (B)
16th Ave. S and S 240th St	D	-- (B)	-- (B)	-- (B)	-- (B)	-- (B)
28th Ave. S/Highline College Driveway and S 240th St	D	-- (C)	-- (B)	-- (B)	-- (B)	-- (B)
S 240th St and Highline College Drop-Off Loop	D	-- (A)	-- (A)	-- (A)	-- (A)	-- (A)
Military Rd S and Kent-Des Moines P&R	E	-- (D)	-- (D)	-- (D)	-- (D)	-- (D)

TABLE 4-19
2035 AM/PM No Build and SR 99 Alternative Intersection Level of Service: Kent/Des Moines Station Area

Intersection	LOS Standard[a]	Alternative/Station Options				
		No Build Alternative, AM LOS (PM LOS)	SR 99 West Station, AM LOS (PM LOS)	HC Campus Station Option, AM LOS (PM LOS)	SR 99 Median Station Option, AM LOS (PM LOS)	SR 99 East Station Option, AM LOS (PM LOS)
I-5 Southbound Ramps and Kent-Des Moines Rd	D	C (E)	C (E)	C (E)	C (E)	C (E)
I-5 Northbound Ramps and Kent-Des Moines Rd	D	C (B)	D (B)	D (B)	D (B)	D (B)
I-5 Northbound Ramps/Bus On-ramp and Kent-Des Moines Rd	D	B (B)	B (B)	B (B)	B (B)	B (B)
Military Rd S and Kent-Des Moines Rd	E	-- (E)	-- (E)	-- (E)	-- (E)	-- (E)
SR 99 and S 236th Lane	D	A (C)	B (D)	B (C)	B (C)	B (C)
SR 99 and S 240th St	D	D (D)	D (C)	D (C)	D (D)	D (D)
S 240th St and 30th Ave. S	E	A (A)	A (A)	A (A)	A (A)	A (A)
Military Rd S and S 240th St	E	-- (C)	-- (C)	-- (C)	-- (C)	-- (C)
SR 99 and S 252nd St	D	-- (B)	-- (B)	-- (B)	-- (B)	-- (B)
SR 99 and Fred Meyer	D	-- (C)	-- (C)	-- (C)	-- (B)	-- (B)
SR 99 and S 260th St	D	-- (D)	-- (D)	-- (D)	-- (D)	-- (D)
Military Rd S and 259th Pl/S Reith Rd	E	-- (C)	-- (D)	-- (D)	-- (D)	-- (D)
16th Ave. S and S 260th St	D	-- (C)	-- (C)	-- (C)	-- (C)	-- (C)

Notes:
Volume-to-capacity was also used in assessing LOS impacts for intersections in Federal Way and Des Moines. See Appendix D, Existing and Future Intersection Level of Service Results, for detailed intersection analysis results.
Gray shading indicates intersection does not meet LOS standard.
[a]LOS designation based on local jurisdiction or WSDOT HSS/Non-HSS Standards.
HC = Highline College; HSS = Highway of Statewide Significance; LOS = level of service; P&R = park-and-ride
-- = not analyzed

S 272nd Redondo Station Area

Of the intersections analyzed near the S 272nd Redondo Station area, only one intersection would not meet agency LOS standards. The I-5 northbound ramps/S 272nd Street intersection would operate at LOS E during the AM peak hour period under both the No Build and SR 99 alternatives. Although intersection delays would increase at this intersection with the SR 99 Alternative as a result of the increased number of vehicles to and from the south, this intersection would meet LOS standards in the PM peak hour. Table 4-20 provides the intersection analysis results for the SR 99 Alternative S 272nd Redondo Station.

TABLE 4-20
No Build and SR 99 Alternative Intersection Level of Service: S 272nd Redondo Station

Intersection	LOS Standard[a]	Alternative	
		No Build, AM LOS (PM LOS)	S 272nd Redondo Station[b], AM LOS (PM LOS)
16th Ave. S and S 272nd St	D	-- (D)	-- (D)
SR 99 and S 272nd St	D	D (D)	D (D)
S Star Lake Rd and S 272nd St	E	-- (C)	-- (C)
26th Ave. S and Star Lake P&R North Driveway	E	-- (A)	-- (A)
26th Ave. S and Star Lake P&R South Driveway	E	-- (A)	-- (A)
S 272nd St and 26th Ave. S	E	A (A)	A (A)
I-5 Southbound Ramps and S 272nd St	D	C (D)	C (D)
I-5 Northbound Ramps and S 272nd St	D	E (D)	E (D)
Military Rd S and S 272nd St	E	-- (D)	-- (D)
SR 99 and S 276th St	D	B (B)	C (C)
SR 99 and 16th Ave S	D	-- (C)	-- (D)
SR 99 and S 288th St	D	-- (D)	-- (D)
SR 99 and Dash Point Rd	D	-- (C)	-- (C)

Notes:
Gray shading indicates intersection does not meet LOS standard.
Volume to-capacity was also used in assessing LOS impacts for intersections in Federal Way and Des Moines. See Appendix D, Existing and Future Intersection Level of Service Results, for detailed intersection analysis results.
[a]LOS designation based on local jurisdiction or WSDOT HSS/Non-HSS Standards.
[b] The intersection LOS results with the 272nd Redondo Trench Station Option are similar to the S 272nd Redondo Station.
HSS = Highway of Statewide Significance; LOS = level of service; P&R = park-and-ride
-- = not analyzed

Federal Way Transit Center Station Area

There are two station options associated with the SR 99 Alternative near the Federal Way Transit Center. All intersections surrounding the Federal Way Transit Center Station would operate better than the jurisdictional LOS standard. Results for the AM and PM peak hour analysis used to evaluate the station area are shown in Table 4-21 for each intersection in the station area.

TABLE 4-21
No Build and SR 99 Alternative Intersection Level of Service: Federal Way Transit Center Station Area

Intersection ID	LOS Standard[a]	Alternative/Station Option		
		No Build, AM LOS (PM LOS)	Federal Way Transit Center, AM LOS (PM LOS)	Federal Way SR 99 Station Option, AM LOS (PM LOS)
SR 99 and S 304th St	D	-- (C)	-- (C)	-- (C)
SR 99 and S 308th St	D	-- (C)	-- (C)	-- (C)
SR 99 and S 312th St	D	-- (D)	-- (D)	-- (D)
20th Ave. S and S 312th St	E	-- (B)	-- (B)	-- (B)
23rd Ave. S and S 312th St	E	-- (B)	-- (B)	-- (B)
SR 99 and S 316th St	D	B (C)	B (C)	C (D)
20th Ave. S and S 316th St	E	-- (B)	-- (B)	-- (B)
21st Ave. S and S 316th St	E	B (B)	B (B)	B (B)

TABLE 4-21
No Build and SR 99 Alternative Intersection Level of Service: Federal Way Transit Center Station Area

Intersection ID	LOS Standard[a]	Alternative/Station Option		
		No Build, AM LOS (PM LOS)	Federal Way Transit Center, AM LOS (PM LOS)	Federal Way SR 99 Station Option, AM LOS (PM LOS)
23rd Ave. S and S 316th St	E	-- (B)	-- (B)	-- (B)
23rd Ave. S and S 317th St	E	A (B)	A (B)	A (B)
S 317th St and 28th Ave. S	E	A (A)	A (A)	A (A)
SR 99 and S 320th St	D	D (D)	D (D)	D (D)
20th Ave. S and S 320th St	E	-- (C)	-- (C)	-- (C)
21st Ave. S and S 320th St	E	-- (B)	-- (B)	-- (B)
23rd Ave. S and S 320th St	E	C (D)	C (D)	C (D)
25th Ave. S and S 320th St	E	A (B)	A (B)	A (B)
I-5 Southbound Ramps and S 320th St	D	-- (C)	B (C)	B (C)
I-5 Northbound Ramps and S 320th St	D	B (C)	B (C)	B (C)
23rd Ave. S and S 322nd St	E	A (A)	A (A)	A (A)
SR 99 and S 324th St	D	-- (C)	-- (C)	-- (C)
P&R and 23rd Ave. S/S 324th St	E	A (B)	A (B)	A (B)

Notes:
Gray shading indicates intersection does not meet LOS standard.
Volume to-capacity was also used in assessing LOS impacts for intersections in Federal Way and Des Moines. See Appendix D, Existing and Future Intersection Level of Service Results, for detailed intersection analysis result.
[a]LOS designation based on local jurisdiction or WSDOT HSS/Non-HSS Standards.
HSS = Highway of Statewide Significance; LOS = level of service
-- = not analyzed

Potential Additional Stations

S 216th Station Options

The potential additional S 216th West and East options were evaluated for the SR 99 Alternative. Intersection LOS results for these station areas are shown in Table 4-22. The intersection operations surrounding these station areas would not change compared with the SR 99 Alternative because the vehicle activity expected at the station would be relatively low.

TABLE 4-22
No Build and SR 99 Alternative Intersection Level of Service: S 216th Station Options

Intersection	LOS Standard[a]	Alternative/Station Options			
		No Build, AM LOS (PM LOS)	SR 99, AM LOS (PM LOS)	S 216th West, AM LOS (PM LOS)	S 216th East, AM LOS (PM LOS)
SR 99 and S 200th St	E	-- (D)	-- (D)	-- (D)	-- (D)
SR 99 and S 204th St	E	-- (B)	-- (B)	-- (B)	-- (B)
SR 99 and S 208th St	E	-- (B)	-- (B)	-- (B)	-- (B)
Military Rd S and S 216th St	E	-- (D)	-- (D)	-- (D)	-- (D)
24th Ave. S and S 216th St	E	-- (C)	-- (C)	-- (C)	-- (C)
SR 99 and S 216th St	D	-- (E)	-- (E)	-- (E)	-- (E)

TABLE 4-22
No Build and SR 99 Alternative Intersection Level of Service: S 216th Station Options

Intersection	LOS Standard[a]	Alternative/Station Options			
		No Build, AM LOS (PM LOS)	SR 99, AM LOS (PM LOS)	S 216th West, AM LOS (PM LOS)	S 216th East, AM LOS (PM LOS)
S 220th St and SR 99	D	-- (B)	-- (B)	-- (B)	-- (B)
SR 99 and S 224th St	D	-- (B)	-- (B)	-- (B)	-- (B)
25th Ave. S/24th Ave S and Kent-Des Moines Rd	D	-- (B)	-- (B)	-- (B)	-- (B)
SR 99 and Kent-Des Moines Rd	D	F (F)	F (F)	F (F)	F (F)
30th Ave. S and Kent-Des Moines Rd	D	-- (B)	-- (B)	-- (B)	-- (B)
16th Ave. S and S 240th St	D	-- (B)	-- (B)	-- (B)	-- (B)
28th Ave. S/Highline College Driveway and S 240th St	D	-- (C)	-- (B)	-- (B)	-- (B)
S 240th St and Highline College Drop-Off Loop	D	-- (A)	-- (A)	-- (A)	-- (A)
Military Rd S and Kent-Des Moines P&R	E	-- (D)	-- (D)	-- (D)	-- (D)
I-5 Southbound Ramps and Kent-Des Moines Rd	D	C (E)	C (E)	C (E)	C (E)
I-5 Northbound Ramps and Kent-Des Moines Rd	D	C (B)	D (B)	D (B)	D (B)
I-5 Northbound Ramps/Bus On-ramp and Kent-Des Moines Rd	D	B (B)	B (B)	B (B)	B (B)
Military Rd S and Kent-Des Moines Rd	E	-- (E)	-- (E)	-- (E)	-- (E)

Notes:
Gray shading indicates intersection does not meet LOS standard.
Volume-to-capacity was also used in assessing LOS impacts for intersections in Federal Way and Des Moines. See Appendix D, Existing and Future Intersection Level of Service Results, for detailed intersection analysis results.
[a]LOS designation based on local jurisdiction or WSDOT HSS/Non-HSS Standards.
HSS = Highway of Statewide Significance; LOS = level of service
-- = not analyzed

S 260th Station Options

The potential additional S 260th West and East station options were evaluated for the SR 99 Alternative. Intersection LOS results for these station areas are shown in Table 4-23. The intersection operations surrounding these station areas would not change compared with the SR 99 Alternative because the vehicle activity expected at the station would be similar to the SR 99 Alternative. Therefore, no additional intersection operations would degrade below the jurisdictional LOS standard in association with either of these station areas.

I-5 Alternative

The majority of the intersections analyzed for the I-5 Alternative would operate similarly between the No Build and the I-5 Alternative. The intersections that do not meet jurisdictional LOS standards in the No Build Alternative would continue to not meet standards under the I-5 Alternative.

TABLE 4-23
No Build and SR 99 Alternative Intersection Level of Service: S 260th Station Options

Intersection	LOS Standard[a]	Alternative/Station Options			
		No Build, AM LOS (PM LOS)	SR 99, AM LOS (PM LOS)	S 260th West, AM LOS (PM LOS)	S 260th East, AM LOS (PM LOS)
SR 99 and S 236th Lane	D	A (C)	B (D)	B (C)	B (C)
SR 99 and S 240th St	D	D (D)	D (C)	D (C)	D (C)
S 240th St and 30th Ave. S	E	A (A)	A (A)	A (A)	A (A)
Military Rd S and S 240th St	E	-- (C)	-- (C)	-- (C)	-- (C)
SR 99 and S 252nd St	D	-- (B)	-- (B)	-- (B)	-- (B)
SR 99 and Fred Meyer	D	-- (C)	-- (C)	-- (C)	-- (C)
SR 99 and S 260th St	D	-- (D)	-- (D)	-- (D)	-- (D)
Military Rd S and 259th Pl/S Reith Rd	E	-- (C)	-- (D)	-- (D)	-- (D)
16th Ave. S and S 260th St	D	-- (C)	-- (C)	-- (C)	-- (C)
16th Ave S and S 272nd St	D	-- (D)	-- (D)	-- (D)	-- (D)
SR 99 and S 272nd St	D	D (D)	D (D)	D (D)	D (D)
S Star Lake Rd and S 272nd St	E	-- (C)	-- (C)	-- (C)	-- (C)
26th Ave S and Star Lake P&R North Driveway	E	-- (A)	-- (A)	-- (A)	-- (A)
26th Ave S and Star Lake P&R South Driveway	E	-- (A)	-- (A)	-- (A)	-- (A)
S 272nd St and 26th Ave S	E	A (A)	A (A)	A (A)	A (A)
I-5 Southbound Ramps and S 272nd St	D	C (D)	C (D)	C (D)	C (D)
I-5 Northbound Ramps and S 272nd St	D	E (D)	E (D)	E (D)	E (D)
Military Rd S and S 272nd St	E	-- (D)	-- (D)	-- (D)	-- (D)

Notes:
Gray shading indicates intersection does not meet LOS standard. Volume-to-capacity was also used in assessing LOS impacts for intersections in Federal Way and Des Moines. See Appendix D, Existing and Future Intersection Level of Service Results, for detailed intersection analysis results.
[a]LOS designation based on local jurisdiction or WSDOT HSS/Non-HSS Standards.
HSS = Highway of Statewide Significance; LOS = level of service; P&R = park-and-ride
-- = not analyzed

Kent/Des Moines Station Area

Intersections analyzed in the Kent/Des Moines Station area under the I-5 Alternative and station options would operate similarly to the No Build Alternative. Three intersections would not meet agency LOS standards in the area surrounding the Kent/Des Moines Station under the I-5 Alternative and all I-5 Kent/Des Moines station options:

- SR 99/S 216th Street (PM Peak only)
- SR 99/Kent-Des Moines Road (AM and PM Peak)
- I-5 southbound ramps/Kent-Des Moines Road (PM Peak only)

Intersection delay at SR 99 and S 216th Street would not be increased by the FWLE. The FWLE is expected to increase intersection delay at the other two intersections listed above and delays would be caused by increased traffic volumes at the intersection from the station. Under the Kent/Des Moines At-Grade Station Option, SR 99 and S 240th Street would also operate below the LOS standards. With this station option, station traffic would be required to travel through this intersection

to access the site, thus substantially increasing vehicle delay compared with the No Build condition. LOS results are provided in Table 4-24 for each of the Kent/Des Moines station options under the I-5 Alternative.

TABLE 4-24
No Build and I-5 Alternative Intersection Level of Service: Kent/Des Moines Station Area

Intersection	LOS Standard[a]	No Build, AM LOS (PM LOS)	Station Options		
			I-5, AM LOS (PM LOS)	SR 99 East, AM LOS (PM LOS)	At-Grade, AM LOS (PM LOS)
SR 99 and S 200th St	E	-- (D)	-- (D)	-- (D)	-- (D)
SR 99 and S 204th St	E	-- (B)	-- (B)	-- (B)	-- (B)
SR 99 and S 208th St	E	-- (B)	-- (B)	-- (B)	-- (B)
Military Rd S and S 216th St	E	-- (D)	-- (D)	-- (D)	-- (D)
24th Ave. S and S 216th St	E	-- (C)	-- (C)	-- (C)	-- (C)
SR 99 and S 216th St	D	-- (E)	-- (E)	-- (E)	-- (E)
S 220th St and SR 99	D	-- (B)	-- (B)	-- (B)	-- (B)
SR 99 and S 224th St	D	-- (B)	-- (B)	-- (B)	-- (B)
25th Ave. S/24th Ave S and Kent-Des Moines Rd	D	-- (B)	-- (B)	-- (B)	-- (B)
SR 99 and Kent-Des Moines Rd	D	F (F)	F (F)	F (F)	F (F)
30th Ave. S and Kent-Des Moines Rd	D	-- (B)	-- (B)	-- (B)	-- (B)
16th Ave. S and S 240th St	D	-- (B)	-- (B)	-- (B)	-- (B)
28th Ave. S/Highline College Driveway and S 240th St	D	-- (C)	-- (B)	-- (B)	-- (C)
S 240th St and Highline College Drop-Off Loop	D	-- (A)	-- (A)	-- (A)	-- (A)
Military Rd S and Kent-Des Moines P&R	E	-- (D)	-- (D)	-- (D)	-- (D)
I-5 Southbound Ramps and Kent-Des Moines Rd	D	C (E)	C (E)	C (E)	C (E)
I-5 Northbound Ramps and Kent-Des Moines Rd	D	C (B)	D (B)	D (B)	D (B)
I-5 Northbound Ramps/Bus On-ramp and Kent-Des Moines Rd	D	B (B)	B (B)	B (B)	B (B)
Military Rd S and Kent-Des Moines Rd	E	-- (E)	-- (E)	-- (E)	-- (E)
SR 99 and S 236th Lane	D	A (C)	B (C)	B (C)	A (C)
SR 99 and S 240th St	D	D (D)	D (D)	D (D)	F (E)
S 240th St and 30th Ave S	E	A (A)	A (B)	A (A)	B (B)
Military Rd S and S 240th St	E	-- (C)	-- (C)	-- (C)	-- (C)
SR 99 and S 252nd St	D	-- (B)	-- (B)	-- (B)	-- (B)
SR 99 and Fred Meyer	D	-- (C)	-- (C)	-- (C)	-- (C)
SR 99 and S 260th St	D	-- (D)	-- (D)	-- (D)	-- (D)
Military Rd S and 259th Pl/S Reith Rd	E	-- (C)	-- (D)	-- (D)	-- (D)
16th Ave. S and S 260th St	D	-- (C)	-- (C)	-- (C)	-- (C)

Notes:
Gray shading indicates intersection does not meet LOS standard.
Volume-to-capacity was also used in assessing LOS impacts for intersections in Federal Way and Des Moines. See Appendix D, Existing and Future Intersection Level of Service Results, for detailed intersection analysis results.
[a]LOS designation based on local jurisdiction or WSDOT HSS/Non-HSS Standards.
HSS = Highway of Statewide Significance; LOS = level of service; P&R = park-and-ride
-- = not analyzed

S 272nd Star Lake Station

Of the intersections analyzed near the S 272nd Star Lake Station, only one intersection would not meet agency LOS standards. The I-5 northbound ramps and S 272nd Street intersection would operate at LOS E during the AM peak hour under the No Build Alternative. The intersection operations would degrade in the build condition to LOS F in the AM peak hour. Delays at this intersection would increase under the I-5 Alternative from the increased vehicles to and from the station. In the PM peak hour, this intersection would meet LOS standards. LOS analysis results are shown in Table 4-25 for the I-5 Alternative S 272nd Star Lake Station.

