4 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter of the Draft EIS discusses the affected environment and environmental consequences for the following resources for the Build and No-Build alternatives:

- Acquisitions, Displacements, and Relocations.
- Land Use.
- Economics.
- Environmental Justice, Social Resources, Community Facilities, and Neighborhoods.
- Visual and Aesthetic Resources.
- Air Quality.
- Noise and Vibration.
- Water Resources.
- Ecosystems.
- Energy.
- Geology and Soils.
- Hazardous Materials.
- Electromagnetic Fields.
- Public Services, Safety, and Security.
- Utilities.
- Historic and Archaeological Resources.
- Parks and Recreational Resources.
- Section 4(f) Evaluation Summary.

Types of Impacts

A **long-term impact**, sometimes referred to as an operational impact, is a direct impact that causes a permanent change or occurs during the operation of the system after construction.

A **construction impact** is a direct short-term impact caused by things like building a retaining wall, a detour, or pile-driving. Short-term impacts only occur during construction.

An **indirect impact** is caused by a proposed action or alternative and occurs later in time or is farther removed in distance but still reasonably foreseeable (40 CFR 1508.1(g)(2)).

Each section introduces the resource and regulatory requirements and then describes the following for the Tacoma Dome Link Extension:

- Affected environment, including the study area for the resource.
- Long-term, construction, and indirect impacts of each alternative.
- Potential mitigation measures for unavoidable impacts.

National Environmental Policy Act (NEPA) and State Environmental Policy Act (SEPA) regulations require that EISs disclose direct and indirect impacts (i.e., effects) of a proposed action on the environment.[1] Direct impacts are caused by the action and occur at the same time and place. Indirect impacts (sometimes called “secondary impacts”) are caused by the action but are later in time or farther removed in distance. Examples include changes in land use patterns and related effects on air quality. Impacts can be either temporary (short-term), such as construction impacts, or permanent (long-term), such as property displacements or impacts due to light rail operations. Cumulative impacts, which could result from the project’s incremental

[1] Because the NEPA process for TDLE began before July 1, 2024, the environmental analysis for TDLE does not apply the implementing regulations adopted through Phase 2: Final Rule, 40 CFR Sections 1500 et seq, May 1, 2024 (40 CFR 1506.12).

impact when added to those of other past, present, and reasonably foreseeable future actions, are discussed in Chapter 5, Cumulative Impacts.

As described in Chapter 2, the OMF South project includes the same 1.4-mile portion of guideway from the Federal Way Downtown Station to S 344th Street as the alternatives in the TDLE Federal Way Segment. Project development and environmental review for the OMF South and TDLE projects began concurrently; however, OMF South recently completed environmental review. In June 2024 FTA and Sound Transit issued the OMF South Final EIS and the Sound Transit Board selected to build the Preferred South 336th Street Alternative. FTA issued the OMF South Record of Decision in August 2024. Based on the Sound Transit Board action, the 1.4-mile portion of guideway is planned to be constructed as part of the OMF South project. Due to the timing of the OMF South Board action in relation to the writing of this TDLE Draft EIS, construction impacts for this portion of track are included in the TDLE Draft EIS.

4.1 Acquisitions, Displacements, and Relocations

4.1.1 Introduction to Resource and Regulatory Requirements

This section describes the property that would potentially be affected by construction and operation of TDLE, and the residences, businesses, and public uses that would be displaced and relocated due to the property acquisitions.

All TDLE alternatives would require the permanent and temporary acquisition of public and private property for the track and station right-of-way, as well as transit integration, road realignment, construction staging, and mitigation. There are two types of potential permanent property acquisitions:

- **Partial acquisition** – A portion of a parcel would be permanently acquired, but the current use would likely not be displaced. In some instances, such as larger parcels that hold multiple uses, a business or residential unit on a parcel could be displaced while other uses remain.
- **Full acquisition** – The entire parcel would be permanently acquired, and all current uses would be displaced. In some instances, full acquisitions include parcels that may not be needed for the project but would be affected to the extent that current uses would be substantially impacted.

At the current level of design, potential partial and full permanent acquisitions for the Draft EIS alternatives are identified as affected properties. The property and displacement data presented in this analysis are based on the conceptual design plans developed by Sound Transit for the Draft EIS (see Appendix F, Conceptual Design Drawings) and would be updated as the project design is refined for the Final EIS. The information on affected parcels, such as businesses and other uses, is based on available information at the time of this analysis and could change as the project design is further developed. Final determination of affected properties, including whether the acquisition would be partial or full, would be based on the project's final design following completion of the EIS process and the Sound Transit Board's selection of the project to build. Property acquisitions described here are intended to be used for comparison across alternatives and are not final determinations.

Property acquisitions are guided by federal and state regulations, Sound Transit procedures comply with the Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (as amended) and Washington State's relocation and property acquisitions

requirements. Any land acquired for the project that is not needed after construction would be sold or transferred by Sound Transit, consistent with agency policies.

In addition to the potential property acquisitions described in this section, the project would also require temporary construction easements, permanent aerial easements, permanent easements for maintenance, and the permanent use of rights-of-way owned by WSDOT and local jurisdictions. The area of these easements is not included in the data presented in this section. Wherever possible, construction staging would occur on parcels needed for the project's alignment, station, or right-of-way. Appendix F, Conceptual Design Plans, identifies the preliminary construction limits for the project. These areas identified for temporary construction uses may change as the project is refined, which could require an environmental reevaluation under 23 CFR 771.129.

In accordance with 23 CFR 810 Part C, Making Highway Right-of-Way Available for Mass Transit Projects, Sound Transit must apply to WSDOT to use the right-of-way on I-5. Following an acceptance of Sound Transit's application, WSDOT would request authorization from FHWA to make the right-of-way available for the project. Acceptance by FHWA would be dependent on Sound Transit providing evidence that the use of the right-of-way for the project would not impair future highway improvements or the safety of highway users.

Additional impacts associated with acquisitions and displacements are discussed in Section 4.2, Land Use; Section 4.3, Economics; Section 4.4, Environmental Justice, Social Resources, Community Facilities, and Neighborhoods; Section 4.14, Public Services, Safety, and Security; Section 4.16, Historic and Archaeological Resources; Section 4.17, Parks and Recreational Resources; Section 4.18, Section 4(f) Evaluation, and Appendix C, Environmental Justice.

4.1.2 Affected Environment

The study area for the acquisitions, displacements, and relocations analysis includes the parcels that are within the areas where the light rail alignments, stations, related facilities, and construction staging areas require a right-of-way. This area extends from the terminus of the Federal Way Link Extension south through Federal Way, Milton, unincorporated Pierce County, Fife, and Tacoma until reaching the TDLE terminus near the Tacoma Dome. The project would cross ancestral and reservation lands of the Puyallup Tribe of Indians. All TDLE alternatives would include a bridge over the Puyallup River.

The project corridor is almost entirely developed and contains residential, commercial, industrial, and public rights-of-way properties. The Federal Way Segment contains primarily low-density residential and commercial properties. The South Federal Way Segment contains low-density residential and commercial properties, two cemeteries, and industrial uses. In addition, along Pacific Highway (SR 99) in this segment, there are some undeveloped natural areas. Both the Fife and Tacoma segments are developed almost entirely for commercial and industrial use, with smaller amounts of residential properties or public land. Developed land in the Tacoma Segment also includes the Operations and Maintenance Facility on E 25th Street that serves the existing Tacoma Link alignment and extension to Hilltop.

4.1.3 Environmental Impacts

Table 4.1-1 presents the estimated number of affected parcels and displacements for each alternative. Appendix H1, Potentially Affected Parcels, includes maps identifying potentially affected properties by alternative.

Table 4.1-1 Summary of Potential Properties Affected and Displacements by Alternative[1]

Alternative	Number of Potential Properties Affected[2]	Number of Businesses Displaced	Number of Residential Units Displaced[3]
Federal Way Segment			
Preferred FW Enchanted Parkway	7	0	77
Preferred FW Enchanted Parkway with Design Option	7	0	102
South Federal Way Segment			
SF Enchanted Parkway[4]	47	14	40[5]
SF I-5	43	7	3
SF 99-West	91	25	17
SF 99-West with Porter Way Design Option	89	23	17
SF 99-East	88	25	2
SF 99-East with Porter Way Design Option	81	24	2
Fife Segment			
Fife Pacific Highway	66	38	3
Fife Pacific Highway with 54th Avenue Design Option	69	50	3
Fife Pacific Highway with 54th Span Design Option	69	54	3
Fife Median	66	12	3
Fife Median with 54th Avenue Design Option	69	24	3
Fife Median with 54th Span Design Option	69	28	3
Fife I-5	56	17	3
Fife I-5 with 54th Avenue Design Option	54	34	3
Fife I-5 with 54th Span Design Option	56	40	3
Tacoma Segment			
Preferred Tacoma 25th Street-West	35	9	0
Tacoma 25th Street-East	31	9	0
Tacoma Close to Sounder	34	43	0
Tacoma 26th Street	51	13	0
Total Range	**135 – 218**	**28 – 122**	**82 - 145**

Source: King County and Pierce County GIS and Assessors (2020), Parametrix windshield survey (2020).

Notes:

(1) The estimates of displacements presented in this section are based on land uses, business, and dwelling counts sourced from King and Pierce County Assessor data as well as high-resolution aerial photo review and on-site surveys.

(2) Includes all potentially affected properties (full and partial acquisitions).

(3) Residential units include single-family houses or mobile homes as well as individual units within an apartment building or condominium building.

(4) Potential properties affected and displacements are the same with the SF 352nd Span Station Option.

(5) A former hotel is being converted into an 84-unit emergency shelter. As of spring 2024, an opening date has not been identified. These units are not counted in the long-term residential units displaced but are discussed separately in Section 4.1.3.2.

If construction of TDLE parking facilities at both of the South Federal Way and Fife stations is deferred up to 3 years after light rail service begins, the areas may be temporarily surrounded by fencing, used for surface parking, or other measures identified in coordination with the local jurisdiction.

If TDLE is constructed in phases, the M.O.S. to the station in South Federal Way and the station in Fife would require fewer acquisitions than what would be required for the full project extent to Tacoma. The two M.O.S. options would not change the number of affected parcels around the station areas.

4.1.3.1 No-Build Alternative

The No-Build Alternative also includes projects, funding packages, and proposals in the central Puget Sound region that are planned to occur with or without TDLE, as described in Chapter 2 (Section 2.2).

For the OMF South project, the Sound Transit Board selected the Preferred South 336th Street Alternative as the project to be built, and FTA issued a ROD in summer 2024. Property acquisition and displacements in the Federal Way Segment are planned to occur between the Federal Way Downtown Station and the OMF South site as part of the OMF South project.

With the No-Build Alternative, no displacements and relocations associated with TDLE would occur.

4.1.3.2 Long-Term Impacts for the Build Alternatives

The following sections describe potential permanently affected properties for each build alternative. Table 4.1-2 presents the potentially affected parcels and displacements by land use for each build alternative.

Federal Way Segment

The Federal Way Segment would require the acquisition of seven private properties and transportation right-of-way to accommodate guideways and stormwater facilities. Properties affected in this segment include single- and multi-family residential as well as commercial and industrial properties, vacant land, and the Federal Way/S 320th Street Park-and-Ride lot.

Potential residential displacements (approximately 77 units) for the Preferred FW Enchanted Parkway Alternative would occur at the Belmor Mobile Home Park (Belmor), which is a manufactured home community, golf course, and restaurant located near The Commons at Federal Way.

The Preferred FW Enchanted Parkway Alternative with the Design Option would impact the same properties and would displace additional units within Belmor (approximately 102 units total).

While both alternatives would affect a portion of one commercial and industrial property and one public and institutional property, neither alternative would result in business displacements. For a comparison of affected properties and displacements in the Federal Way Segment, see Table 4.1-2.