TABLE 4-25
No Build and I-5 Alternative Intersection Level of Service: S 272nd Star Lake Station

Intersection	LOS Standard[a]	Alternative	
		No Build, AM LOS (PM LOS)	S 272nd Star Lake, AM LOS (PM LOS)
16th Ave. S and S 272nd St	D	-- (D)	-- (D)
SR 99 and S 272nd St	D	D (D)	D (D)
S Star Lake Rd and S 272nd St	E	-- (C)	-- (E)
26th Ave. S and Star Lake P&R North Driveway	E	-- (A)	-- (A)
26th Ave. S and Star Lake P&R South Driveway	E	-- (A)	-- (C)
S 272nd St and 26th Ave. S	E	A (A)	C (C)
I-5 Southbound Ramps and S 272nd St	D	C (D)	C (D)
I-5 Northbound Ramps and S 272nd St	D	E (D)	F (D)
Military Rd S and S 272nd St	E	-- (D)	-- (D)
SR 99 and S 276th St	D	B (B)	B (B)
SR 99 and 16th Ave. S	D	-- (C)	-- (C)
SR 99 and S 288th St	D	-- (D)	-- (D)
SR 99 and Dash Point Rd	D	-- (C)	-- (C)

Notes:
Gray shading indicates intersection does not meet LOS standard.
Volume-to-capacity was also used in assessing LOS impacts for intersections in Federal Way and Des Moines. See Appendix D, Existing and Future Intersection Level of Service Results, for detailed intersection analysis results.
[a]LOS designation based on local jurisdiction or WSDOT HSS/Non-HSS Standards.
HSS = Highway of Statewide Significance; LOS = level of service; P&R = park-and-ride
-- = not analyzed

Federal Way Transit Center Station Area

There are two additional station options near the Federal Way Transit Center under the I-5 Alternative. All intersections surrounding the Federal Way Transit Center Station would operate better than the relevant LOS standard in both the No Build and I-5 alternatives, including the two station options. Results for the AM and PM peak hour analysis used to evaluate the station area are shown in Table 4-26.

TABLE 4-26
No Build and I-5 Alternative Intersection Level of Service: Federal Way Transit Center Station Area

Intersection	LOS Standard[a]	Alternative/Station Options			
		No Build, AM LOS (PM LOS)	Federal Way Transit Center, AM LOS (PM LOS)	Federal Way I-5, AM LOS (PM LOS)	Federal Way S 320th P&R, AM LOS (PM LOS)
SR 99 and S 304th St	D	-- (C)	-- (C)	-- (C)	-- (C)
SR 99 and S 308th St	D	-- (C)	-- (C)	-- (C)	-- (C)
SR 99 and S 312th St	D	-- (D)	-- (D)	-- (D)	-- (D)
20th Ave. S and S 312th St	E	-- (B)	-- (B)	-- (B)	-- (B)
23rd Ave. S and S 312th St	E	-- (B)	-- (B)	-- (B)	-- (B)
SR 99 and S 316th St	D	B (C)	B (C)	B (C)	B (C)
20th Ave. S and S 316th St	E	-- (B)	-- (B)	-- (B)	-- (B)
21st Ave. S and S 316th St	E	B (B)	B (B)	B (B)	B (B)
23rd Ave. S and S 316th St	E	-- (B)	-- (B)	-- (B)	-- (B)
23rd Ave. S and S 317th St	E	A (B)	A (B)	A (B)	A (B)
S 317th St and 28th Ave. S	E	A (A)	A (A)	A (A)	A (A)
SR 99 and S 320th St	D	D (D)	D (D)	D (D)	D (D)
20th Ave. S and S 320th St	E	-- (C)	-- (C)	-- (C)	-- (C)
21st Ave. S and S 320th St	E	-- (B)	-- (C)	-- (B)	-- (B)
23rd Ave. S and S 320th St	E	C (D)	C (D)	C (D)	C (D)
25th Ave. S and S 320th St	E	A (B)	A (B)	B (C)	B (B)
I-5 Southbound Ramps and S 320th St	D	-- (C)	B (C)	B (C)	B (C)
I-5 Northbound Ramps and S 320th St	D	B (C)	B (C)	B (C)	B (C)
23rd Ave. S and S 322nd St	E	A (A)	A (A)	A (A)	A (B)
SR 99 and S 324th St	D	-- (C)	-- (C)	-- (C)	-- (C)
P&R and 23rd Ave. S/S 324th St	E	A (B)	A (B)	A (B)	B (C)

Notes:
Gray shading indicates intersection does not meet LOS standard.
Volume-to-capacity was also used in assessing LOS impacts for intersections in Federal Way and Des Moines. See Appendix D, Existing and Future Intersection Level of Service Results, for detailed intersection analysis results.
[a]LOS designation based on local jurisdiction or WSDOT HSS/Non-HSS Standards.
HSS = Highway of Statewide Significance; LOS = level of service; P&R = park-and-ride
-- = not analyzed

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 that station. The following three intersections would operate worse than the No Build Alternative and not meet the applicable LOS standard:

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

- I-5 northbound ramps/S 272nd Street (AM peak only)

At these three intersections, increased vehicle volume as a result of vehicles traveling to and from the station areas is expected to increase delay. The intersection of SR 99 and S 216th Street also would not meet the jurisdictional LOS standard, but intersection delay with this alternative would be the same as the No Build Alternative. Results for the AM and PM peak hour analysis used to evaluate the station area are shown in Table 4-27. Level of service for intersections located south of the Kent/Des Moines Station area are provided in Tables D-10 and D-11 in Appendix D, Existing and Future Intersection Level of Service Results.

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 intersection LOS results similar to the SR 99 Alternative south of this station. The following three intersections would operate worse than the No Build Alternative and not meet the jurisdictional LOS standard due to the increased trips traveling to and from the station area:

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

The intersection of SR 99 and S 216th Street also would not meet the jurisdictional LOS standard, but intersection delay with this alternative is not expected to increase more than under the No Build Alternative. Results for the AM and PM peak hour analysis used to evaluate the station area are shown in Table 4-28. Level of service for intersections located south of the Kent/Des Moines Station area are provided in Tables D-13 and D-14 in Appendix D, Existing and Future Intersection Level of Service Results.

4.3.4 Interim Terminus Condition Analysis

Intersection LOS analyses were also conducted for the Kent/Des Moines and S 272nd Redondo or Star Lake interim terminus station conditions for the Federal Way Link Extension. See Exhibits 4-13 through 4-16 for the AM and PM peak hour intersection LOS results for the two interim terminus station conditions.

4.3.4.1 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 Peak)
- I-5 southbound ramps/Kent-Des Moines Road (PM Peak only)

Increased vehicle numbers traveling to and from the station areas are expected to increase intersection delays at each of these intersections.

TABLE 4-27

No Build and SR 99 to I-5 Intersection Level of Service: Kent/Des Moines Station Area

Intersection	LOS Standard[a]	Alternative/Station Options	
		No Build Alternative, AM LOS (PM LOS)	30th Ave East Station, AM LOS (PM LOS)
SR 99 and S 200th St	E	-- (D)	-- (D)
SR 99 and S 204th St	E	-- (B)	-- (B)
SR 99 and S 208th St	E	-- (B)	-- (B)
Military Rd S and S 216th St	E	-- (D)	-- (D)
24th Ave. S and S 216th St	E	-- (C)	-- (C)
SR 99 and S 216th St	D	-- (E)	-- (E)
S 220th St and SR 99	D	-- (B)	-- (B)
SR 99 and S 224th St	D	-- (B)	-- (B)
25th Ave. S/24th Ave S and Kent-Des Moines Rd	D	-- (B)	-- (B)
SR 99 and Kent-Des Moines Rd	D	F (F)	F (F)
30th Ave. S and Kent-Des Moines Rd	D	-- (B)	-- (B)
16th Ave. S and S 240th St	D	-- (B)	-- (B)
28th Ave. S/Highline College Driveway and S 240th St	D	-- (C)	-- (B)
S 240th St and Highline College Drop-Off Loop	D	-- (A)	-- (A)
Military Rd S and Kent-Des Moines P&R	E	-- (D)	-- (D)
I-5 Southbound Ramps and Kent-Des Moines Rd	D	C (E)	C (E)
I-5 Northbound Ramps and Kent-Des Moines Rd	D	C (B)	D (B)
I-5 Northbound Ramps/Bus On-ramp and Kent-Des Moines Rd	D	B (B)	B (B)
Military Rd S and Kent-Des Moines Rd	E	-- (E)	-- (E)
SR 99 and S 236th Lane	D	A (C)	B (C)
SR 99 and S 240th St	D	D (D)	D (D)
S 240th St and 30th Ave. S	E	A (A)	A (A)
Military Rd S and S 240th St	E	-- (C)	-- (C)
SR 99 and S 252nd St	D	-- (B)	-- (B)
SR 99 and Fred Meyer	D	-- (C)	-- (B)
SR 99 and S 260th St	D	-- (D)	-- (D)
Military Rd S and 259th Pl/S Reith Rd	E	-- (C)	-- (D)
16th Ave. S and S 260th St	D	-- (C)	-- (C)

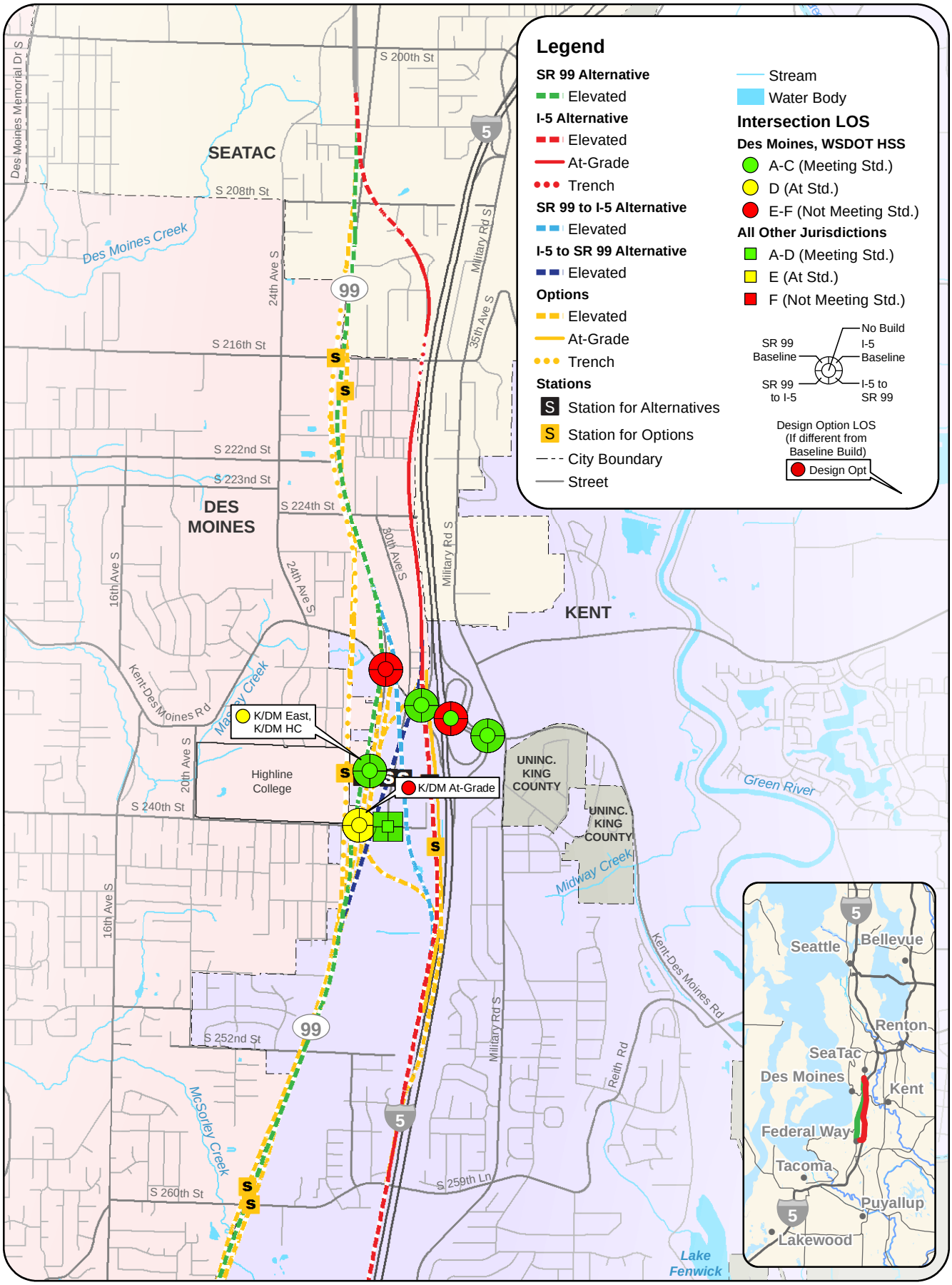
Notes:
Gray shading indicates intersection does not meet LOS standard.
Volume-to-capacity was also used in assessing LOS impacts for intersections in Federal Way and Des Moines. See Appendix D, Existing and Future Intersection Level of Service Results, for detailed intersection analysis results.
[a]LOS designation based on local jurisdiction or WSDOT HSS/Non-HSS Standards.
HSS = Highway of Statewide Significance; LOS = level of service
-- = not analyzed

TABLE 4-28

No Build and I-5 to SR 99 Intersection Level of Service: Kent/Des Moines Station Area

Intersection	LOS Standard[a]	Alternative/Station Options	
		No Build Alternative, AM LOS (PM LOS)	30th Ave West Station, AM LOS (PM LOS)
SR 99 and S 200th St	E	-- (D)	-- (D)
SR 99 and S 204th St	E	-- (B)	-- (B)
SR 99 and S 208th St	E	-- (B)	-- (B)
Military Rd S and S 216th St	E	-- (D)	-- (D)
24th Ave. S and S 216th St	E	-- (C)	-- (C)
SR 99 and S 216th St	D	-- (E)	-- (E)
S 220th St and SR 99	D	-- (B)	-- (B)
SR 99 and S 224th St	D	-- (B)	-- (B)
25th Ave. S/24th Ave S and Kent-Des Moines Rd	D	-- (B)	-- (B)
SR 99 and Kent-Des Moines Rd	D	F (F)	F (F)
30th Ave. S and Kent-Des Moines Rd	D	-- (B)	-- (B)
16th Ave. S and S 240th St	D	-- (B)	-- (B)
28th Ave. S/Highline College Driveway and S 240th St	D	-- (C)	-- (B)
S 240th St and Highline College Drop-Off Loop	D	-- (A)	-- (A)
Military Rd S and Kent-Des Moines P&R	E	-- (D)	-- (D)
I-5 Southbound Ramps and Kent-Des Moines Rd	D	C (E)	C (E)
I-5 Northbound Ramps and Kent-Des Moines Rd	D	C (B)	D (B)
I-5 Northbound Ramps/Bus On-ramp and Kent-Des Moines Rd	D	B (B)	B (B)
Military Rd S and Kent-Des Moines Rd	E	-- (E)	-- (E)
SR 99 and S 236th Lane	D	A (C)	B (C)
SR 99 and S 240th St	D	D (D)	D (D)
S 240th St and 30th Ave. S	E	A (A)	A (B)
Military Rd S and S 240th St	E	-- (C)	-- (C)
SR 99 and S 252nd St	D	-- (B)	-- (B)
SR 99 and Fred Meyer	D	-- (C)	-- (C)
SR 99 and S 260th St	D	-- (D)	-- (D)
Military Rd S and 259th Pl/S Reith Rd	E	-- (C)	-- (D)
16th Ave. S and S 260th St	D	-- (C)	-- (C)

Notes:
Gray shading indicates intersection does not meet LOS standard.
Volume-to-capacity was also used in assessing LOS impacts for intersections in Federal Way and Des Moines. See Appendix D, Existing and Future Intersection Level of Service Results, for detailed intersection analysis results.
[a]LOS designation based on local jurisdiction or WSDOT HSS/Non-HSS Standards.
HSS = Highway of Statewide Significance; LOS = level of service
-- = not analyzed