Table 4.1-2 Number of Potential Permanently Affected Parcels and Displacements by Alternative and Land Use

Alternative	Single-Family	Multi-Family	Commercial and Industrial	Public and Institutional	Vacant	Total Number of Potential Properties Affected[1]	Business Displacements	Residential Displacements[2]
Federal Way Segment								
Preferred FW Enchanted Parkway	0	2	1	1	3	**7**	0	77
Preferred FW Enchanted Parkway with Design Option	0	1	1	1	4	**7**	0	102
South Federal Way Segment								
SF Enchanted Parkway	5	1	26	1	14	**47**	14	40[3]
SF I-5	5	1	21	1	15	**43**	7	3
SF 99-West	7	4	41	5	34	**91**	25	17
SF 99-West with Porter Way Design Option	9	3	42	3	32	**89**	23	17
SF 99-East	11	1	34	7	35	**88**	25	2
SF 99-East with Porter Way Design Option	10	0	34	3	34	**81**	24	2
Fife Segment								
Fife Pacific Highway	2	0	49	3	12	**66**	38	3
Fife Pacific Highway with 54th Avenue Design Option	2	0	53	4	10	**69**	50	3
Fife Pacific Highway with 54th Span Design Option	2	0	53	4	10	**69**	54	3
Fife Median	2	0	49	3	12	**66**	12	3
Fife Median with 54th Avenue Design Option	2	0	53	4	10	**69**	24	3
Fife Median with 54th Span Design Option	2	0	53	4	10	**69**	28	3
Fife I-5	1	1	38	3	13	**56**	17	3
Fife I-5 with 54th Avenue Design Option	1	1	38	4	10	**54**	34	3
Fife I-5 with 54th Span Design Option	1	1	40	4	10	**56**	40	3
Tacoma Segment								
Preferred Tacoma 25th Street-West	0	0	29	1	5	**35**	9	0
Tacoma 25th Street-East	0	0	24	2	5	**31**	9	0
Tacoma Close to Sounder	0	0	26	1	7	**34**	43	0
Tacoma 26th Street	0	0	36	5	10	**51**	13	0

Sources: King County and Pierce County GIS and Assessors (2020).

Notes:

(1) Includes all potentially affected properties (full and partial acquisitions).

(2) Residential displacements represent a count of the single-family and multi-family dwelling units displaced as part of the project.

(3) A former hotel is being converted into an 84-unit emergency shelter. As of July 2024, an opening date has not been identified. These units are not counted in the long-term residential units displaced but are discussed separately in Section 4.1.3.2.

South Federal Way Segment

The South Federal Way Segment would require the acquisition of between 43 and 91 private properties, city-owned properties, and transportation right-of-way as well as an executed Intergovernmental Agreement with the Puyallup Tribe of Indians for renewable, long-term easements. The easements would be on land that is owned by the Puyallup Tribe of Indians or land that the United States government holds in trust on behalf of the Puyallup Tribe of Indians.

All of the South Federal Way alternatives would affect residential, commercial, industrial, public, and vacant properties. The SF 99-West and SF 99-East alternatives, with or without the Porter Way Design Option, would affect more properties (approximately 33 to 48) and businesses (approximately 9 to 18) than the other alternatives Fewer properties would be affected by the SF Enchanted Parkway Alternative and SF I-5 Alternative because these alternatives would be developed within WSDOT right-of-way adjacent to I-5 for much of the segment, compared to the more densely built environment and narrower right-of-way along Pacific Highway.

The SF 99-West and SF 99-East alternatives would displace the most businesses (approximately 23 to 25), requiring nearly twice the business displacements as the SF Enchanted Parkway and more than three times as many business displacements as the SF I-5 Alternative. Most business displacements for all South Federal Way alternatives in King County would be for the station in Federal Way. Business impacts associated with the station in Federal Way would be identical for the SF Enchanted Parkway and SF 99-West alternatives, with displacements occurring for retail businesses and Heidelberg Materials (a ready-mix concrete supplier) along the west side of Enchanted Parkway between S 348th Street and S 352nd Street. The SF 99-East Alternative would displace the same businesses as the SF 99-West Alternative along this stretch of the alignment but would also displace several industrial businesses along the south side of S 352nd Street between Enchanted Parkway and Pacific Highway. The SF I-5 Alternative would avoid business displacements along Enchanted Parkway north of S 356th Street but would displace the Jet Chevrolet Car Dealership and several retail businesses for the station south of S 356th Street.

From S 356th Street to the southern end of the South Federal Way Segment, the SF 99-West Alternative would displace 14 businesses and 15 residences, and the SF 99-East Alternative would displace 12 businesses and 2 residences. Business displacement along Pacific Highway for the SF 99-West and SF 99-East alternatives would include retail and industrial uses, and the residential displacements would include single-family homes for both alternatives, as well as a mobile home park for the SF 99-West Alternative. From the Pierce County line to the segment's southern terminus, the SF 99-West Alternative would displace two additional businesses, and the SF 99-East Alternative would displace one additional business compared to the Porter Way Design Option. The SF Enchanted Parkway and SF I-5 alternatives would displace comparatively fewer businesses between the South Federal Way Station and Porter Way because of its location within the I-5 right-of-way. The SF 99-West and SF 99-East alternatives (with or without the Porter Way Design Option) would displace several billboards, Daffodil Storage, and a commercial building on Porter Way, while the SF Enchanted Parkway and SF I-5 alternatives would avoid these impacts. South of Porter Way, all of the South Federal Way alternatives would displace approximately two businesses (on five parcels) with retail, office, and industrial uses along the east side of Pacific Highway.

Looking at the entirety of the South Federal Way Segment, the SF Enchanted Parkway Alternative would have the most residential displacements (approximately 40), followed by the SF 99-West Alternative (approximately 17). The higher number of residential displacements associated with the SF Enchanted Parkway Alternative can be attributed to potential impacts at

the CrossPoint Apartments. The residential displacements associated with the SF 99-West Alternative (with or without the Porter Way Design Option) would be primarily in two adjoining mobile home and RV communities along the west side of Pacific Highway. For a comparison of affected properties and displacements in the South Federal Way Segment, see Table 4.1-2.

In addition to the affected properties described above, the SF Enchanted Parkway Alternative would fully acquire a former hotel near the corner of S 348th Street and 16th Avenue S. This property was purchased by King County in 2021 and is transitioning to an 84-bed emergency shelter. The opening date for the emergency shelter has not been established. For additional information on affordable housing, see Section 4.4, Environmental Justice, Social Resources, Community Facilities, and Neighborhoods. For additional information on impacts to public services, see Section 4.14, Public Services.

Fife Segment

The Fife Pacific Highway and Fife Median alternatives would affect the most properties (approximately 66), and the Fife Pacific Highway Alternative would displace the most businesses (approximately 38). The roadway modifications and guideway of the Fife Pacific Highway Alternative would encroach into the parking lot and buildings within the Fife Business Park and into the parcels along the south side of Pacific Highway, which could require displacing several retail complexes, including the Pick-Quick Drive In on the corner of Pacific Highway and Alexander Avenue E. The Fife Pacific Highway Alternative would avoid the displacement of car dealerships, but their associated parking lots along Pacific Highway would be reduced.

Between Willow Road E and Alexander Avenue E, the Fife Median Alternative would affect the same nine properties as the Fife Pacific Highway Alternative but would displace 26 fewer businesses on the south side of Pacific Highway. West of Alexander Avenue E, the Fife Median and Fife Pacific Highway alternatives would have identical impacts to properties, businesses, and residents, including the same reduction to car dealership parking lots along Pacific Highway.

All three alternatives require using approximately 750 feet of the Puyallup Tribal Integrative Medicine Center property frontage, owned by the Puyallup Tribe of Indians; however, the facility would not be displaced. A long-term agreement for renewable easements from the Puyallup Tribe of Indians would be needed. All three build alternatives would also permanently impact the north and south portions of the former Cappa property, which encompasses multiple parcels. The title to this property was transferred to the City to become park space in perpetuity. The alternatives would not preclude its use as a future park or recreational facility.

Three residential displacements would be anticipated for all alternatives in the Fife Segment. One of the residential displacements is a priest's residence associated with St. Paul Chong Hasang Church. The Fife I-5 Alternative would also affect a portion of the Chateau Rainier Apartments parking lot, an affordable housing complex managed by the Pierce County Housing Authority; however, no residential displacements would occur.

All three alternatives would require acquisition of the parcel located at 1327 52nd Avenue E. With FTA's approval, Sound Transit is acquiring this parcel as a protective acquisition under 23 CFR 771.118(d)(3)(ii) prior to the TDLE ROD. The purpose of a protective acquisition is to prevent imminent development of a parcel that may be needed for a proposed transportation corridor or site. A protective acquisition does not limit the evaluation of alternatives required under the NEPA process. No development on the parcels would occur until after FTA issues a ROD.

All three alternatives in the Fife Segment could include the 54th Avenue Design Option or the 54th Span Design Option. The Fife Pacific Highway and Fife Median alternatives with the 54th Avenue Design Option would potentially affect three additional properties. The Fife I-5 Alternative with 54th Avenue Design Option would potentially affect two fewer properties. With the 54th Avenue Design Option, impacts would shift from the industrial properties between 59th Avenue Court E and 54th Avenue E to the industrial and commercial properties west of 54th Avenue E, increasing business displacements by approximately 12 to 17 for each alternative. These additional business displacements would include full acquisition of the Fife Square Shopping Center and the Les Schwab facility on the west side of 54th Avenue E as well as several office and medical uses along 12th Street E. The 54th Avenue Design Option would result in the same residential displacements as each alternative without the option.

The Fife Pacific Highway and Fife Median alternatives with the 54th Span Design Option would potentially affect three additional properties. The 54th Span Design Option would require acquisition of the Fife Square Shopping Center and Les Schwab facility on 54th Avenue E, like the 54th Avenue Design Option, but could also require displacement of the Pape Material Handling Yard and a construction business east of 54th Avenue E. For all Fife alternatives, the 54th Span Design Option would have approximately 16 to 23 additional business impacts. For a comparison of affected properties and displacements in the Fife Segment, see Table 4.1-2.

Tacoma Segment

The Tacoma Segment would require the acquisition of private and public properties and transportation right-of-way to accommodate the guideway, two stations, bus transit facilities, and street or highway adjustments. Properties affected through this segment include industrial and commercial uses as well as public and vacant land. No residential properties would be affected by any of the Tacoma Segment alternatives. The Tacoma 26th Street Alternative would potentially affect more properties (approximately 51 total) than the other alternatives but impact fewer business than the Tacoma Close to Sounder Alternative, which would result in the highest number of business displacements (approximately 43 total) in Tacoma.

From the Puyallup River bridge to the station area at Portland Avenue, all alternatives and options would impact the same properties (approximately 10) and displace the same retail and industrial businesses (approximately 6). For all alternatives, an optional Portland Avenue bike and pedestrian bridge is being considered that would connect the Portland Avenue Station or the Portland Avenue Span Station Option to the neighborhoods and Puyallup Tribe of Indians facilities on the south side of I-5. This optional bridge would cross above I-5 and improve nonmotorized access and safety between the station and areas to the south. There are two options for the bike and pedestrian bridge. From the station area, the west option could extend south along E Portland Avenue to E 30th Street, and the east option could extend south to near E 29th Street and East R Street. Both options would require a permanent airspace easement over I-5 and an Intergovernmental Agreement with the Puyallup Tribe of Indians for renewable, long-term easements on approximately four to eight parcels owned by the Tribe, beyond those that have been identified for TDLE in this Draft EIS. This bridge is not currently funded as part of TDLE.

West of the Portland Avenue station area, impacts for each alternative would differ, with the Tacoma 26th Street Alternative impacting the largest number of properties (approximately 41 west of East N Street) and the Tacoma Close to Sounder Alternative displacing the most businesses (approximately 37 west of East N Street). Between the stations area at Portland Avenue to the TDLE terminus, the Tacoma 25th Street-East Alternative would impact four fewer properties but the same three business displacements as the Preferred Tacoma 25th Street

West-Alternative. Both of the alternatives on E 25th Street would acquire properties for a bus layover facility, but only the Tacoma 25th Street-East Alternative would require relocating the power substation along E 26th Street. For this same stretch, the Tacoma 26th Street Alternative would result in approximately seven retail and industrial business displacements along E 26th Street for guideway and station development. The Tacoma Close to Sounder Alternative would impact fewer properties than the Tacoma 26th Street Alternative from the Portland Avenue Station to the terminus but would result in considerably more business displacements than the other Tacoma alternatives to accommodate the station. Development of the Tacoma Close to Sounder station would likely require full acquisition of Freighthouse Square, displacing the small retail and office tenants. Displacements associated with Freighthouse Square (approximately 29) account for most of the 43 total business displacements for this alternative. Additional impacts from Tacoma Close to Sounder Station could include demolishing and rebuilding the existing Sounder concourse and Amtrak station.