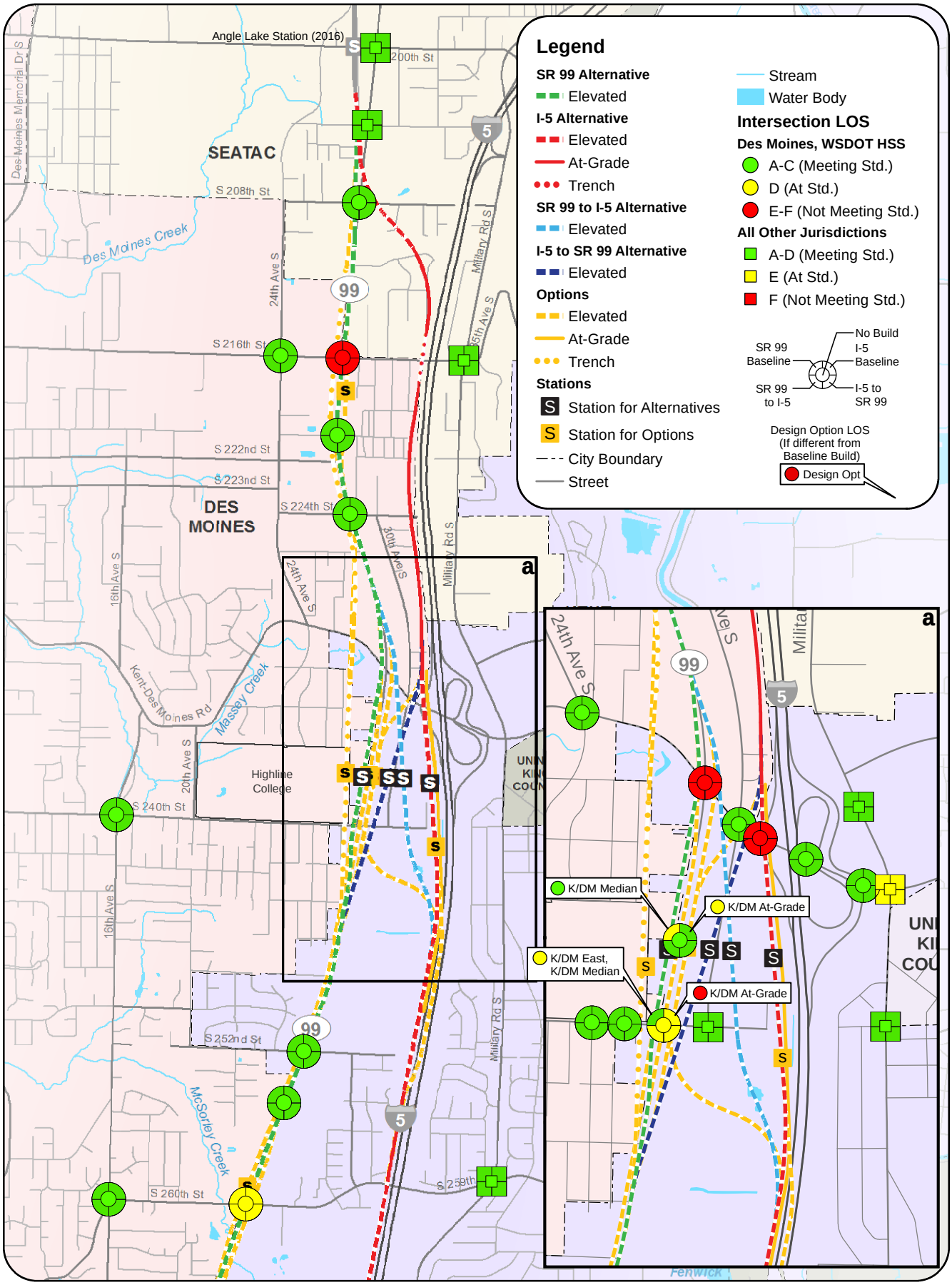


Data Sources: King County (2013)
HSS = Highway of STatewide Significance

N

0 0.25 0.5 1 Miles

EXHIBIT 4-13
2035 AM Kent/Des Moines Interim Terminus
Intersection Level of Service
Federal Way Link Extension

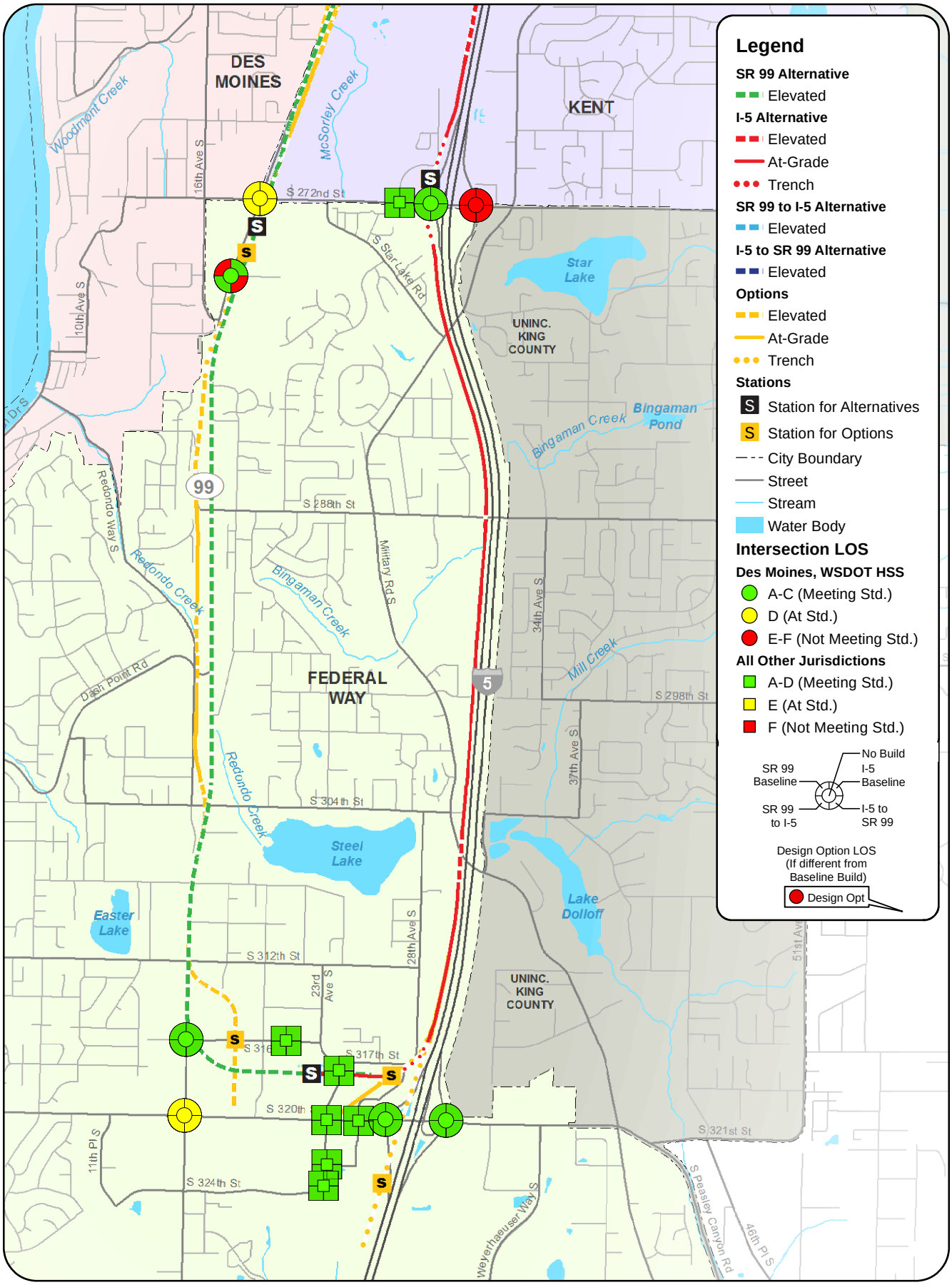


Data Sources: King County (2013)
HSS = Highway of Statewide Significance

N

0 0.25 0.5 1 Miles

EXHIBIT 4-14
2035 PM Kent/Des Moines Interim Terminus
Intersection Level of Service
Federal Way Link Extension

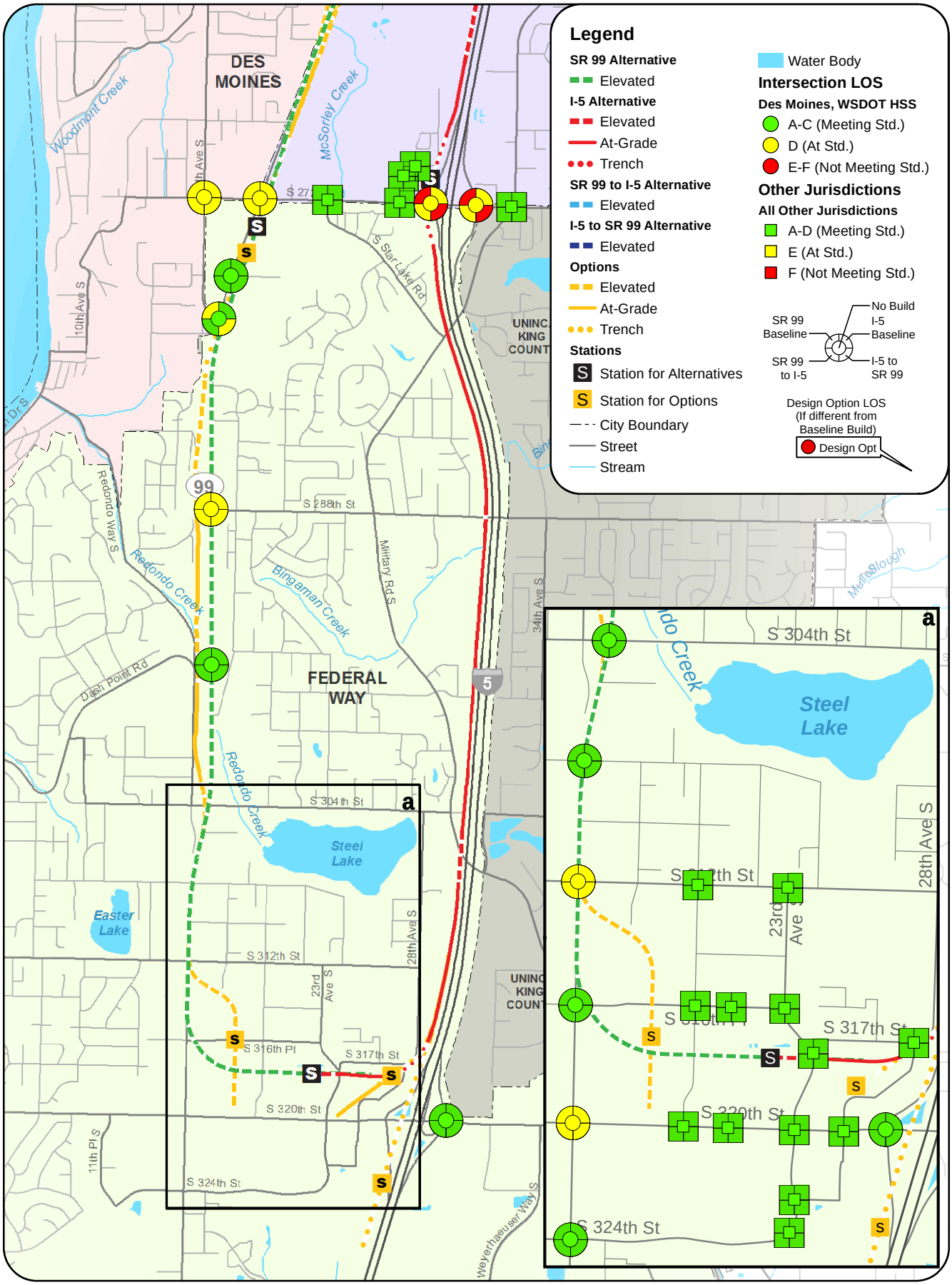


Data Sources: King County (2013)
HSS = Highway of Statewide Significance

N

0 0.25 0.5 1 Miles

EXHIBIT 4-15
2035 AM S 272nd Street Interim Terminus
Intersection Level of Service
Federal Way Link Extension



Data Sources: King County (2013)
HSS = Highway of Statewide Significance

N

0 0.25 0.5 1 Miles

EXHIBIT 4-16
2035 PM S 272nd Street Interim Terminus
Intersection Level of Service
Federal Way Link Extension

Kent/Des Moines Station Interim Terminus Conditions

In addition to the two intersections identified under the full length SR 99 Alternative, the I-5 northbound off-ramp at the Kent-Des Moines Road intersection would also operate below the jurisdictional LOS standard in the AM peak hour and worse than the No Build Alternative, regardless of the station option. An increase in intersection delay is expected due to the increased number of trips, compared with the full length condition, traveling through this location to the station in the morning. Table 4-29 shows LOS results for the No Build Alternative, SR 99 Alternative, and station options.

TABLE 4-29
No Build and SR 99 Alternative Intersection Level of Service: Kent/Des Moines Station Interim Terminus Conditions

Intersection	LOS Standard[a]	Alternative/Station Options				
		No Build, AM LOS (PM LOS)	SR 99 West, AM LOS (PM LOS)	HC Campus, AM LOS (PM LOS)	SR 99 Median, AM LOS (PM LOS)	SR 99 East, AM LOS (PM LOS)
SR 99 and S 200th St	E	-- (D)	-- (D)	-- (D)	-- (D)	-- (D)
SR 99 and S 204th St	E	-- (B)	-- (B)	-- (B)	-- (B)	-- (B)
SR 99 and S 208th St	E	-- (B)	-- (B)	-- (B)	-- (B)	-- (B)
Military Rd S and S 216th St	E	-- (D)	-- (D)	-- (D)	-- (D)	-- (D)
24th Ave. S and S 216th St	E	-- (C)	-- (C)	-- (C)	-- (C)	-- (C)
SR 99 and S 216th St	D	-- (E)	-- (E)	-- (E)	-- (E)	-- (E)
S 220th St and SR 99	D	-- (B)	-- (B)	-- (B)	-- (B)	-- (B)
SR 99 and S 224th St	D	-- (B)	-- (B)	-- (C)	-- (B)	-- (B)
25th Ave. S/24th Ave S and Kent-Des Moines Rd	D	-- (B)	-- (B)	-- (B)	-- (B)	-- (B)
SR 99 and Kent-Des Moines Rd	D	F (F)	F (F)	F (F)	F (F)	F (F)
30th Ave. S and Kent-Des Moines Rd	D	-- (B)	-- (B)	-- (B)	-- (B)	-- (B)
16th Ave. S and S 240th St	D	-- (B)	-- (B)	-- (B)	-- (B)	-- (B)
28th Ave. S/Highline College Driveway and S 240th St	D	-- (C)	-- (B)	-- (B)	-- (B)	-- (B)
S 240th St and Highline College Drop-Off Loop	D	-- (A)	-- (A)	-- (A)	-- (A)	-- (A)
Military Rd S and Kent-Des Moines P&R	E	-- (D)	-- (D)	-- (D)	-- (D)	-- (D)
I-5 Southbound Ramps and Kent-Des Moines Rd	D	C (E)	C (E)	C (E)	C (E)	C (E)
I-5 Northbound Ramps and Kent-Des Moines Rd	D	C (B)	F (B)	F (B)	F (B)	F (B)
I-5 Northbound Ramps/Bus On-ramp and Kent-Des Moines Rd	D	B (B)	B (B)	B (B)	B (B)	B (B)
Military Rd S and Kent-Des Moines Rd	E	-- (E)	-- (E)	-- (E)	-- (E)	-- (E)
SR 99 and S 236th Lane	D	A (C)	C (D)	D (D)	B (C)	D (D)
SR 99 and S 240th St	D	D (D)	D (C)	D (C)	D (D)	D (D)
S 240th St and 30th Ave. S	E	A (A)	A (A)	A (A)	A (A)	A (B)
Military Rd S and S 240th St	E	-- (C)	-- (C)	-- (C)	-- (C)	-- (C)

TABLE 4-29
No Build and SR 99 Alternative Intersection Level of Service: Kent/Des Moines Station Interim Terminus Conditions

Intersection	LOS Standard[a]	Alternative/Station Options				
		No Build, AM LOS (PM LOS)	SR 99 West, AM LOS (PM LOS)	HC Campus, AM LOS (PM LOS)	SR 99 Median, AM LOS (PM LOS)	SR 99 East, AM LOS (PM LOS)
SR 99 and S 252nd St	D	-- (B)	-- (B)	-- (B)	-- (B)	-- (B)
SR 99 and Fred Meyer	D	-- (C)	-- (C)	-- (C)	-- (C)	-- (C)
SR 99 and S 260th St	D	-- (D)	-- (D)	-- (D)	-- (D)	-- (D)
Military Rd S and 259th Pl/S Reith Rd	E	-- (C)	-- (D)	-- (D)	-- (D)	-- (D)
16th Ave. S and S 260th St	D	-- (C)	-- (C)	-- (C)	-- (C)	-- (C)

Notes:
Gray shading indicates intersection does not meet LOS standard.
Volume-to-capacity was also used in assessing LOS impacts for intersections in Federal Way and Des Moines. See Appendix D, Existing and Future Intersection Level of Service Results, for detailed intersection analysis results.
[a]LOS designation based on local jurisdiction or WSDOT HSS/Non-HSS Standards.
HSS = Highway of Statewide Significance; LOS = level of service; P&R = park-and-ride
-- = not analyzed

S 272nd Redondo Station Interim Terminus Conditions

With the S 272nd Redondo Station interim terminus condition, the following two intersections, in addition to the intersections identified under the SR 99 Alternative full-length condition, would operate worse than the No Build Alternative and not meet agency LOS standards:

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

Both of these intersections would operate worse than the No Build Alternative because there would be an increase in the number of trips traveling to and from the S 272nd Redondo Station with no light rail extending south beyond this station. The intersection LOS results north of this station would be similar to the results for the full length SR 99 Alternative. LOS results are shown in Table 4-30 for the No Build Alternative and SR 99 Alternative with the S 272nd Redondo Station interim condition.

4.3.4.2 I-5 Alternative

The two intersections listed below, which were 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 under both the Kent/Des Moines and S 272nd Star Lake station interim terminus conditions:

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

A greater number of vehicles traveling to and from the station areas would increase intersection delays at each of these intersections.

TABLE 4-30
No Build and SR 99 Alternative Intersection Level of Service: S 272nd Redondo Station Option Interim Terminus Conditions

Intersection	LOS Standard[a]	Alternative	
		No Build, AM LOS (PM LOS)	S 272nd Redondo, AM LOS (PM LOS)
16th Ave. S and S 272nd St	D	-- (D)	-- (D)
SR 99 and S 272nd St	D	D (D)	D (D)
S Star Lake Rd and S 272nd St	E	-- (C)	-- (D)
26th Ave. S and Star Lake P&R North Driveway	E	-- (A)	-- (A)
26th Ave. S and Star Lake P&R South Driveway	E	-- (A)	-- (A)
S 272nd St and 26th Ave. S	E	A (A)	A (A)
I-5 Southbound Ramps and S 272nd St	D	C (D)	C (E)
I-5 Northbound Ramps and S 272nd St	D	E (D)	F (E)
Military Rd S and S 272nd St	E	-- (D)	-- (D)
SR 99 and S 276th St	D	B (B)	E (B)
SR 99 and 16th Ave. S	D	-- (C)	-- (D)
SR 99 and S 288th St	D	-- (D)	-- (D)
SR 99 and Dash Point Rd	D	-- (C)	-- (C)

Notes:
Gray shading indicates intersection does not meet LOS standard.
Volume-to-capacity was also used in assessing LOS impacts for intersections in Federal Way and Des Moines. See Appendix D, Existing and Future Intersection Level of Service Results, for detailed intersection analysis results.
[a]LOS designation based on local jurisdiction or WSDOT HSS/Non-HSS Standards.
HSS = Highway of Statewide Significance; LOS = level of service; P&R = park-and-ride
-- = not analyzed

Kent/Des Moines Station Interim Terminus Conditions

In addition to the intersections identified under the full length I-5 Alternative, the I-5 northbound off-ramp at Kent-Des Moines Road would also operate below the LOS standard and the No Build Alternative in the AM peak hour. More trips, compared with the full-length condition, would travel through this location to the station in the morning, thus causing an expected increase in intersection delay. Table 4-31 shows LOS analysis results for the I-5 Alternative Kent/Des Moines Station and station options.