Table 4.1-2 compares the affected properties and business displacements for the Tacoma Segment. The majority of the Tacoma Close to Sounder business displacements would occur within Freighthouse Square, whereas business displacements for other alternatives are more dispersed and generally related to bus layover facilities and not the track. No residential properties would be displaced by any of the alternatives in the Tacoma Segment.

4.1.3.3 Construction Impacts for the Build Alternatives

Construction of TDLE would require property for construction staging, construction access, and temporary construction easements in each segment. Most of these construction needs would be accommodated within property required for permanent right-of-way. Construction activities would also require temporary easements from adjacent properties. Following construction, these easement areas would be restored to preconstruction conditions or better. For the Draft EIS analysis, the construction footprint includes the staging areas and areas needed for constructing facilities such as traction power substations, stormwater facilities, and utility relocations (shown in Appendix F, Conceptual Design Drawings). The construction footprint will be refined for the Final EIS.

TDLE parking facilities would be constructed on properties that are acquired for construction staging and station areas, but construction of parking facilities at the South Federal Way and Fife stations may be deferred for up to 3 years after light rail service begins. However, any delay in construction of parking facilities will have no effect on the anticipated number of acquisitions, displacements, or relocations.

See Appendix H1, Potentially Affected Parcels, Table H1-7 for more information on temporary construction impacts.

4.1.4 Sound Transit Acquisition and Relocation Policy Summary

Sound Transit has notified property owners whose property could be directly affected by any of the alternatives. With the exception of certain early acquisitions that are reviewed and approved by FTA, property acquisitions generally begin only after the Final EIS is issued, the Sound Transit Board selects the project to build, and FTA issues the Record of Decision (ROD). Once the project is approved, Sound Transit's assistance and advisory services would work closely with affected residents, businesses, and organizations to determine their relocation needs and preferences.

Sound Transit staff will be available to answer questions and provide additional information regarding just compensation, relocation payments and advisory services, and relocation expense,

as well as the timing of the processes. The agency would also provide information on the current availability, purchase price, or rental rates of comparable replacement properties. Sound Transit uses interpreters to help those with limited English proficiency understand their choices and options. Relocation assistance applies to all residential relocations, regardless of ownership status.

Affected residents and businesses owners would make the final decision on their relocation sites. Generally, owners would not have to relocate until they have been paid the agreed-upon purchase price or an amount equal to Sound Transit's estimate of just compensation has been deposited with the court. Businesses and tenants would not be required to move or relocate without receiving at least 90 days' notice via written communication.

A public agency must pay "just compensation" to property owners for land and improvements acquired for public purposes. "Just compensation" must not be less than the fair market value of the property acquired. This value includes any measurable loss in value to the remaining property as a result of a partial acquisition. For instance, Sound Transit would compensate for the permanent loss of parking lots resulting from partial property acquisition by compensating the property owner or by providing replacement parking.

Sound Transit would pay normal expenses of sale, including escrow fees, title insurance, prepayment penalties, mortgage release fees, recording fees, and typical costs incurred as part of conveying a title.

Relocation benefits depend on the circumstances of each affected resident or business. In addition to compensating owners for property, other benefits and compensation could include residential moving expenses and replacement housing payments, nonresidential moving expenses, business reestablishment expenses, and other eligible expenses. See Sound Transit's *Property Acquisition and Non-Residential Relocation Handbook* for detailed compensation and acquisition procedures (Sound Transit 2023).

4.1.4.1 Tribal Lands

Sound Transit anticipates the need to use Tribal properties during project construction and for long-term project operation. Table 4.1-3 shows the potential renewable easements needed for long-term operation. Sound Transit would work with the Puyallup Tribe of Indians to acquire the necessary permissions to use these properties. Once an Intergovernmental Agreement has been executed, the Bureau of Indian Affairs (BIA) would record the identified, agreed-upon easements. The project would also need temporary construction easements on some Tribal properties, which would be short-term and require approval from the Puyallup Tribe of Indians.

Table 4.1-3 Tribal Lands Requiring Renewable Easements for Long-Term Project Operation

Alternative	Number of Tribal Parcels and Lands Potentially Affected[1]
Federal Way Segment	
All Alternatives	0
South Federal Way Segment	
SF Enchanted Parkway	0
SF I-5	0
SF 99-West	6

Table 4.1-3 Tribal Lands Requiring Renewable Easements for Long-Term Project Operation (continued)

Alternative	Number of Tribal Parcels and Lands Potentially Affected[1]
SF 99-West with Porter Way Design Option	0
SF 99-East	5
SF 99-East with Porter Way Design Option	0
Fife Segment	
Fife Pacific Highway[2]	3
Fife Median[2]	3
Fife I-5[2]	2
Tacoma Segment	
All Alternatives	2[3]
Optional	
Optional Portland Avenue bike and pedestrian bridge - east option	8
Optional Portland Avenue bike and pedestrian bridge - west option	4

Notes:

(1) Includes parcels that are billboard footprints.

(2) Impacts to Tribal parcels and lands would be the same with the 54th Avenue Design Option and 54th Span Design Option.

(3) Includes the Puyallup River.

4.1.4.2 Avoidance and Minimization of Impacts

When developing TDLE alternatives, Sound Transit used several measures to avoid and minimize potential acquisition impacts, primarily by locating TDLE within and near existing transportation right-of-way, where possible. These measures extend to Puyallup Tribe of Indian properties, where Sound Transit took additional consideration to avoid and minimize impacts.

Property impacted temporarily for construction would be restored to its previous condition or better.

4.1.5 Potential Mitigation Measures

Sound Transit's policies and procedures comply with the Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (as amended) and Washington State's relocation and property acquisitions requirements and, in some cases, provide advisory services to property owners above the minimum requirements of federal and state law. Sound Transit would compensate affected property owners in accordance with Sound Transit's Real Property Acquisition and Relocation Policy, Procedures, and Guidelines (Sound Transit 2017). Benefits would depend on the level of impact, available relocation options, and other factors. Sound Transit would work with the Puyallup Tribe of Indians to acquire the necessary permissions to use these properties. Once an Intergovernmental Agreement has been executed, the BIA would record the identified, agreed-upon easements. No additional mitigation is anticipated.

4.2 Land Use

4.2.1 Introduction to Resource and Regulatory Requirements

This section analyzes the changes in land use that could occur as a result of TDLE. This section also considers TDLE's consistency with local and regional plans and policies. A more detailed evaluation of the plans and policies that apply to the study area and TDLE's consistency with those plans is in Appendix H2, Land Use.

TDLE would be within the four-county central Puget Sound region, where land use planning is guided by the shared regional long range comprehensive planning strategy established by the Puget Sound Regional Council (PSRC). PSRC's VISION 2050 defines a growth management strategy for a sustainable environment, thriving communities, and a strong economy (PSRC 2020). VISION 2050, like earlier iterations of the regional vision, contains a framework for how and where development should occur and how the region can manage growth equitably within the urban growth area. The Regional Transportation Plan (RTP) (PSRC 2022), which is designed to implement VISION 2050, identifies the improvements needed to further develop the region's integrated multimodal transportation system and effectively connect communities. This includes the regional HCT system that Sound Transit is responsible for, as well as ferries, local transit, bus rapid transit, roads, rail, nonmotorized facilities, and maritime transportation systems. Chapter 3, Transportation, has further details on these facilities and the RTP. VISION 2050 provides guidance and direction to regional, county, and local governments as they fulfill their responsibilities under the Washington State Growth Management Act (GMA). The GMA requires cities and towns in King and Pierce County to review and update their local comprehensive plans by December 2024. The communities discussed are currently in the process of updating and adopting revised Comprehensive Plans, most draft Plans are available online for reference.

The local and county comprehensive plans, land use designations and zoning types in the cities of Federal Way, Fife, Milton, and Tacoma, and in Pierce County vary in definition, so all land uses have been grouped into generalized land-use categories to allow consistent comparison. These categories include single-family residential, multi-family residential, commercial, industrial, public/institutional, mixed-use, and vacant. Land use and zoning designations were based on adopted local jurisdiction comprehensive plans and zoning maps. Existing land uses were based on county tax assessor data.

This land use evaluation is also based on the analysis of other elements of the environment, including Section 4.1, Acquisitions, Displacements, and Relocations; Section 4.3, Economics; Section 4.5, Visual; Section 4.7, Noise and Vibration and Chapter 3, Transportation Environment and Consequences.

4.2.2 Affected Environment

TDLE would be within King and Pierce counties, generally in the vicinity of I-5 and Pacific Highway (SR 99), traveling across ancestral and reservation lands of the Puyallup Tribe of Indians, as well as the cities of Federal Way, Fife, Milton, and Tacoma. Existing land uses in the study area include single-family residential, multi-family residential, commercial (which includes retail, services, and office use), public, industrial, mixed-use, and transportation uses.

The study area for analyzing localized land use impacts consists of the parcels within 0.5 mile of the project footprint. The land use figures also show a 0.25-mile buffer to provide additional context for uses close to the station area. This land use analysis also considers the local jurisdictional and regional land use context in which TDLE would be constructed and operated.

Generalized land use designations and generalized existing land uses are shown by segment in Figures 4.2-1 to 4.2-8.

4.2.2.1 Federal Way Segment

The Federal Way Segment would begin just south of the Federal Way Downtown Station, within the PSRC-designated Federal Way Regional Growth Center, and extend south to S 344th Street.

Within the Federal Way Segment, Federal Way's land use and zoning designations support primarily multi-family residential uses, with some areas of mixed use and commercial uses. Generalized land use designations that illustrate planned and designated land uses in adopted local comprehensive plans and zoning are shown in Figure 4.2-1.

Most of the surrounding land use in the Federal Way Segment is multi-family residential, with some commercial, public, and vacant property. A few small areas of single-family residential use are also located along the project footprint. The generalized existing land use in the Federal Way Segment is shown in Figure 4.2-2.