S 272nd Star Lake Station Interim Terminus Conditions

With the S 272nd Star Lake Station interim terminus condition, no additional intersections beyond those identified under the I-5 Alternative are expected to operate below jurisdictional LOS standards or the No Build Alternative. Compared to the SR 99 Alternative S 272nd Redondo Station interim terminus condition, there would be fewer impacts with the I-5 Alternative S 272nd Star Lake Station interim condition. The increase in vehicle trips to and from the S 272nd Star Lake Station would be less than the increase expected under the S 272nd Redondo Station because less available parking would be provided at Star Lake. Table 4-32 shows the LOS analysis interim condition results for the intersections around the S 272nd Star Lake Station area.

TABLE 4-31

No Build and I-5 Alternative Intersection Level of Service: Kent/Des Moines Station Interim Terminus Conditions

Intersection	LOS Standard[a]	No Build, AM LOS (PM LOS)	Station/Station Option		
			I-5, AM LOS (PM LOS)	SR 99 East, AM LOS (PM LOS)	At-Grade, AM LOS (PM LOS)
SR 99 and S 200th St	E	-- (D)	-- (D)	-- (D)	-- (D)
SR 99 and S 204th St	E	-- (B)	-- (B)	-- (B)	-- (B)
SR 99 and S 208th St	E	-- (B)	-- (B)	-- (B)	-- (B)
Military Rd S and S 216th St	E	-- (D)	-- (D)	-- (D)	-- (D)
24th Ave. S and S 216th St	E	-- (C)	-- (C)	-- (C)	-- (C)
SR 99 and S 216th St	D	-- (E)	-- (E)	-- (E)	-- (E)
S 220th St and SR 99	D	-- (B)	-- (B)	-- (B)	-- (B)
SR 99 and S 224th St	D	-- (B)	-- (B)	-- (B)	-- (B)
25th Ave. S/24th Ave S and Kent-Des Moines Rd	D	-- (B)	-- (B)	-- (B)	-- (B)
SR 99 and Kent-Des Moines Rd	D	F (F)	F (F)	F (F)	F (F)
30th Ave. S and Kent-Des Moines Rd	D	-- (B)	-- (B)	-- (B)	-- (B)
16th Ave. S and S 240th St	D	-- (B)	-- (B)	-- (B)	-- (B)
28th Ave. S/Highline College Driveway and S 240th St	D	-- (C)	-- (B)	-- (B)	-- (C)
S 240th St and Highline College Drop-Off Loop	D	-- (A)	-- (A)	-- (A)	-- (A)
Military Rd S and Kent-Des Moines P&R	E	-- (D)	-- (D)	-- (D)	-- (D)
I-5 Southbound Ramps and Kent-Des Moines Rd	D	C (E)	C (E)	C (E)	C (E)
I-5 Northbound Ramps and Kent-Des Moines Rd	D	C (B)	F (B)	F (B)	F (B)
I-5 Northbound Ramps/Bus On-ramp and Kent-Des Moines Rd	D	B (B)	B (B)	B (B)	B (B)
Military Rd S and Kent-Des Moines Rd	E	-- (E)	-- (E)	-- (E)	-- (E)
SR 99 and S 236th Lane	D	A (C)	B (C)	C (C)	B (D)
SR 99 and S 240th St	D	D (D)	D (D)	D (D)	F (E)
S 240th St and 30th Ave. S	E	A (A)	A (B)	A (B)	B (B)
Military Rd S and S 240th St	E	-- (C)	-- (C)	-- (C)	-- (C)
SR 99 and S 252nd St	D	-- (B)	-- (B)	-- (B)	-- (B)
SR 99 and Fred Meyer	D	-- (C)	-- (C)	-- (C)	-- (C)
SR 99 and S 260th St	D	-- (D)	-- (D)	-- (D)	-- (D)
Military Rd S and 259th Pl/S Reith Rd	E	-- (C)	-- (D)	-- (D)	-- (D)
16th Ave. S and S 260th St	D	-- (C)	-- (C)	-- (C)	-- (C)

Notes:
Gray shading indicates intersection does not meet LOS standard.
Volume-to-capacity was also used in assessing LOS impacts for intersections in Federal Way and Des Moines. See Appendix D, Existing and Future Intersection Level of Service Results, for detailed intersection analysis results.
[a]LOS designation based on local jurisdiction or WSDOT HSS/Non-HSS Standards.
HSS = Highway of Statewide Significance; LOS = level of service; P&R = park-and-ride
-- = not analyzed

TABLE 4-32
No Build and I-5 Alternative Intersection Level of Service: S 272nd Star Lake Station Interim Terminus Conditions

Intersection	LOS Standard[a]	Alternative	
		No Build, AM LOS (PM LOS)	S 272nd Star Lake, AM LOS (PM LOS)
16th Ave. S and S 272nd St	D	-- (D)	-- (D)
SR 99 and S 272nd St	D	D (D)	D (D)
S Star Lake Rd and S 272nd St	E	-- (C)	-- (D)
26th Ave. S and Star Lake P&R North Driveway	E	-- (A)	-- (A)
26th Ave. S and Star Lake P&R South Driveway	E	-- (A)	-- (C)
S 272nd St and 26th Ave. S	E	A (A)	C (C)
I-5 Southbound Ramps and S 272nd St	D	C (D)	C (D)
I-5 Northbound Ramps and S 272nd St	D	E (D)	F (D)
Military Rd S and S 272nd St	E	-- (D)	-- (D)
SR 99 and S 276th St	D	B (B)	B (B)
SR 99 and 16th Ave. S	D	-- (C)	-- (C)
SR 99 and S 288th St	D	-- (D)	-- (D)
SR 99 and Dash Point Rd	D	-- (C)	-- (C)

Notes:
Gray shading indicates intersection does not meet LOS standard.
Volume-to-capacity was also used in assessing LOS impacts for intersections in Federal Way and Des Moines. See Appendix D, Existing and Future Intersection Level of Service Results, for detailed intersection analysis results.
[a]LOS designation based on local jurisdiction or WSDOT HSS/Non-HSS Standards.
HSS = Highway of Statewide Significance; LOS = level of service; P&R = park-and-ride
-- = not analyzed

4.3.4.3 SR 99 to I-5 Alternative

Two of the intersections identified with the full length SR 99 to I-5 Alternative as not meeting agency LOS standards and operating worse than the No Build Alternative would also be affected under both the Kent/Des Moines and S 272nd Star Lake stations interim terminus conditions.

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

A greater number of vehicles traveling to and from the station areas are expected to result in higher intersection delays at each of these intersections. The I-5 northbound ramps and S 272nd Street intersection also would not meet agency LOS standards and would operate worse than the No Build Alternative in the full length SR 99 to I-5 Alternative. This intersection would also be affected in the S 272nd Star Lake Station interim terminus condition but not the Kent/Des Moines Station interim terminus condition because light rail would not extend south of the station.

Kent/Des Moines Station Interim Terminus Conditions

Intersection operations under the SR 99 Alternative Kent/Des Moines Station interim terminus condition would be similar to the SR 99 to I-5 Alternative. The following intersections would operate below either the jurisdictional LOS standard or No Build Alternative under this condition:

- SR 99/Kent-Des Moines Road (AM and PM Peak)
- I-5 southbound ramps/Kent-Des Moines Road (PM Peak only)
- I-5 northbound off-ramp/Kent-Des Moines Road (AM Peak only)

A greater number of trips traveling through these intersections to and from the station would likely result in higher intersection delay. Table 4-33 shows the LOS analysis interim condition results for the intersections around the Kent/Des Moines Station.

TABLE 4-33
No Build and SR 99 to I-5 Alternative Intersection Level of Service: Kent/Des Moines Station Interim Terminus Conditions

Intersection ID	LOS Standard[a]	Alternatives	
		No Build, AM LOS (PM LOS)	30th Ave East, AM LOS (PM LOS)
SR 99 and S 200th St	E	-- (D)	-- (D)
SR 99 and S 204th St	E	-- (B)	-- (B)
SR 99 and S 208th St	E	-- (B)	-- (B)
Military Rd S and S 216th St	E	-- (D)	-- (D)
24th Ave. S and S 216th St	E	-- (C)	-- (C)
SR 99 and S 216th St	D	-- (E)	-- (E)
S 220th St and SR 99	D	-- (B)	-- (B)
SR 99 and S 224th St	D	-- (B)	-- (B)
25th Ave. S/24th Ave S and Kent-Des Moines Rd	D	-- (B)	-- (B)
SR 99 and Kent-Des Moines Rd	D	F (F)	F (F)
30th Ave. S and Kent-Des Moines Rd	D	-- (B)	-- (B)
16th Ave. S and S 240th St	D	-- (B)	-- (B)
28th Ave. S/Highline College Driveway and S 240th St	D	-- (C)	-- (B)
S 240th St and Highline College Drop-Off Loop	D	-- (A)	-- (A)
Military Rd S and Kent-Des Moines P&R	E	-- (D)	-- (D)
I-5 Southbound Ramps and Kent-Des Moines Rd	D	C (E)	C (E)
I-5 Northbound Ramps and Kent-Des Moines Rd	D	C (B)	F (B)
I-5 Northbound Ramps/Bus On-ramp and Kent-Des Moines Rd	D	B (B)	B (B)
Military Rd S and Kent-Des Moines Rd	E	-- (E)	-- (E)
SR 99 and S 236th Lane	D	A (C)	C (C)
SR 99 and S 240th St	D	D (D)	D (D)
S 240th St and 30th Ave. S	E	A (A)	A (A)
Military Rd S and S 240th St	E	-- (C)	-- (C)
SR 99 and S 252nd St	D	-- (B)	-- (B)
SR 99 and Fred Meyer	D	-- (C)	-- (C)
SR 99 and S 260th St	D	-- (D)	-- (D)
Military Rd S and 259th Pl/S Reith Rd	E	-- (C)	-- (D)
16th Ave. S and S 260th St	D	-- (C)	-- (C)

Notes:
Gray shading indicates intersection does not meet LOS standard.
Volume-to-capacity was also used in assessing LOS impacts for intersections in Federal Way and Des Moines. See Appendix D, Existing and Future Intersection Level of Service Results, for detailed intersection analysis results.
[a]LOS designation based on local jurisdiction or WSDOT HSS/Non-HSS Standards.
HSS = Highway of Statewide Significance; LOS = level of service; P&R = park-and-ride
-- = not analyzed

S 272nd Star Lake Station Interim Terminus Conditions

Intersection operations near the S 272nd Star lake Station are expected to operate similarly to the I-5 Alternative S 272nd Star Lake Station interim terminus condition. North of the station, intersection operations would be similar to the full length SR 99 to I-5 Alternative. Three intersections would operate below jurisdictional LOS standards and the No Build Alternative:

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

A greater number of trips traveling through these intersections to and from the station would likely result in higher intersection delay. Table 4-34 shows interim condition LOS results for the intersections around the S 272nd Star Lake Station area.

TABLE 4-34
No Build and SR 99 to I-5 Alternative Intersection Level of Service: S 272nd Star Lake Station Interim Terminus Conditions

Intersection ID	LOS Standard[a]	Alternative	
		No Build, AM LOS (PM LOS)	S 272nd Star Lake, AM LOS (PM LOS)
16th Ave. S and S 272nd St	D	-- (D)	-- (D)
SR 99 and S 272nd St	D	D (D)	D (D)
S Star Lake Rd and S 272nd St	E	-- (C)	-- (D)
26th Ave. S and Star Lake P&R North Driveway	E	-- (A)	-- (A)
26th Ave. S and Star Lake P&R S Driveway	E	-- (A)	-- (C)
S 272nd St and 26th Ave. S	E	A (A)	C (C)
I-5 Southbound Ramps and S 272nd St	D	C (D)	C (D)
I-5 Northbound Ramps and S 272nd St	D	E (D)	F (D)
Military Rd S and S 272nd St	E	-- (D)	-- (D)
SR 99 and S 276th St	D	B (B)	B (B)
SR 99 and 16th Ave. S	D	-- (C)	-- (C)
SR 99 and S 288th St	D	-- (D)	-- (D)
SR 99 and Dash Point Rd	D	-- (C)	-- (C)

Notes:
Gray shading indicates intersection does not meet LOS standard.
Volume-to-capacity was also used in assessing LOS impacts for intersections in Federal Way and Des Moines. See Appendix D, Existing and Future Intersection Level of Service Results, for detailed intersection analysis results.
[a]LOS designation based on local jurisdiction or WSDOT HSS/Non-HSS Standards.
HSS = Highway of Statewide Significance; LOS = level of service; P&R = park-and-ride
-- = not analyzed

4.3.4.4 I-5 to SR 99 Alternative

The two intersections listed below, which were identified with the full length I-5 to SR 99 Alternative as not meeting agency LOS standards and operating worse than the No Build Alternative in 2035, would also be affected in both the Kent/Des Moines and S 272nd Redondo stations interim terminus conditions.

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

More vehicles traveling to and from the station areas are expected to increase intersection delays at each of these intersections. The I-5 northbound ramps and S 272nd Street intersection also would not meet agency LOS standards and would operate worse than under the No Build Alternative and the full length I-5 to SR 99 Alternative. This intersection would also be affected in the S 272nd Redondo Station interim terminus condition.

Kent/Des Moines Station Interim Terminus Conditions

Intersection operations with the I-5 to SR 99 Alternative Kent/Des Moines Station interim terminus condition would be similar as the I-5 Alternative. The following intersections would operate below the jurisdictional LOS Standard or No Build Alternative:

- SR 99/Kent-Des Moines Road (AM and PM Peak)
- I-5 southbound ramps/Kent-Des Moines Road (PM Peak only)
- I-5 northbound off-ramp/Kent-Des Moines Road (AM Peak only)

An increased number in trips traveling through these intersections to and from the station would likely cause an increase in intersection delay. Table 4-35 shows LOS analysis interim condition results for the intersections around the Kent/Des Moines Station.

TABLE 4-35
No Build and I-5 to SR 99 Alternative Intersection Level of Service: Kent/Des Moines Station Interim Terminus Conditions

Intersection	LOS Standard[a]	Alternatives	
		No Build, AM LOS (PM LOS)	30th Avenue West, AM LOS (PM LOS)
SR 99 and S 200th St	E	-- (D)	-- (D)
SR 99 and S 204th St	E	-- (B)	-- (B)
SR 99 and S 208th St	E	-- (B)	-- (B)
Military Rd S and S 216th St	E	-- (D)	-- (D)
24th Ave. S and S 216th St	E	-- (C)	-- (C)
SR 99 and S 216th St	D	-- (E)	-- (E)
S 220th St and SR 99	D	-- (B)	-- (B)
SR 99 and S 224th St	D	-- (B)	-- (B)
25th Ave. S/24th Ave S and Kent-Des Moines Rd	D	-- (B)	-- (B)
SR 99 and Kent-Des Moines Rd	D	F (F)	F (F)
30th Ave. S and Kent-Des Moines Rd	D	-- (B)	-- (B)
16th Ave. S and S 240th St	D	-- (B)	-- (B)
28th Ave. S/Highline College Driveway and S 240th St	D	-- (C)	-- (B)
S 240th St and Highline College Drop-Off Loop	D	-- (A)	-- (A)
Military Rd S and Kent-Des Moines P&R	E	-- (D)	-- (D)

TABLE 4-35
No Build and I-5 to SR 99 Alternative Intersection Level of Service: Kent/Des Moines Station Interim Terminus Conditions

Intersection	LOS Standard[a]	Alternatives	
		No Build, AM LOS (PM LOS)	30th Avenue West, AM LOS (PM LOS)
I-5 Southbound Ramps and Kent-Des Moines Rd	D	C (E)	C (E)
I-5 Northbound Ramps and Kent-Des Moines Rd	D	C (B)	F (B)
I-5 Northbound Ramps/Bus On-ramp and Kent-Des Moines Rd	D	B (B)	B (B)
Military Rd S and Kent-Des Moines Rd	E	-- (E)	-- (E)
SR 99 and S 236th Lane	D	A (C)	B (C)
SR 99 and S 240th St	D	D (D)	D (D)
S 240th St and 30th Ave. S	E	A (A)	A (A)
Military Rd S and S 240th St	E	-- (C)	-- (C)
SR 99 and S 252nd St	D	-- (B)	-- (B)
SR 99 and Fred Meyer	D	-- (C)	-- (C)
SR 99 and S 260th St	D	-- (D)	-- (D)
Military Rd S and 259th Pl/S Reith Rd	E	-- (C)	-- (D)
16th Ave. S and S 260th St	D	-- (C)	-- (C)

Notes:
Gray shading indicates intersection does not meet LOS standard.
Volume-to-capacity was also used in assessing LOS impacts for intersections in Federal Way and Des Moines. See Appendix D, Existing and Future Intersection Level of Service Results, for detailed intersection analysis results.
[a]LOS designation based on local jurisdiction or WSDOT HSS/Non-HSS Standards.
HSS = Highway of Statewide Significance; LOS = level of service
-- = not analyzed

S 272nd Redondo Station Interim Terminus Conditions

Intersection operations near the S 272nd Redondo Station are expected to operate similarly to the SR 99 Alternative S 272nd Redondo Station interim terminus condition. North of the station, intersection operations would be similar to the full length I-5 to SR 99 Alternative. Two intersections would operate below jurisdictional LOS standards and the No Build Alternative:

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

A greater number of trips traveling through these intersections to and from the station would likely cause an increase in intersection delay. Table 4-36 shows the LOS analysis interim condition results for the intersections in the S 272nd Redondo Station area.

4.3.5 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 in the AM and PM peak hours based on their proximity to future FWLE stations and the potential for a high number of vehicle trips using these interchanges and to assess the change in vehicle queue lengths at off-ramps compared with the No Build Alterative.

TABLE 4-36
No Build and I-5 to SR 99 Alternative Intersection Level of Service: S 272nd Redondo Station Interim Conditions

Intersection	LOS Standard[a]	Alternative	
		No Build, AM LOS (PM LOS)	S 272nd Redondo, AM LOS (PM LOS)
16th Ave. S and S 272nd St		-- (D)	-- (D)
SR 99 and S 272nd St	D	D (D)	D (D)
S Star Lake Rd and S 272nd St	E	-- (C)	-- (D)
26th Ave. S and Star Lake P&R North Driveway	E	-- (A)	-- (A)
26th Ave. S and Star Lake P&R South Driveway	E	-- (A)	-- (A)
S 272nd St and 26th Ave. S	E	A (A)	A (A)
I-5 Southbound Ramps and S 272nd St	D	C (D)	C (E)
I-5 Northbound Ramps and S 272nd St	D	E (D)	F (E)
Military Rd S and S 272nd St	E	-- (D)	-- (D)
SR 99 and S 276th St	D	B (B)	E (B)
SR 99 and 16th Ave. S	D	-- (C)	-- (D)
SR 99 and S 288th St	D	-- (D)	-- (D)
SR 99 and Dash Point Rd	D	-- (C)	-- (C)

Notes:
Gray shading indicates intersection does not meet LOS standard.
Volume-to-capacity was also used in assessing LOS impacts for intersections in Federal Way and Des Moines. See Appendix D, Existing and Future Intersection Level of Service Results, for detailed intersection analysis results.
[a]LOS designation based on local jurisdiction or WSDOT HSS/Non-HSS Standards.
HSS = Highway of Statewide Significance; LOS = level of service; P&R = park-and-ride
-- = not analyzed

Compared to the No Build Alternative, year 2035 vehicle queue lengths on the Kent-Des Moines southbound off-ramp would be longer with all of the full length build alternatives and would also be longer on the northbound off-ramp with the Kent/Des Moines Station interim terminus condition with all build alternatives. 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 rampused to decelerate from freeway to ramp speeds. The S 272nd Street northbound off-ramp queue length is expected to lengthen with all the build alternatives 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 are not expected to extend onto the I-5 mainline or in the ramp area (approximately 400 feet) used to decelerate from freeway to ramp speeds. 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. Forecasted queue lengths for each station option are provided in Appendix E, I-5 Ramp Terminal Queue Length Results.