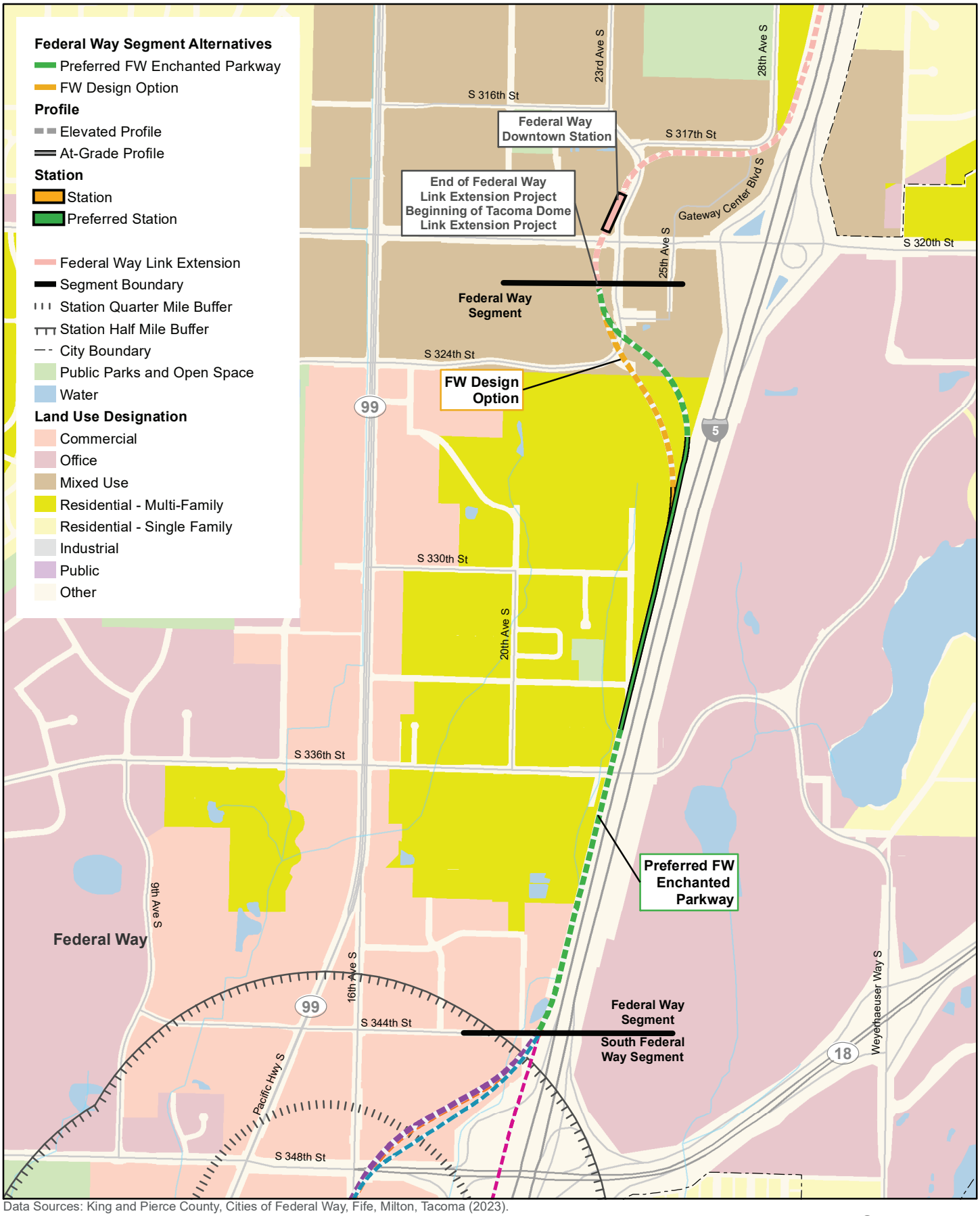
4.2.2.2 South Federal Way Segment

The South Federal Way Segment would begin at S 344th Street and travel south through the City of Federal Way and portions of the City of Milton and unincorporated Pierce County, with alternatives generally following either the I-5 or SR 99 corridor. The station area in the South Federal Way Segment is within the Candidate Countywide Growth Center designated by the King County Growth Management Planning Council as a place intended for concentrating jobs, housing, shopping, and recreational opportunities (VISION 2050). The City of Federal Way is currently preparing a subarea plan for the South Station Subarea, anticipated to be adopted as part of the City's 2024 Periodic Update to the Comprehensive Plan.

The City of Federal Way and Milton's land use and zoning designations support primarily single-family residential, commercial, and industrial uses in the study area. Areas designated for residential use within the study area are largely developed but not necessarily to the full extent allowed by existing zoning. Generalized land use designations in the South Federal Way Segment are shown on Figure 4.2-3.

The Land Use chapter of the Federal Way Comprehensive Plan provides a framework for Federal Way's future development and sets forth policy direction for Federal Way's current and future land uses. The plan is intended to result in an appropriate balance of services, employment, and housing. The station locations for all alternatives would be in an area the Federal Way Comprehensive Plan identifies as intended to capture the demand for a diverse mix of industrial, office, and retail sales and services in well-integrated, high-quality developments. However, the current designation does not contemplate housing. To inform potential future amendments to the comprehensive plan, Federal Way began a community visioning process in 2019 to contemplate alternative futures for the potential station area to inform the subarea planning process and comprehensive plan amendments anticipated to be adopted in 2024.

Federal Way's Comprehensive Plan also includes a goal of enhancing transportation by providing a connected system of pedestrian, bicycle, and transit ways that are integrated into a coordinated regional network. An associated Comprehensive Plan policy requires Federal Way to "prepare, promote, and provide for an enhanced, high-capacity transit, regional transit system" and several other goals and policies encourage Federal Way to facilitate and encourage HCT transit and to reduce auto dependency.