4.4 Safety

This section describes the effects of the No Build and build alternatives on arterial and local street safety in the study area. This section includes a discussion on SR 99 and I-5 safety, including impacts on the I-5 clear zone.

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 (AASHTO 2011).

Key findings and observations include the following:

- Safety effects are expected to be minimal because the FWLE would be located in an exclusive guideway outside of roadway operations. 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.
- 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 introduce fixed objects that may diminish safety; however, the project would provide guardrails and barriers to protect mainline traffic from light rail columns. Adding barrier could result in an increase of up to two crashes per year.

4.4.1 Impacts Common to All Alternatives

The safety of the transportation system is expected to be minimally affected by the FWLE because all alternatives would be grade-separated and operate in exclusive right-of-way, with no direct conflicts with vehicles, pedestrians, or bicyclists.

The light rail design would adhere to both light rail and roadway standards to minimize the potential effects on traffic safety. For example, infrastructure elements of the light rail guideway, such as walls and columns, would be designed to current standards to ensure conflicts with fixed objects, vertical and horizontal clearances, and other infrastructure-related safety elements are minimized. If the project were to remove or modify transportation infrastructure, these facilities would be replaced or upgraded to ensure that the transportation system would not be considerably affected.

4.4.2 SR 99 Alternative

There would be an increase in vehicle and nonmotorized activity around the stations, 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 roadway safety.

The light rail guideway would be elevated along the entire corridor and occasionally cross public streets, private driveways, and property accesses. When the guideway is in the SR 99 median, the roadway would generally need to be widened to accommodate guideway columns and this would increase pedestrian crossing distances. The design of the median alignment adheres to current design standards; therefore, vehicle sight distance guidelines are expected to be achieved. If transportation infrastructure such as mid-block U-turns, medians, and intersection channelization 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.

4.4.2.1 S 216th Station Options

The potential additional S 216th West and East station options would have minimal potential to affect the safety of the transportation system. The station options would have relatively low increases in traffic volumes compared with other station areas with park-and-ride facilities. While nonmotorized activity would increase at the station areas and at nearby signalized intersections, it would be accommodated within the existing transportation facilities. As with all station options along SR 99, riders transferring between RapidRide A Line and light rail would result in an increase in pedestrians crossing SR 99. Crosswalks would be maintained at the signalized intersections near the station to facilitate the pedestrian movements across SR 99 to the station area. Bus and paratransit service and access have been designed to minimize potential conflicts between buses, pedestrians, and vehicles.

The S 216th West station option would be in a trench under S 216th Street instead of being elevated across S 216th Street within the median of SR 99, as with the SR 99 Alternative. This is not expected to change the safety conditions of the transportation system compared with the SR 99 Alternative, as the alignment would continue to be grade-separated from traffic and be designed to agency standards.

4.4.2.2 Kent/Des Moines Station Options

Pedestrian activity is expected to increase at all of the Kent/Des Moines station options. A portion of the pedestrians traveling to and from the station are riders transferring between transit modes. At all SR 99 Kent/Des Moines Station options, the increase in transfers between RapidRide A Line and light rail would result in an increase of pedestrians crossing SR 99 as described in Section 4.6. Crosswalks would be maintained at signalized intersections near the station to facilitate pedestrians across SR 99. A new traffic signal would be provided at the SR 99 and S 236th Lane intersection with the SR 99 Alternative and all station options. This traffic signal would provide a new crossing across SR 99 for pedestrians and bicyclists to discourage jaywalking between the station, the Highline College campus, and other land uses across from the station.

The Kent/Des Moines SR 99 Median Station Option would require widening of SR 99 to accommodate the station/platform area and would substantially increase the pedestrian crossing distances at the SR 99/S 236th Lane and SR 99/S 240th Street intersections. To completely cross SR 99, two separate pedestrian crossings would be required. The Kent/Des Moines HC Campus Station Option and SR 99 East Station Option would have similar impacts compared with the SR 99 Alternative.

The proposed bus loop and paratransit access for all Kent/Des Moines stations would be designed to minimize conflicts among buses, pedestrians, and vehicles. A transit-only signal at the driveway to the proposed bus loop may be provided to allow for the safe movement of buses in and out of the bus loop.

4.4.2.3 S 260th Station Options

The potential additional S 260th station options (West and East) would have minimal potential to affect the safety of the transportation system. The station options would have relatively low increases in traffic volumes compared with other station areas with park-and-ride facilities. While nonmotorized activity would increase at, and nearby, the station areas, it would be accommodated within the existing transportation facilities. As with both S 260th Station options, riders transferring between the RapidRide A Line and light rail would result in an increase in pedestrians crossing SR 99. Crosswalks would be maintained at all signalized intersections to facilitate these pedestrian movements across SR 99 to the station area. Bus and paratransit service and access would been designed to minimize potential conflicts among buses, pedestrians, and vehicles.

4.4.2.4 S 272nd Redondo Trench Station Option

At the S 272nd Redondo Station, riders transferring between RapidRide A Line and light rail would result in an increase in pedestrians crossing SR 99. Crosswalks would be maintained at signalized intersections to facilitate these pedestrian movements across SR 99 to the station area. The off-street bus loop and paratransit access would be designed to minimize conflicts among buses, pedestrians, and vehicles.

The S 272nd Redondo Trench Station Option would be underneath SR 99 instead of elevated across SR 99 with the SR 99 Alternative. This is not expected to change the safety conditions of the transportation system compared with the SR 99 Alternative because the light rail guideway would continue to be grade-separated from traffic and designed to agency standards.

4.4.2.5 Federal Way Transit Center Station and SR 99 Station Option

With the Federal Way Transit Center Station, the level of increased nonmotorized activity around the station area would increase the potential for pedestrian conflicts with cars and buses. The light rail station would be adjacent to the existing transit center, which would minimize the potential conflicts among pedestrians, buses, and vehicles.

The distance between the Federal Way SR 99 Station Option and the existing transit center would lead to an increased amount of pedestrians walking between these two facilities but would be accommodated within the proposed transit access road connecting the SR 99 station and the existing Federal Way Transit Center. The transit access road would create additional conflicts between pedestrians, buses, and vehicles at the SR 99 intersections with 21st Avenue S and 20th Avenue S but would be designed to agency standards. The off-street bus loop and paratransit access for both of the SR 99 Alternative Federal Way station options would be designed to minimize conflicts among buses, pedestrians, and vehicles.

4.4.3 I-5 Alternative

The I-5 Alternative would have minimal effects 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 among different travel modes; however, these are not expected to affect roadway accident rates or appreciably affect safety. Vehicle queues at the I-5 ramp terminal

intersections are expected to increase due to increased trips to and from station areas; however, they are not expected to back up to the I-5 mainline or affect how vehicles decelerate from freeway to ramp speeds.

The light rail guideway would be elevated, at-grade, or in a trench west of or within the WSDOT right-of-way for I-5. It would occasionally cross public streets, private driveways, and property access; however, the number of these crossing would occur less frequently compared with the SR 99 Alternative. The I-5 Alternative design would adhere to current design standards.

4.4.3.1 I-5 Clear Zone

A clear zone assessment of the I-5 mainline and ramps was completed for the No Build Alternative and FWLE alternatives located within the I-5 right-of-way. Table 4-37 documents where a clear zone is present with the No Build and build alternatives along I-5 between S 211th Street and S 317th Street. It also shows the length of the corridor where barriers are present (e.g., grade-separated crossings) and where a sufficient clear zone is not provided.

A detailed inventory of where the FWLE alternatives near I-5 would affect the clear zone are also provided in Appendix H, I-5 Clear Zone Analysis.

As shown in Table 4-37, similar to current conditions, with the No Build Alternative the majority of southbound I-5 would have a clear zone, and where the sufficient clear zone is not provided, guardrails or barriers would be present. The future available clear zone would be the same with the I-5 Alternative compared to the No Build Alternative. The current I-5 Alternative, by definition, has been designed not to interfere with any future I-5 clear zone areas. The entire I-5 guideway alignment would be located more than 46 feet away from the existing edge of traveled way and would be designed so as to not preclude WSDOT's ability to provide future clear zones where they do not currently meet minimum standards. Other potential I-5 Alternative configurations that could have impacts on the I-5 clear zone have been analyzed and are presented in Appendix G, Location of I-5 Alternative within I-5 Right-of-Way, of the Draft EIS.

TABLE 4-37
Southbound I-5 No Build and I-5 Alternative Clear Zone Summary (Between S 211th Street and S 317th Street)

Clear Zone Condition	Length of Clear Zone (feet)		
	No Build	I-5 Alternative	I-5 Landfill Median Alignment Option
Barrier Provided[a]	11,500	11,500 (+0)	12,600 (+1,100)
Available Clear Zone[b]	22,900	22,900	21,800
Total Segment Length	34,400	34,400	34,400

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

The potential for increased collisions on the I-5 mainline and ramps was also evaluated for the I-5 Alternative using a methodology described in the *Highway Safety Manual* (HSM) (AASHTO, 2014). This analysis included a review of highway geometric conditions associated with the No Build and build alternatives, including I-5 travel lane widths, shoulder widths, and locations of roadside barriers/fixed objects. A percent change in crash frequency for the I-5 mainline was determined based on these highway characteristics and applicable crash data. This percent change was then applied to historical crash rates in the study area to estimate the potential change in accident frequency that could occur with the No Build and I-5 Alternatives.

Based on HSM analysis findings for the FWLE, any objects located beyond 30 feet from the edge of traveled way would not have any effect on the potential for collisions along the I-5 mainline and ramps. The I-5 Alternative and design options, except short segments of the I-5 Landfill Median Alignment Option, are located outside of the clear zone and more than 30 feet away from the existing edge of traveled way; therefore, the I-5 Alternative is not expected to have any quantifiable impact on the safety of the I-5 mainline and ramps. A further discussion of clear zone and the potential for collisions associated with the I-5 Landfill Median Alignment Option is provided below.

4.4.3.2 Kent/Des Moines Station Options

With the I-5 Alternative, S 236th Lane would be extended from SR 99 and connect with 30th Avenue S with a proposed traffic signal at SR 99. This traffic signal would provide a new crossing across SR 99 for pedestrians and bicyclists to discourage jaywalking between the station, the Highline College campus, and other land uses across from the station. Pedestrian activity is expected to increase with all Kent/Des Moines station options. A portion of the pedestrians traveling to and from each station are pedestrians transferring between bus and light rail. At the Kent/Des Moines Station, the increase in transfers between the RapidRide A Line and the station would result in an increase of pedestrians crossing SR 99, and the impacts would be similar to those described for the SR 99 Alternative. Crosswalks would be maintained at all signalized intersections to facilitate pedestrian movements across SR 99 to the station area. The proposed bus loops and paratransit access would be designed to minimize the potential for conflict among buses, pedestrians, and vehicles.

All of the Kent/Des Moines station options would have similar impacts compared to the I-5 Alternative, except for the At-Grade Station Option. For this station option, S 236th Lane would not be developed by its current use; therefore, a traffic signal would not be provided at SR 99. A right-in, right-out access road between SR 99 and the station is proposed at S 242nd Street. This new access road would increase the potential for vehicle and pedestrians conflicts along SR 99 but would be designed to roadway standards and therefore, is not expected to affect safety conditions. Furthermore, most bicyclists and pedestrian trips transferring between transit would generally travel along S 240th Street and cross SR 99 at the existing crosswalk at SR 99 and S 240th Street.

All Kent/Des Moines Station options would be located outside the I-5 right-of-way; therefore, no change in I-5 mainline and ramp safety is expected. Some increases in traffic volumes are expected because people would drive between the station area and I-5.

4.4.3.3 S 272nd Star Lake Station

At the S 272nd Star Lake Station, there would be an increase in pedestrians transferring between buses that currently use the I-5 flyer stops and the station. For riders transferring from buses traveling on northbound I-5, pedestrians would be required to cross both ramp terminal intersections at the S 272nd Street interchange, thus increasing the potential for conflicts with vehicles. Pedestrians transferring between buses traveling south on I-5 would have direct access between the station and the I-5 southbound off-ramp with no increased conflicts with vehicles.

The proposed bus loop and paratransit access would be designed to minimize the potential for conflict among buses, pedestrians, and vehicles. The proposed parking garage driveways could increase the potential for conflicts between travel modes, but providing a separate access for the bus loop would minimize the potential conflicts among buses, pedestrians, and vehicles.

The S 272nd Star Lake Station would be located at the existing Star Lake Park-and-Ride and be outside the I-5 right-of-way; therefore, no change in I-5 mainline and ramp safety is expected. Some increases in traffic volume are expected as people would drive between the station area and I-5.

4.4.3.4 Landfill Median Alignment Option

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, 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 the 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.

4.4.3.5 Federal Way Transit Center Station and City Center Station Options

For the Federal Way Transit Center Station and City Center station options, the amount of nonmotorized activity around the station area is expected to increase, which would could lead to more conflicts among pedestrians, vehicles, and buses. With the Federal Way Transit Center Station, the light rail station would be adjacent to the existing transit center, which would minimize the potential conflicts among pedestrians, buses, and vehicles.

The distance between the Federal Way I-5 Station Option and the existing transit center could lead to an increase in the amount of pedestrian activity between the station areas. Access between the existing transit center and the new station would be provided along the south side of S 317th Street, which could create additional conflicts among pedestrians, vehicles, and buses but would be designed to roadway standards.

The Federal Way S 320th Park-and-Ride Station Option would be grade-separated from the I-5 and S 320th Interchange and therefore would have no impacts on the vehicle or pedestrian activity at or near the interchange. The current design of the station would require the removal of the existing bus access via the I-5 southbound on-ramp to the station. Eliminating this access from the on-ramp would remove slow-moving buses where other vehicles are accelerating to get onto I-5.

All Federal Way City Center station options would be located outside the I-5 right-of-way; therefore, no change in I-5 mainline and ramp safety is expected. Some increases in traffic volume are expected because people would drive between the station area and I-5.

4.4.4 SR 99 to I-5 Alternative

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

4.4.5 I-5 to SR 99 Alternative

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

4.5 Parking

The build alternatives assume that station users would either use existing parking spaces or, where proposed, additional park-and-ride stalls. This section documents the amount of existing public (on- and off-street) and private (off-street) parking that would be removed by the build alternatives and assesses the potential for the station parking demand to exceed capacity. If parking demand is exceeded at the stations, the potential for spillover to nearby on-street parking that surrounds the station areas is assessed.

The main findings related to parking include:

- The build alternatives would remove between 0 and 40 public parking spaces. All of this parking loss would be associated with the I-5 Alternative or I-5 to SR 99 Alternative near S 216th Street.
- The build alternatives would result in a loss of between 250 to 830 parking stalls on private properties. The station and alignment options could remove up to an additional 540 stalls. While these properties would not be fully acquired by the project, the loss of private parking may result in lost business opportunities.
- The park-and-ride capacities have been sized to accommodate the forecasted parking demand. The potential for hide-and-ride exists at some stations, although it is expected to be low except for the

216th East Station Option. The S 216th East Station Option would have the greatest potential for hide-and-ride activity due to the available on-street parking surrounding the station.

- At the Kent/Des Moines Station, there is a potential that the park-and-ride could be used by Highline College students because of its proximity to the Highline College campus. Sound Transit could consider a parking management program at this location to maximize the parking capacity for transit riders.

4.5.1 Parking Impacts

All of the build alternatives would affect the amount of private, off-street parking available. Table 4-38 summarizes the number of public (on-street and off-street) and private parking that would be removed by each build alternative compared with the No Build Alternative. Private parking spaces within properties that are expected to be entirely acquired by Sound Transit for an alternative are not included in this analysis because there would be no demand for these spaces. When off-street private parking is removed due to partial property acquisitions, business opportunities could be reduced in these situations. If the removed parking was deemed to make the property unviable, it was considered a full acquisition and was not included in the parking impacts assessment.

TABLE 4-38
Parking Impacts by Build Alternative

Alternative	Removed Public Parking		Removed Private Parking Off-Street	Total
	On-Street	Off-Street		
SR 99 Alternative	**0**	**0**	**600**	**600**
S 216th Station Options				
S 216th West Station Option	0	0	+100	+100
S 216th East Station Option	0	0	+20	+20
Kent/Des Moines Station Options				
Kent/Des Moines HC Campus Station Option	0	0	+120	+120
Kent/Des Moines HC Campus Station from 216th West Station Option	0	0	+260	+260
Kent/Des Moines SR 99 Median Station	0	0	-50	-50
Kent/Des Moines SR 99 East Station Option	0	0	+30	+30
S 260th Station Options				
S 260th West Station Option	0	0	+60	+60
S 260th East Station Option	0	0	-10	-10
S 272nd Redondo Trench Station Option	**0**	**0**	**+10**	**+10**
Federal Way SR 99 Station Option	**0**	**0**	**+230**	**+230**
I-5 Alternative	**20**	**20**	**370**	**410**
Alignment Option				
Landfill Median Alignment Option	0	0	0	0
Kent/Des Moines Station Options				
Kent/Des Moines I-5 At-Grade Station Option	0	0	0	0
Kent/Des Moines SR 99 East Station Option	0	0	+220	+220

TABLE 4-38
Parking Impacts by Build Alternative

Alternative	Removed Public Parking		Removed Private Parking Off-Street	Total
	On-Street	Off-Street		
Federal Way City Center Station Options				
Federal Way I-5 Station Option	0	0	-150	-150
Federal Way S 320th Street Park-and-Ride Station Option	0	0	-110	-110
SR 99 to I-5 Alternative	**0**	**0**	**250**	**250**
S 216th Station Options				
S 216th West Station Option	0	0	+100	+100
S 216th East Station Option	0	0	+20	+20
Federal Way City Center Station Options				
Federal Way I-5 Station Option	0	0	-150	-150
Federal Way S 320th Street Park-and-Ride Station Option	0	0	-110	-110
I-5 to SR 99 Alternative	**20**	**20**	**790**	**830**
S 260th Station Options				
S 260th West Station Option	0	0	+60	+60
S 260th East Station Option	0	0	-10	-10
S 272nd Redondo Trench Station Option	**0**	**0**	**0**	**0**
Federal Way SR 99 Station Option	**0**	**0**	**+230**	**+230**

Note: Parking numbers are rounded up to the nearest 10 stalls.

In general, the build alternatives would have minimal impact on public on-street and off-street parking, other than the 40 spaces removed in the Kent/Des Moines Station area with the I-5 and I-5 to SR 99 alternatives. These public on- and off-street parking spaces that would be removed are all along 32nd Avenue S near S 212th Street. The amount of private parking removed under the build alternatives would remove between 250 and 830 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. Parking impacts for each alternative are described in the following sections.

4.5.1.1 SR 99 Alternative

Under the SR 99 Alternative, no public on- or off-street parking impacts would occur. Approximately 600 private off-street parking spaces would be acquired. Parking acquisitions are fairly evenly distributed along the alignment, with approximately 210 spaces removed between S 200th Street and S 260th Street, 210 spaces between S 260th Street and Dash Point Road, and the remaining 190 spaces between Dash Point Road and S 320th Street. Within each of these light rail segments, specific areas may have a higher concentration of parking acquisition. Approximately 60 spaces would be acquired at retail properties located on the west side of SR 99 between S 248th Street and S 252nd Street. Just south of the S 272nd Redondo Station, approximately 100 parking spaces would be acquired from properties between S 276th Street and 16th Avenue S. The highest concentration of parking removed would occur at commercial properties immediately west of the existing Federal Way Transit Center, with up to 150 spaces removed.

Station Options

No public parking spaces would be removed with any of the SR 99 Alternative station options. For private parking spaces, the station options would remove more parking spaces than the SR 99 Alternative, except for the Kent/Des Moines SR 99 Median Station Option.

The potential additional S 216th West Station Option would remove 100 more spaces compared to the SR 99 Alternative. These spaces are located at properties north and west of the SR 99 and S 216th Street intersection. For the S 216th East Station, 20 additional stalls would be acquired compared to the SR 99 Alternative; all these parking stalls are located at the parcel on the northeast corner of SR 99 and S 220th Street.

For the Kent/Des Moines station options, up to 120 additional private parking spaces would be removed compared to the SR 99 Alternative. The Kent/Des Moines SR 99 Median Station Option would have 50 fewer spaces removed, thus maintaining spaces for properties along SR 99 just south and west of Kent-Des Moines Road. In contrast, the Kent/Des Moines HC Campus and SR 99 East station options would require additional parking acquisition. For the Kent/Des Moines HC Campus Station Option, up to 120 additional parking spaces would be acquired near Highline College. The SR 99 East Station Option would remove 30 additional parking spaces compared to the SR 99 Alternative, and most would be removed from the parcel on the southeast corner of the SR 99/S 240th Street intersection.

Either of the two potential additional S 260th station options (West or East) would result in a modest change in removed private parking spaces, with a range from a net difference of 10 fewer stalls removed with the S 260th Street East Station Option to a net difference of 60 more stalls removed with the S 260th West Station Option compared to the SR 99 Alternative. The S 260th East Station Option would require more full property acquisitions compared with the SR 99 Alternative; therefore, parking that was removed at properties that were partial acquisitions under the SR 99 Alternative near S 260th Street would become full acquisitions under the S 260th East Station Option. Full property acquisitions are not counted in the removed parking totals. The majority of the S 260th Street removed spaces would be at properties west of SR 99 between S 242nd Street and S 252nd Street.

The Federal Way SR 99 Station Option would remove 230 more private parking spaces than the SR 99 Alternative, resulting in the highest removal of parking of the SR 99 Alternative station options. The majority of the removed spaces would occur at two properties located south of S 316th Place. The properties immediately to the west of the existing Federal Way Transit Center would not have parking removed with this station option.

4.5.1.2 I-5 Alternative

Under the I-5 Alternative, up to 40 public on- or off-street parking spaces would be removed along 32nd Avenue S just south of S 212th Street. Approximately 370 private off-street parking spaces would be acquired. Most of the private parking acquisitions would be focused in two areas: along 30th Avenue S just north of Kent-Des Moines Road (approximately 130 spaces) and in Federal Way near S 317th Street (approximately 150 spaces).

Station and Alignment Options

The number of public parking spaces removed is expected to be the same as the I-5 Alternative with any of this alternative's station options. The Landfill Median Alignment Option would remove the same number of private parking spaces as the I-5 Alternative. The Kent/Des Moines station options would remove up to 220 additional private parking spaces. The Kent/Des Moines SR 99 East Station Option would remove up to 220 additional private parking spaces, all of which are located at the property south of S 240th Street on the east side of SR 99. The Kent/Des Moines At-Grade Station Option would have the same private parking removed as the I-5 Alternative.

For the I-5 Federal Way City Center station options, up to 150 fewer stalls would be removed with the Federal Way I-5 Station Option. This station would be located farther east of other proposed Federal Way station options; parking impacts would be minimized compared with the I-5 Alternative because fewer properties would be impacted. With the Federal Way S 320th Park-and-Ride Station Option, up to 110 fewer stalls would be removed than with the I-5 Alternative. Similar to the Federal Way I-5 Station Option, with the Federal Way S 320th Park-and Ride Station Option, the light rail alignment would remain close to the I-5 right-of-way, thus reducing the need for private parking removal. Approximately 40 spaces would be removed from the parcel located south of the 28th Avenue S/S 317th Street intersection.

4.5.1.3 SR 99 to I-5 Alternative

Under the SR 99 to I-5 Alternative, no public on- or off-street parking impacts would occur. This alternative would have the fewest private off-street parking spaces removed, with approximately 250 spaces. Similar to other build alternatives, the highest concentration of parking removed (150 spaces) would be along S 317th Street near the Federal Way Transit Center. Some parking removal would occur with the SR 99 to I-5 Alternative that would not occur with other build alternatives or station options. Up to 50 private parking spaces would be removed at properties along 30th Avenue S between Kent-Des Moines Road and S 240th Street, including approximately 40 spaces removed at the Midway Sewer District property.

Station Options

No change in the number of public parking spaces removed is expected with any of the SR 99 to I-5 Alternative station options. Either of the two potential additional stations at S 216th Street would remove the same private parking spaces as the SR 99 Alternative. At the Federal Way Transit Center, the stations options would remove the same private parking spaces as the I-5 Alternative.

4.5.1.4 I-5 to SR 99 Alternative

Under the I-5 to SR 99 Alternative, up to 40 public on- or off-street parking spaces would be removed along 32nd Avenue S just south of S 212th Street. Approximately 790 private off-street parking spaces would be acquired, the largest amount among the build alternatives. The highest concentration of private parking acquisitions would be located in three areas:

- 30th Avenue S north of Kent-Des Moines Road (approximately 120 spaces)
- SR 99 south of S 240th Street (approximately 90 spaces)

- Along S 317th Street (approximately 140 spaces) at the property immediately to the west of the Federal Way Transit Center.

Station Options

No additional public parking spaces would be removed with the I-5 to SR 99 Alternative station options. For I-5 to SR 99 station options, the Federal Way Transit Center and either of the two potential additional stations at S 260th Street would remove the same private parking spaces as the SR 99 Alternative.

4.5.2 Station Area Parking

All of the light rail station areas that currently have existing park-and-ride facilities would have additional parking to accommodate the forecasted parking demand with the FWLE. The parking demand was assessed along the entire FWLE corridor and allocated to the most compatible station areas. This was based on the adjacent land uses and modal accessibility, population density, access to transit, nonmotorized facilities, and the local street network and transit-oriented development potential. In general, the parking was allocated across three station areas (Kent/Des Moines, S 272nd, and Federal Way Transit Center) to provide a reasonable estimate of potential impacts on one station location. 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 potential additional S 216th and S 260th station options.

Hide-and-Ride

This activity occurs when transit users park in neighborhoods surrounding transit stations and is generally caused by insufficient parking at the transit station.

Table 4-39 shows the station area forecasted demand, parking supply, and available nearby public on-street potential hide-and-ride spaces. The forecasted park-and-ride transit demand (bus and light rail) is based on estimates predicted with the Sound Transit Ridership Model at each station area. This demand is calculated differently than the trip generation demand described in Section 4.3.1, which assumes all park-and-ride facilities would be full during the peak period.

At the Kent/Des Moines Station, 500 structured parking spaces would be provided. At either the S 272nd Star Lake or Redondo stations, 700 spaces in addition to the current park-and-ride parking supply would be provided. At any of the proposed Federal Way 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. The FWLE would not provide parking at the S 216th Street West or East or S 260th Street West or East station options because they were selected to serve as neighborhood stations.

Under the Kent/Des Moines interim terminus condition, an additional 500 parking spaces would be provided at the Kent/Des Moines Station. These parking spaces would likely be on a surface lot near the station.

TABLE 4-39
Summary of Station Area Parking Facilities

Alternative	Station	Forecasted Park-and-Ride Demand[a]	Existing Park-and-Ride Stalls[b]	Number of Proposed Park-and-Ride Stalls	Available On-street Parking Stalls[c]
SR 99	S 216th West or East Station Option	0	0	0	51
SR 99, I-5, SR 99 to I-5, I-5 to SR 99	Kent/Des Moines Station	300	0	500	0
SR 99	S 260th West or East Station Option	0	0	0	10
SR 99, I-5 to SR 99	S 272nd Redondo Station	400	697	1,397	15
I-5, SR 99 to I-5	S 272nd Star Lake Station	400	540	1,240	24
SR 99	Federal Way SR 99 Station Option	2,900	0 (+1,190 Federal Way Transit Center)	1,590	21
SR 99, I-5, SR 99 to I-5, I-5 to SR 99	Federal Way Transit Center Station	2,900	1190	1,590	21
I-5	Federal Way I-5 Station Option	2,900	0 (+1,190 Federal Way Transit Center)	1,590	21
	Federal Way S 320th Station Option	2,900	877 (+1,190 Federal Way Transit Center)	1,277 (+ 1,190 Federal Way Transit Center)	21

[a]Source: Sound Transit, 2012.
[b] For the stations located at or the near the existing Federal Way Transit Center, the total existing parking includes the total at the proposed station area and at the existing Federal Way Transit Center.
[c] Existing on-street unrestricted parking spaces within 1/4 mile of each station area.

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

The potential additional S 216th West or East and S 260th West or East station options also would have the potential for hide-and-ride activity because no parking would be provided at the station. However, the hide-and-ride potential would be minimized at the S 216th West or either S 260th station option because there is a low amount of easily accessible on-street public spaces near these stations. Some hide-and-ride potential is present at the S 216th East Station area because of the station location's proximity to available public on-street parking for the single-family and multi-family residences east and south of the station.

At the Kent/Des Moines Station, there is a potential that the park-and-ride could be used by Highline College students due to its proximity to the Highline College campus. According to the 2014 Highline College Master Plan, the Highline College east parking lot, which is located closest to the potential light

rail station, has approximately 800 spaces and is the most utilized Highline College parking lot (Highline College, 2014). Moreover, in a parking utilization study completed by Highline College in 2010, they found during peak times parking demand exceeded available parking capacity by 100 to 350 vehicles across the entire campus.

Currently, Highline College charges students a fee to park on-campus. When up to 1,000 additional parking spaces are provided for light rail transit riders, the proximity of the light rail station to the Highline College campus, the likelihood of free transit parking, and, with Highline College parking demand exceeding available capacity, could affect the capacity of the park-and-ride for transit riders and affect ridership at this station. Sound Transit could consider a parking management program at this location to maximize the parking capacity for transit riders.

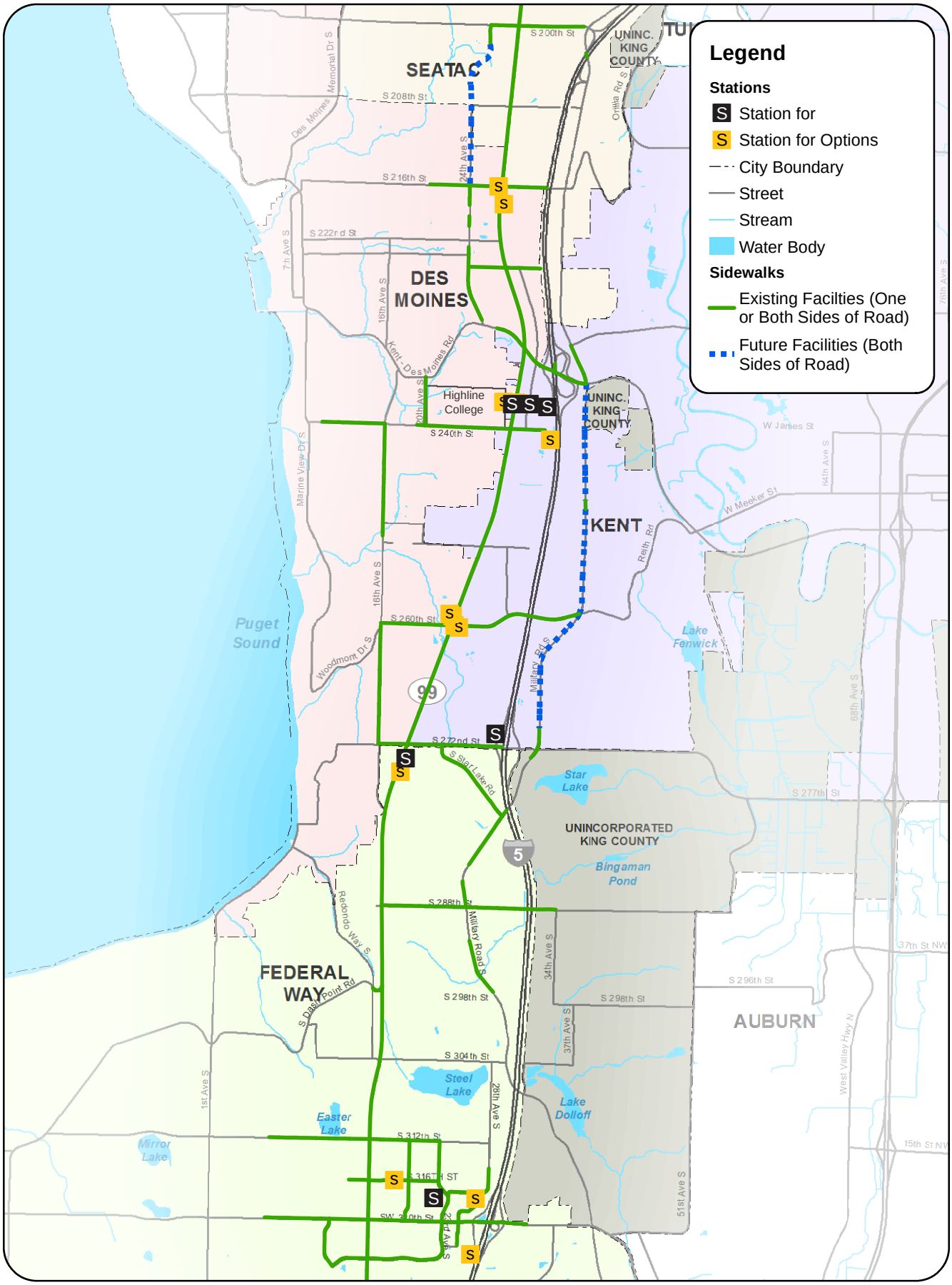
4.6 Nonmotorized Facilities

This section discusses the future nonmotorized conditions (year 2035) with the No Build Alternative and the anticipated nonmotorized impacts with the build alternatives. The different FWLE station options could affect surrounding land uses and the way pedestrians access and circulate within each station area. A discussion of future pedestrian and bicycle facilities, pedestrian/bicycle mobility, nonmotorized trip generation, and crosswalk operations (LOS) are presented in this section. Key findings include the following:

- For most stations, I-5 is a major barrier to walking and bicycle activity and could deter nonmotorized trips from accessing stations. Other major roads, including SR 99, S 272nd Street, and S 320th Street have high volumes, exhibit higher vehicle speeds, and have long pedestrian crossings. These characteristics make it uncomfortable for pedestrians and bicyclists to access the station.
- The Federal Way S 320th Park-and-Ride Station Option would have the highest pedestrian activity within the stations for any of the build alternatives during the PM peak hour (2,460 persons). The S 260th Street station option would have the lowest pedestrian activity (about 200 persons) during the PM peak hour. Under the interim terminus condition, the Kent/Des Moines Station would have up to 2,000 persons per hour during the PM peak hour.
- The Kent/Des Moines Station, S 216th West or East Station, and S 260th West or East Station would have the highest number of walk and bicycle trips of all FWLE station options.
- Generally, the build alternatives would have LOS between A and C with all three components of the pedestrian experience. For most intersections, a lower LOS rating would be attributed to a substantial increase in pedestrian volume (e.g., where the park-and-ride facilities or transit stops are not located adjacent to light rail stations).

4.6.1 Nonmotorized Elements

Year 2035 pedestrian and bicycle facilities in the FWLE corridor are shown in Exhibits 4-17 and 4-18, respectively. These new facilities that are planned with identified funding sources were documented and included in the analysis. New facilities are generally not located within the direct vicinity of FWLE



Data Sources: King County (2013)

N

0 0.5 1 2 Miles

EXHIBIT 4-17
Existing and Future Sidewalk Locations
Federal Way Link Extension

Data Sources: King County (2013)

N

0 0.5 1 2 Miles

EXHIBIT 4-18
Existing and Future Bicycle Facilities and Routes
Federal Way Link Extension

station areas. A detailed list of the assumed nonmotorized background projects in the study area are also provided in Appendix A, Transportation Technical Analysis Methodology.

The nonmotorized facilities were inventoried and evaluated for a walkshed of 1/2 mile and a bikeshed of 1 mile around each station assuming the actual walk or bicycle distance on the roadway system from the station platform. This area reflects the potential population and employment base that could directly access the light rail system without requiring motorized travel. The availability of sidewalks and nonmotorized use trails were considered for the walk shed analysis, while streets were also considered in the bikeshed analysis. The absence of nonmotorized facilities or the presence of major geographic barriers, such as I-5, affects how much area can be covered with a 1/2-mile walk or 1-mile bike ride from each station. Other natural barriers, such as topography, were not included as part of the walk and bicycle shed analysis. However, they could make nonmotorized travel less attractive.

Walk and Bikeshed

A walk or bikeshed is 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 bike distance via streets and nonmotorized use trails to a station.

Table 4-40 shows the forecasted population and employment in 2035 contained within walksheds and bikesheds. All of the Kent/Des Moines station options would have very similar population and employment near each station. The S 272nd Street station options would have the least employment within a 1/2-mile walk; however, within a 1-mile bicycle 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 serves the highest amount of both employment and population based on a 1/2-mile walk, while the Federal Way SR 99 Station Option would serve the highest population and employment based on a 1-mile bicycle ride.

TABLE 4-40
Walkshed and Bikeshed Population and Employment for Year 2035

Station[a]	Walkshed		Bikeshed	
	Employment	Population	Employment	Population
S 216th West and East	600	1,900	2,600	7,300
Kent/Des Moines At-Grade	2,200	2,100	5,300	5,200
Kent/Des Moines I-5 Options[b]	2,300	2,200	5,400	6,600
Kent/Des Moines SR 99 Options[c]	2,700	2,600	5,600	6,400
S 260th West and East	1,300	1,700	500	3,200
S 272nd Redondo	200	1,900	3,400	5,600
S 272nd Star Lake	200	1,100	600	4,100
Federal Way Transit Center	4,100	3,600	6,300	6,200
Federal Way SR 99	2,400	2,300	8,100	8,100
Federal Way I-5	2,800	2,400	5,500	5,500
Federal Way S 320th P&R	2,200	2,000	6,500	5,800

[a] Groupings are consistent with walk- and bikeshed graphics.
[b] Includes Kent/Des Moines 30th Avenue East and Kent/Des Moines I-5 stations.
[c] Includes SR 99 West, HC Campus Station, SR 99 Median Station, Kent/Des Moines SR 99 East, and 30th Avenue West stations.
Population and employment numbers rounded to the nearest 100.

4.6.2 Pedestrian Trip Generation

For the No Build Alternative, pedestrian volumes were developed from population and employment growth estimates surrounding each station area and at study area intersections.

For the build alternatives, the number of pedestrians accessing the station area is based on an estimate of transit users that would walk to or from the following:

- A park-and-ride facility
- A passenger drop-off/pick-up area
- A transfer between transit modes (bus to bus, or bus to rail)
- Surrounding land uses

The Sound Transit Ridership Model provided the PM peak hour mode of access information. Trips were distributed between the platforms and the facilities listed above within and surrounding the station area. Nonmotorized trips were distributed to and from the station based on an assessment of adjacent land uses and an estimate of where walk-based trips would be generated. These trips were added to the No Build pedestrian volume estimates to produce the pedestrian volume estimates for the build alternatives.

4.6.3 Pedestrian Level of Service

A pedestrian LOS analysis was conducted for signalized intersections located within 300 feet of the FWLE station areas for the 2035 PM peak hour. An LOS analysis for crosswalks inside station areas was not conducted. The analysis for the signalized intersections was conducted using *Highway Capacity Manual 2010* (TRB, 2010) methodology, which analyzes each crosswalk and holding area (corner) separately. The analysis focused on three components of the pedestrian experience:

- Intersection corner circulation area
- Crosswalk circulation area
- Pedestrian LOS score

The first two components are based on the concept of circulation area and describes the space available to pedestrians. The first element focuses on the amount of area provided to pedestrians while they wait at an intersection corner. The other measure focuses on the experience while walking within the crosswalk. Intuitively a larger area for each of these is desirable from a pedestrian perspective. As the volume of pedestrians increase, the area available for maneuverability and comfort is decreased. For these two measures of effectiveness, LOS C or better represents that pedestrians can move at 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 frequent. This is typical of dense urban areas.

The last component analyzed, the pedestrian LOS score, is an indication of the typical pedestrian's perception of the overall crossing experience and was analyzed for signalized intersections. This score considers crossing length, average pedestrian delay, pedestrian and vehicular volume, and pedestrian

refuge locations. Level of service thresholds for each of these measures of effectiveness are provided in Appendix B, Level of Service Definitions used for Federal Way Link Extension Analysis.

4.6.3.1 No Build Alternative and Build Alternatives

Pedestrian facilities in the vicinity of the FWLE light rail stations are expected to operate at LOS A for the intersection corner quality of service and crosswalk circulation area for all signalized intersections within 300 feet of a potential FWLE station area under the No Build Alternative. The pedestrian LOS score is expected to range between LOS A and LOS C. Most LOS C crosswalks are across SR 99 and S 272nd Street, which require longer crossing distances due to the width of these streets.

For the build alternatives, pedestrian and bicycle activity and the accessibility to the station areas would be a major contributor to the nonmotorized mode share 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 also affect the way pedestrians circulate within the station areas.

Tables 4-41 and 4-42 show the estimated total pedestrian trips generated at stations for the light rail alternatives and station options during the PM peak hour, respectively. Table 4-43 shows the estimated pedestrian trip generation for the interim terminus conditions during the PM peak hour. Pedestrian activity was classified into two categories: outside the station area and within the station area. Trips considered to occur outside the station area include all walk and bike trips to or from the station. Depending on the station site, these trips could include park-and-ride walk trips, and certain transit transfer trips, in particular RapidRide A Line transfers that require a person to cross a major arterial street to access the station platform. Those trips that are within the station area include the park-and-ride trips, transit transfer trips that have bus bays adjacent to the station platform area, and passenger drop-off/pick-up trips. The evaluation of nonmotorized facilities indicates that the FWLE would result in considerably more pedestrian and bicycle activity in and around the stations than the No Build Alternative.

With the build alternatives, pedestrian volumes were developed based on the pedestrian trip generation at each station and the No Build pedestrian volumes. The pedestrian LOS results are provided in Appendix F, Pedestrian Level of Service.

Generally, the pedestrian LOS for the FWLE alternatives would range between LOS A and LOS D for all three components of the pedestrian experience. 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). A detailed discussion of the nonmotorized elements and pedestrian LOS are discussed in the following subsections for each station area.

TABLE 4-41

2035 PM Peak Hour Pedestrian Trip Generation at Build Alternatives Stations

Station Area	Alternative	Total Pedestrian Trips (persons/hr)	Auto (persons/hr)[a]	Walk/Bike (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 of trip numbers to nearest 10.
[a] Source: Parking Stall Estimate and Passenger Drop-off/Pick-up forecasts.
[b] Source: Sound Transit, 2012.

TABLE 4-42

2035 PM Peak Hour Pedestrian Trip Generation at Build Alternatives Station Options

Station Area	Alternative	Station Option	Peak Hour Project Pedestrian Trip Generation			
			Total Pedestrian Trips (persons/hr)	Automobile (persons/hr)[a]	Walk/Bike (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 of trip numbers to nearest 10.
[a] Source: Parking Stall Estimate and [a]Passenger Drop-off/Pick-up forecasts.
[b] Source: Sound Transit, 2012.

TABLE 4-43
2035 PM Peak Hour Pedestrian Trip Generation at FWLE Stations (Interim Terminus Conditions)

Station Area	Alternative	Station Option	Peak Hour Project Pedestrian Trip Generation			
			Total Pedestrian Trips (persons/hr)	Auto (persons/hr)[a]	Walk/Bike (persons/hr)[b]	Transit (persons/hr)[b]
Kent/Des Moines	SR 99	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
		East SR 99	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 of trip numbers to nearest 10.
[a] Source: Parking Stall Estimate and Passenger Drop-off/Pick-up forecasts.
[b] Sound Transit, 2012.

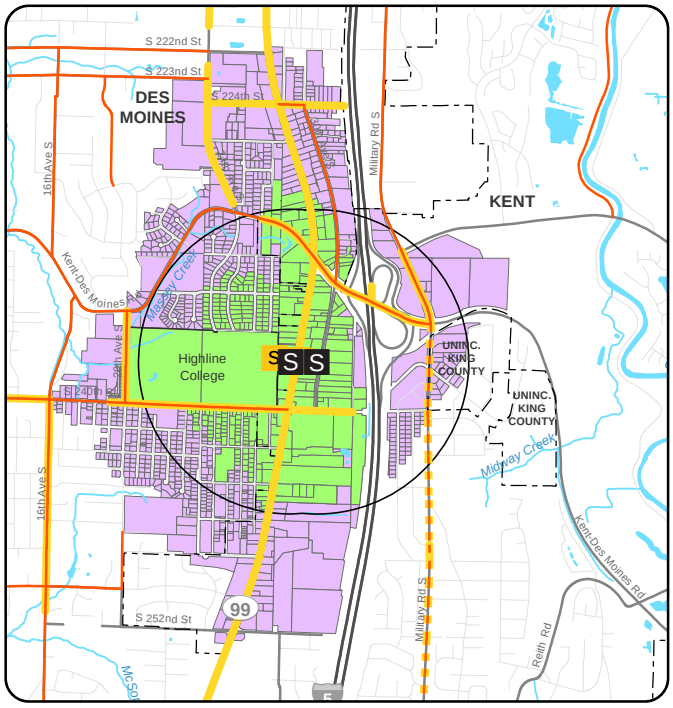
4.6.4 Station Areas

4.6.4.1 Kent/Des Moines Station

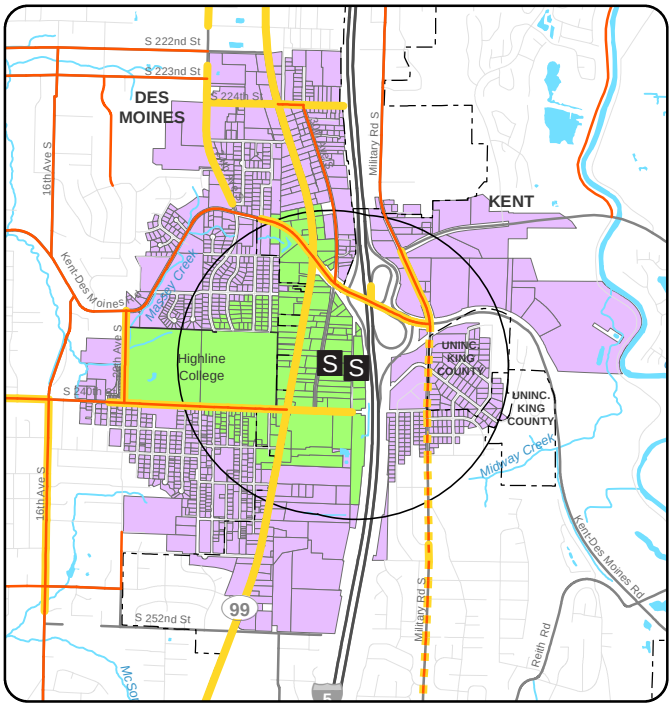
Nonmotorized Facilities

Exhibit 4-19 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 alternatives and station options in the Kent/Des Moines area would have a fairly similar walk- and bikeshed.

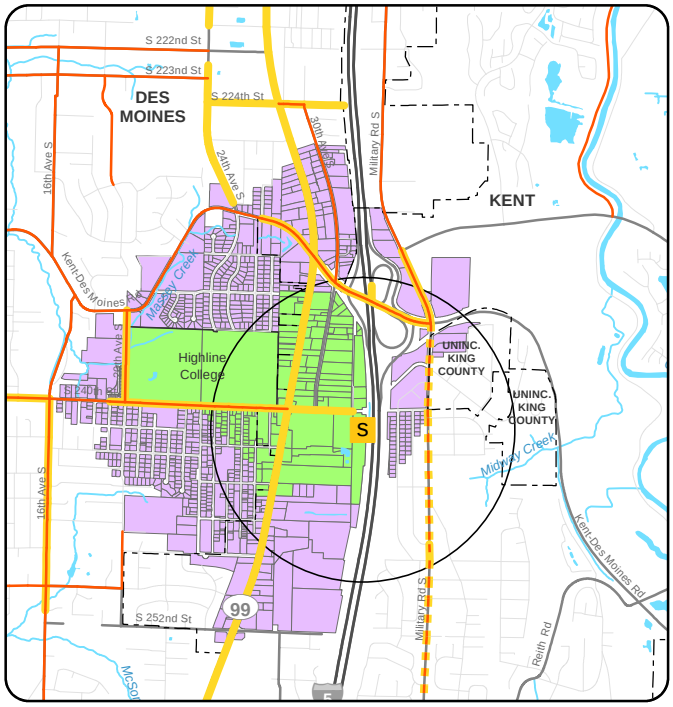
With each of the four build alternatives, I-5 is a major barrier to walking and bicycle trips east of I-5. This would be the same with any of the station options because Kent-Des Moines Road provides the only crossing over I-5 near this station area. This effectively removes a majority of the land uses east of I-5 from the station area walk- or bikesheds. Although the bikeshed for all four build alternatives shows a large area north and south of the station areas, high travel speeds and volumes on SR 99 and a lack of dedicated bicycle facilities would make it uncomfortable for bicyclists to access the station from these areas. Pedestrian crossings along SR 99 would be provided at the signalized intersection of S 240th Street and Kent-Des Moines Road. A pedestrian crossing with a proposed signal at SR 99 and S 236th Lane would also be provided with all Kent/Des Moines station options, except the Kent/Des Moines At-Grade Station Option with the I-5 Alternative.



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 4-19
Kent/Des Moines Station Area
Walksheds and Bikesheds
Federal Way Link Extension

Compared with other station options, the I-5 Alternative's Kent/Des Moines At-Grade Station Option would be located farther from major nearby land uses, such as Highline College. Therefore, the Highline College campus would be on the outer limits of a 1/2-mile walkshed.

Pedestrian Trip Generation

The total pedestrian activity is expected to range from 570 pedestrian trips per hour for Kent/Des Moines stations and station options located close to I-5 up to 960 pedestrian trips per hour for station options along SR 99. Of the total pedestrian activity, up to 160 people during the PM peak hour would walk or bike to the station for all alternatives and station options. For build alternatives and station options adjacent to SR 99, the majority of the pedestrian activity would be due to the station's proximity to the Metro RapidRide A Line. With the station located farther east of SR 99, transfers between rail and the RapidRide A Line would diminish because of the longer walking distance between transit modes, which would reduce pedestrian volumes. With the I-5 Alternative and station options, not only would fewer transit transfers occur in the Kent/Des Moines Station area due to the longer walking distance to RapidRide A Line, but more transfers would occur at the S 272nd Star Lake Station because that station would provide more bus feeder service compared with the S 272nd Redondo Station.

At the Kent/Des Moines Station, some options would have transit riders walking outside the station area to and from park-and-ride facilities. In these situations, the park-and ride would be located across a street, such as SR 99 or S 236th Lane, from the station platform area, thus requiring pedestrians to walk longer distances and make longer crossings at an intersection to get to the station.

Pedestrian Level of Service

The intersection corner LOS is expected to be A for the No Build Alternative and all build alternatives and station options. The crosswalk circulation LOS would be A or B for all the build alternatives and station options, except with the Kent/Des Moines SR 99 Median Station Option. With this alternative, the south crosswalk leg at the SR 99 and S 236th Lane intersection would be LOS C. The overall pedestrian LOS score is expected to be LOS B or C at SR 99 and S 236th Lane intersection and SR 99 and S 240th Street intersection near the Kent/Des Moines Station. For crosswalks across SR 99, a LOS C is expected due to the longer crossing distances. Side street crossings are expected to be LOS B.

4.6.4.2 S 272nd Redondo Station

Nonmotorized Facilities

Exhibit 4-20 shows the walkshed and bikeshed 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. This station area would be walkable to some of the residential neighborhoods west of SR 99. The walkshed for the residential neighborhoods southeast of the station area are limited due to a lack of direct sidewalk connectivity to SR 99 or S 272nd Street. Although the bikeshed stretches north and south of the station area, high travel speeds and volumes on SR 99 and a lack of dedicated bicycle facilities might make it uncomfortable for bicyclists to access the station from the north or south. Similar to the Kent/Des Moines Station area, I-5 presents a barrier to bicycle trips east of I-5. Pedestrian crossings along SR 99 would be provided at the signalized intersections of S 276th Street and S 272nd Street.

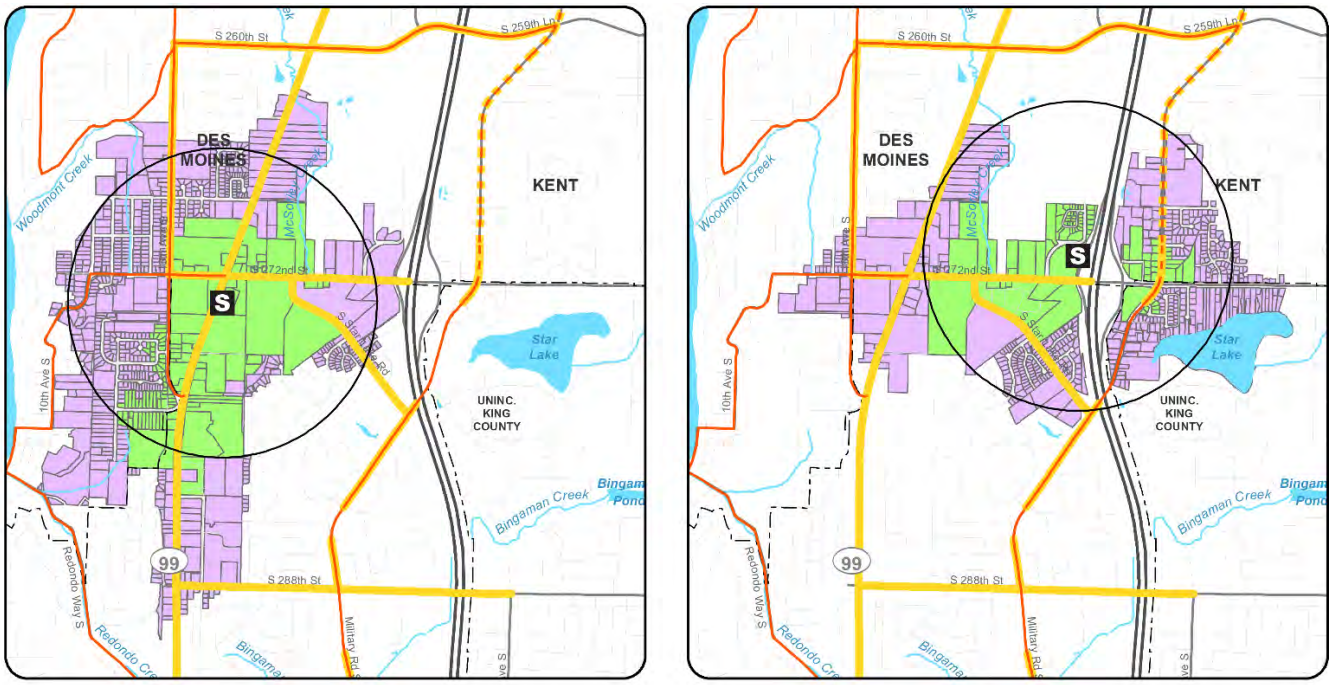


EXHIBIT 4-20
S 272nd Station Area Walksheds and Bikesheds

Pedestrian Trip Generation

The pedestrian activity at the S 272nd Redondo Station would be approximately 850 pedestrian trips per hour for the SR 99 and I-5 to SR 99 alternatives. Of the total pedestrian activity, approximately 60 persons during the PM peak hour would walk or bike to the station. Most of the remaining activity would be transit riders that walk to and from a vehicle at the park-and-ride and transfer from the RapidRide A Line.

Pedestrian Level of Service

The intersection corner quality of service and crosswalk circulation score is expected to be at LOS A with the S 272nd Redondo Station under the No Build, SR 99, and I-5 to SR 99 alternatives. For all the build alternatives and station options, the pedestrian LOS would be between LOS B and LOS C, except for the south leg of the SR 99 and S 276th Street intersection; with the FWLE, it is expected to be at LOS D due to a noticeable increase in pedestrian volumes and an increase in conflicting vehicle volumes (northbound right turns and westbound left turns).

4.6.4.3 S 272nd Star Lake Station

Nonmotorized Facilities

The I-5 and SR 99 to I-5 alternatives would serve the S 272nd Star Lake Station area. The walkshed and bikeshed for this station area are focused west of the station area because of limited public walk and bicycle facilities south and north of S 272nd Street. Similar to the Kent/Des Moines Station area, I-5 presents a barrier to walk and bicycle trips east of I-5. Exhibit 4-20 shows the walkshed and bikeshed for the S 272nd Star Lake Station area. Pedestrian crossings near the station area are provided along S 272nd Street at 26th Avenue S and the I-5 northbound and southbound ramps.

Pedestrian Trip Generation

The pedestrian activity with the S 272nd Star Lake Station would be approximately 900 persons per hour for the I-5 and SR 99 to I-5 alternatives. Of the total pedestrian activity, approximately 120 persons during the PM peak hour would walk or bike to the station and would generally originate from west of the station. All automobile-based pedestrian trips would be contained in the station area. Some riders transferring between rail and bus would walk between the station and bus stop located on the I-5 ramps.

Pedestrian Level of Service

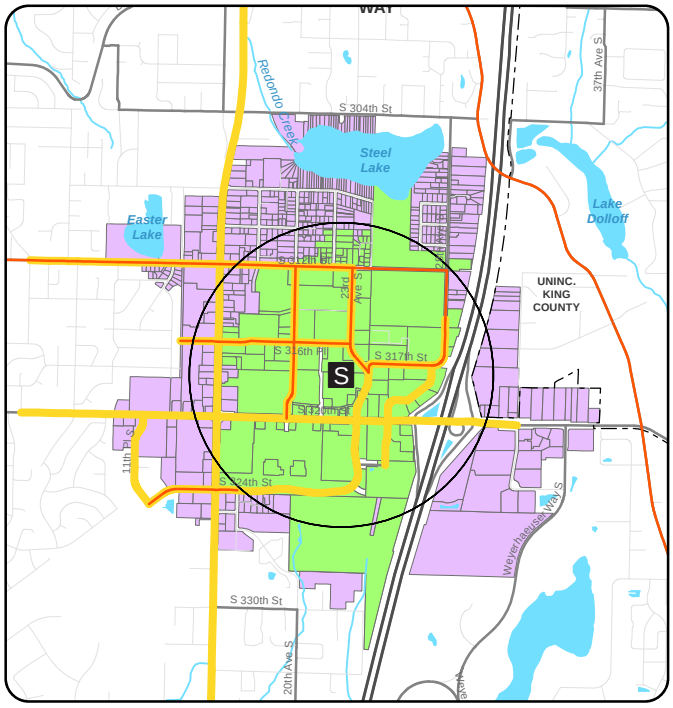
The intersection corner quality of service and crosswalk circulation score is expected to be at LOS A with the S 272nd Star Lake Station under the No Build, I-5, and SR 99 to I-5 Alternatives. The overall pedestrian LOS would be between LOS B and LOS C at the S 272nd Street/26th Avenue S intersection under the No Build, I-5, and SR 99 to I-5 Alternatives.

4.6.4.4 Federal Way Transit Center and City Center Stations

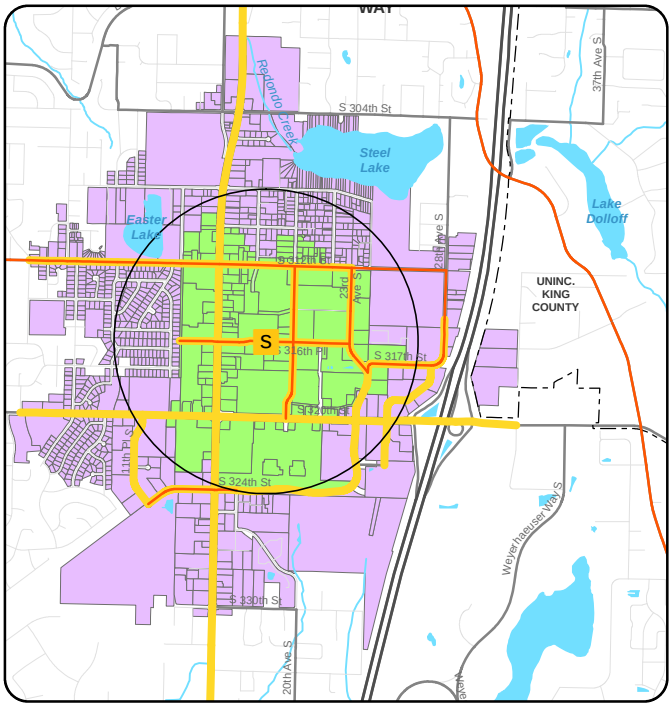
Nonmotorized Facilities

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 walkshed and bikeshed around the station area is generally dominated by commercial properties, with access to residential neighborhoods north of S 312th Street on the outer edge of the walkshed. The location of the station area between SR 99 and I-5 generally limits the walkshed and bikeshed between those two regional facilities. High traffic volumes and long pedestrian crossings along S 320th Street present a potential barrier to land uses south of S 320th Street, including the Federal Way Commons shopping center. Exhibit 4-21 shows the walkshed and bikeshed for the Federal Way Transit Center area.

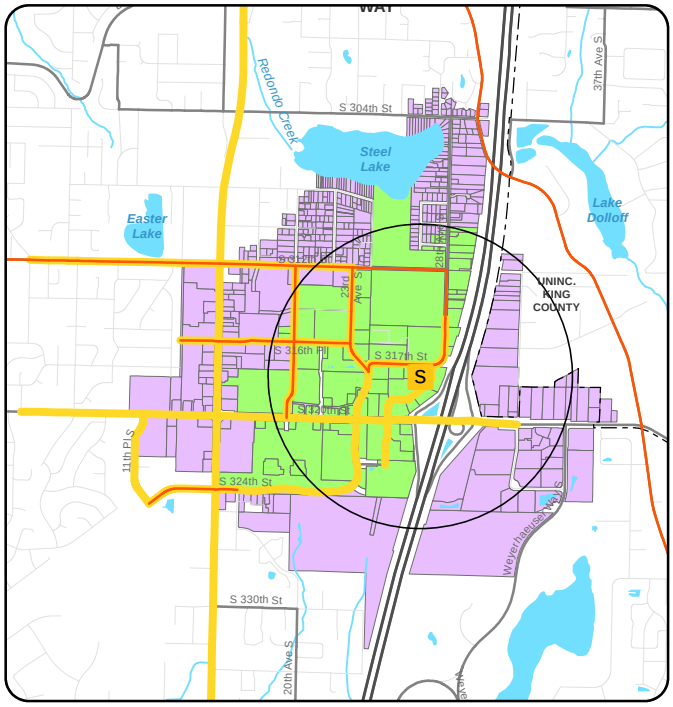
In general, the Federal Way SR 99 Station Option walkshed and bikeshed are similar to the walkshed and bikeshed for the Federal Way Transit Center Station, but the station option's proximity to SR 99 would increase the amount of accessible land uses west of SR 99. Despite this, high travel speeds and traffic volumes on SR 99, in conjunction with long crossing distances, would make it uncomfortable for pedestrians or bicyclists to access this station option from west of SR 99. The walkshed and bikeshed with the Federal Way I-5 Station Option are slightly more limited than the Federal Way Transit Center Station. With the station area located farther east of the other Federal Way City Center stations, the walkshed would not reach SR 99. Additionally, I-5 is a barrier that limits walk or bicycle trips to and from the east that limits the accessibility of this station option for land uses east of I-5.



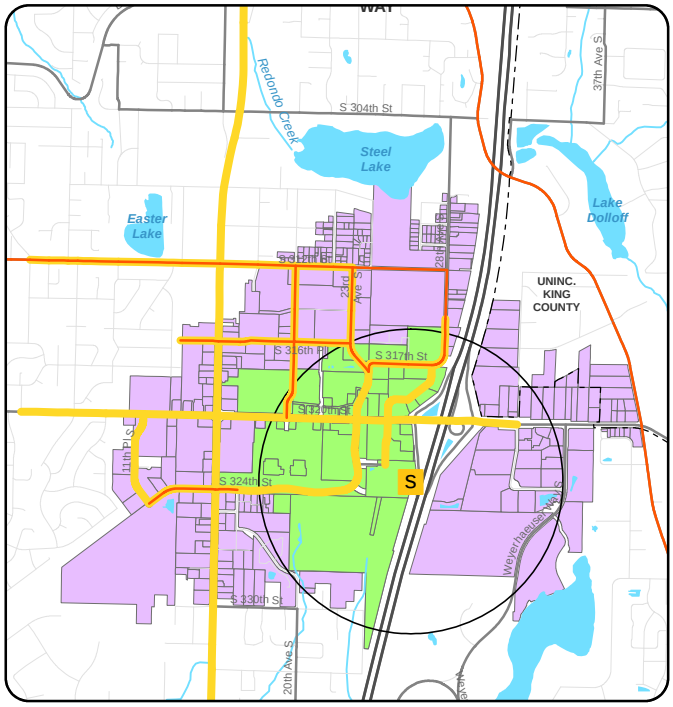
Federal Way Transit Center Station



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 4-21
Federal Way Transit Center Station Area
Walksheds and Bikesheds
Federal Way Link Extension

The Federal Way S 320th Park-and-Ride Station Option walkshed and bikeshed would include a larger share of the land uses south of S 320th, including the Federal Way Commons shopping mall. Similar to the stations north of S 320th Street, pedestrian and bicycle activity across S 320th Street could be hindered and would limit the accessibility of the land uses north of S 320th Street from the station.

Pedestrian Trip Generation

The build alternatives would generate approximately 1,600 to 1,800 pedestrians per hour for all station options except the S 320th Street Park-and-Ride station option, which would have over 2,000 pedestrians per hour. For the Federal Way City Center station options, the majority of the activity would be within the station area as pedestrians transfer between rail and bus and would walk to and from their vehicle at the park-and-ride. Walking and bicycle trips would be lower compared with all other FWLE station areas due to a lack of adjacent residential land uses. Land uses that promote transit-oriented development could encourage more walk and bicycle- based trips.

Pedestrian Level of Service

The intersection corner quality of service and crosswalk circulation score is expected to be at LOS A, regardless of the Federal Way station location under the No Build and build alternatives. With Federal Way station locations north of S 320th Street, the overall pedestrian LOS score would be the same as the No Build Alternative (LOS A to LOS C) for crosswalks at signalized intersections. With the Federal Way S 320th Park-and-Ride Station Option, the pedestrian LOS score would change from LOS B to LOS C at the S 322nd Street and 23rd Avenue S intersection for the north and east crosswalk legs.

4.6.4.5 S 216th Station and S 260th Station Options

Nonmotorized Facilities

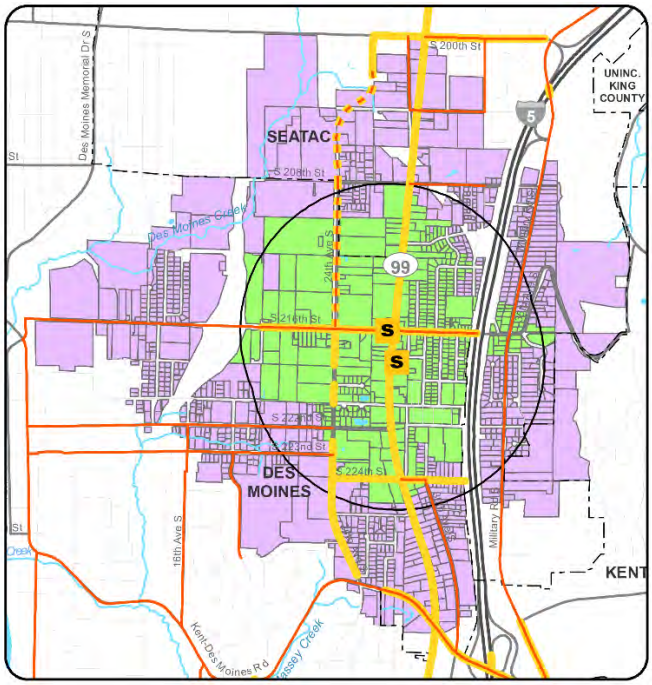
The potential additional S 216th and S 260th West or East station options would have connections to nonmotorized facilities that provide access in all directions. I-5 could be a barrier for potential bicycle trips east of I-5 and would limit the walkshed mostly to the neighborhoods between SR 99 and I-5. High travel speeds and traffic volumes and the lack of bicycle facilities on SR 99 could limit the attractiveness for north-south bicycle trips along SR 99. At the S 216th Street station, the Des Moines Gateway Project would provide sidewalk and bicycle lanes along S 24th Avenue and S 216th Street, which could improve connections between the station and adjacent neighborhoods. Exhibit 4-22 shows the walksheds and bikesheds for these potential additional station areas. Pedestrian crossings along SR 99 would be provided at the signalized intersections of S 216th Street and S 220th Street for the S 216th Street West or East Station and at S 260th Street for the S 260th Street West or East Station.

Pedestrian Trip Generation

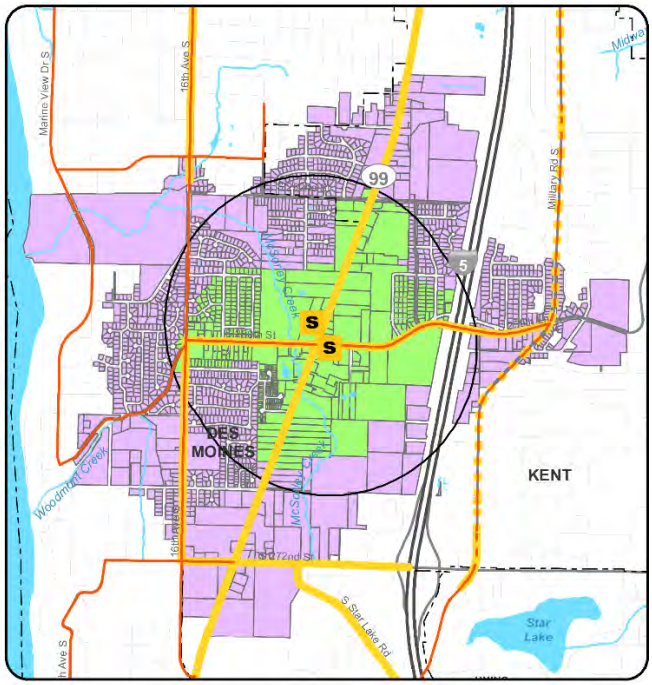
The pedestrian activity at the potential additional S 216th and S 260th West or East station options would be the lowest (about 200 trips per hour) of all station options because no park-and-ride facilities would be provided and there are fewer bus connections to these two stations than to other locations. The majority of the pedestrian activity would be people walking and bicycle to and from the station. Transit transfer trips would be limited because only one or two transit routes are expected to serve each station. Automobile-based (passenger drop-off/pick-up trips) activity is expected to be modest.

Pedestrian Level of Service

The intersection corner quality of service and crosswalk circulation score is expected to be at LOS A, regardless of the FWLE station location under the No Build Alternative, S 216th West or East Station Options, and S 260th West or East station options. The overall pedestrian LOS score with these potential additional stations 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 and SR 99 intersection for the S 216th West or East station options, where the overall crosswalk score would be LOS D.



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 4-22
S 216th and S 260th West and East Station Areas Walkshed and Bikesheds

4.6.4.6 Kent/Des Moines Interim Terminus Condition

Nonmotorized Facilities

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

Pedestrian Trip Generation

The pedestrian trip generation with the Kent/Des Moines interim terminus condition is expected to range from 1,380 persons per hour to 2,010 persons per hour for the build alternatives. Of the total

pedestrian activity, between 110 and 130 persons during the PM peak hour would walk or bike to the station. Compared with the full-length alternatives, pedestrians walking between the station and park-and-ride would likely double because the park-and-ride capacity would be higher. In the interim terminus condition at this station, transit transfer trips would more than double. Similar to the full-length build alternatives and station options, stations located adjacent to SR 99 would have the highest amount of pedestrian trips transferring from bus to rail because of the proximity of the station to the RapidRide A Line. With a station located farther east of SR 99 (e.g., I-5 Station), the desire to make a bus-to-rail transfer would diminish due to the longer walking distance between transit modes.

The higher number of park-and-ride spaces at Kent/Des Moines under the interim condition, would result in more external pedestrian trips going from automobile to transit. In these situations, where the park-and ride is located across a street such as SR 99 or S 236th Lane from the station, pedestrians would walk longer distances and/or be required to cross a street at an intersection.

Pedestrian Level of Service

For the interim terminus condition, the intersection corner quality of service and crosswalk circulation at the Kent/Des Moines Station would generally be between LOS A and LOS C. With the Kent/Des Moines station options located on the west side or median of SR 99, many crosswalks would be between LOS C and LOS D at the S 236th Lane and SR 99 intersection. This would be because of an increased number of pedestrian trips transferring from the bus and the park-and-ride across SR 99 compared with the full-length condition. The south crosswalk with the Kent/Des Moines SR 99 Median Station Option at the SR 99 and S 236th Lane would be LOS D. This crosswalk would serve the north station entry. At this intersection under the Kent/Des Moines interim terminus condition, crosswalk and sidewalks widths would be designed to exceed standards to accommodate the increased number of pedestrians. It is recommended that crosswalks be at least 10 feet wide at the S 236th Street and SR 99 intersection for all Kent/Des Moines station options.

4.6.4.7 S 272nd Interim Terminus Condition

Nonmotorized Facilities

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

Pedestrian Trip Generation

The S 272nd Redondo Station would generate approximately 1,020 pedestrians per hour, while the S 272nd Star Lake Station would generate slightly more (1,360) pedestrians per hour during the PM peak hour. Of the total pedestrian activity, 50 persons during the PM peak hour would walk or bike to the S 272nd Redondo Station and 130 persons during the PM peak hour would walk or bike to the S 272nd Star Lake Station. Compared to the full-length build alternatives, the increase in pedestrian activity would be attributed to a noticeable increase in transit transfer trips and a modest increase in automobile (passenger drop-off/pick up) trips. All automobile-based pedestrian trips would remain internal to the station area for both S 272nd area stations, while a portion of the transit transfer activity would access the station from bus stops located on the I-5 on-ramp for the S 272nd Star Lake Station.

Pedestrian Level of Service

Pedestrian LOS for signalized intersections around either the S 272nd Redondo or the S 272nd Star Lake stations in the interim terminus condition would be the same as the full length build alternatives, even though pedestrian trip generation is expected to be higher under the interim terminus condition.

4.7 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 traffic volumes increase in the transportation study area. However, the 28th/24th Extension Project, planned for completion in 2017 in the cities of SeaTac and Des Moines, will be a T-2 freight route. This facility will enhance north-south freight mobility in the study area and serve Sea-Tac Airport and industrial and commercial land uses along the corridor.

With the build alternatives on either I-5 or SR 99, truck traffic 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. No at-grade crossings of freight rail tracks would occur with the FWLE. Isolated freight movements could experience a benefit with the FWLE locations through project improvements and/or mitigation (see Chapter 7). 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.

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