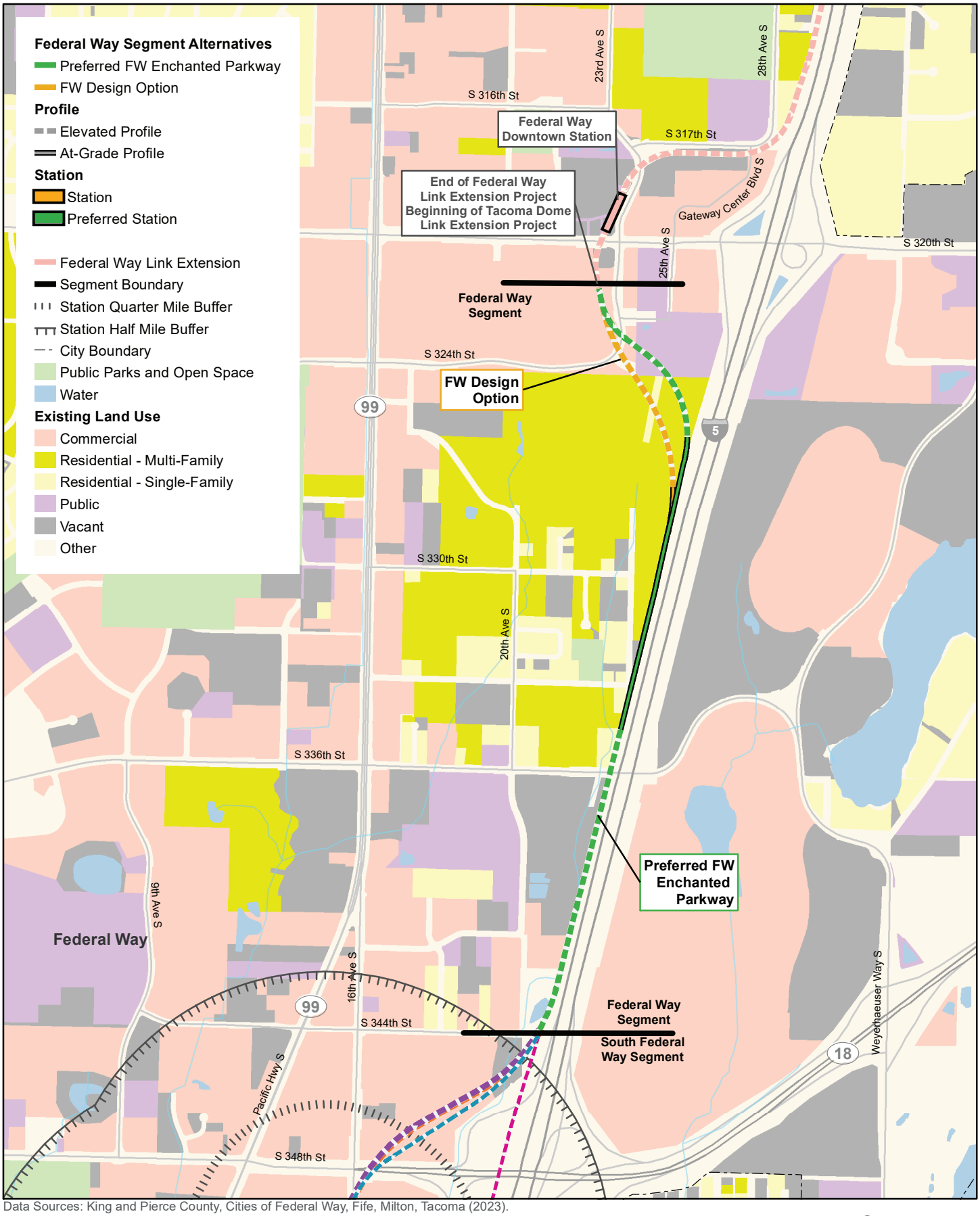


Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

FIGURE 4.2-1
Generalized Land Use Designation
Federal Way Segment
Tacoma Dome Link Extension

N

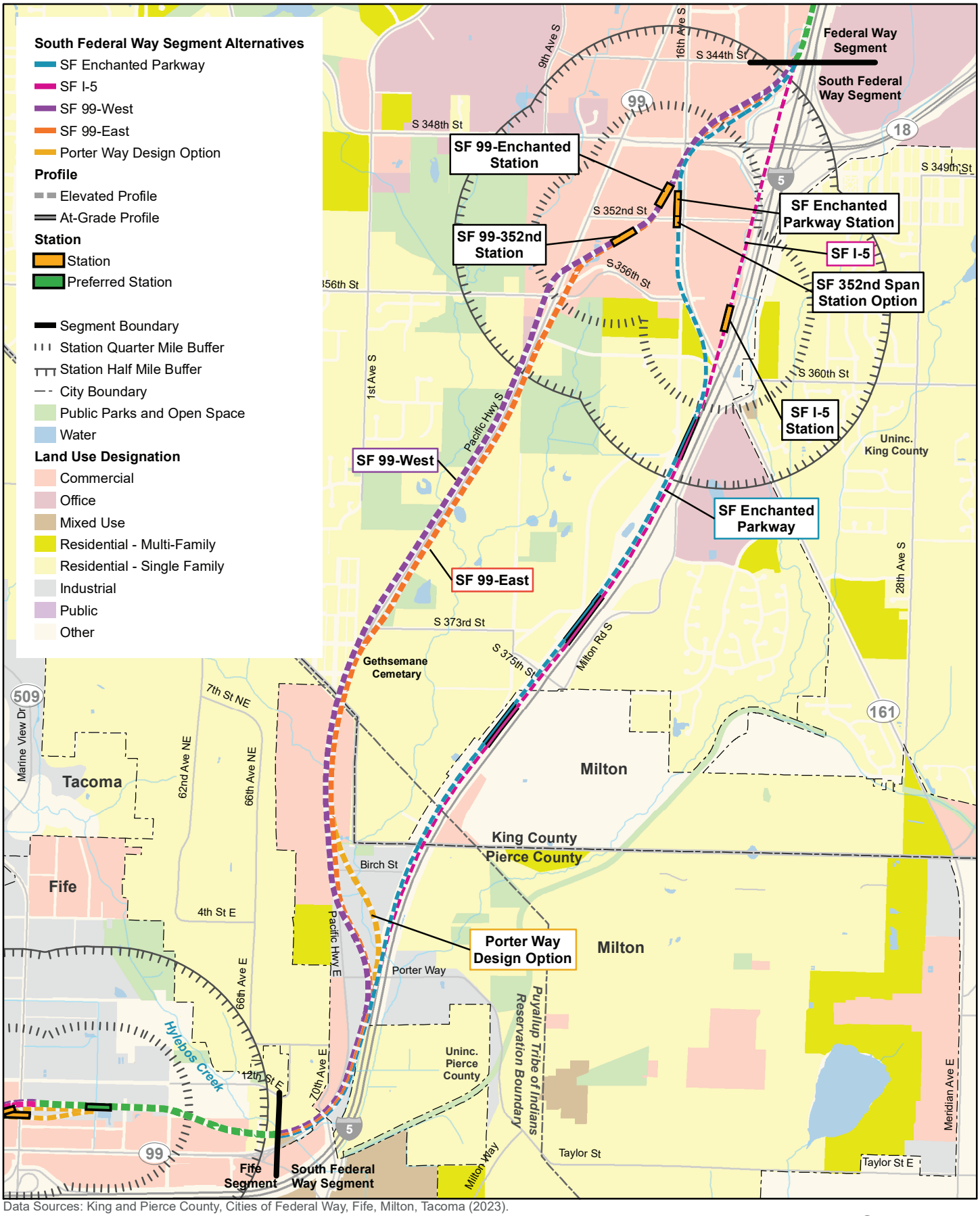
0 0.5 1 Mile



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

FIGURE 4.2-2
Generalized Existing Land Use
Federal Way Segment

Tacoma Dome Link Extension



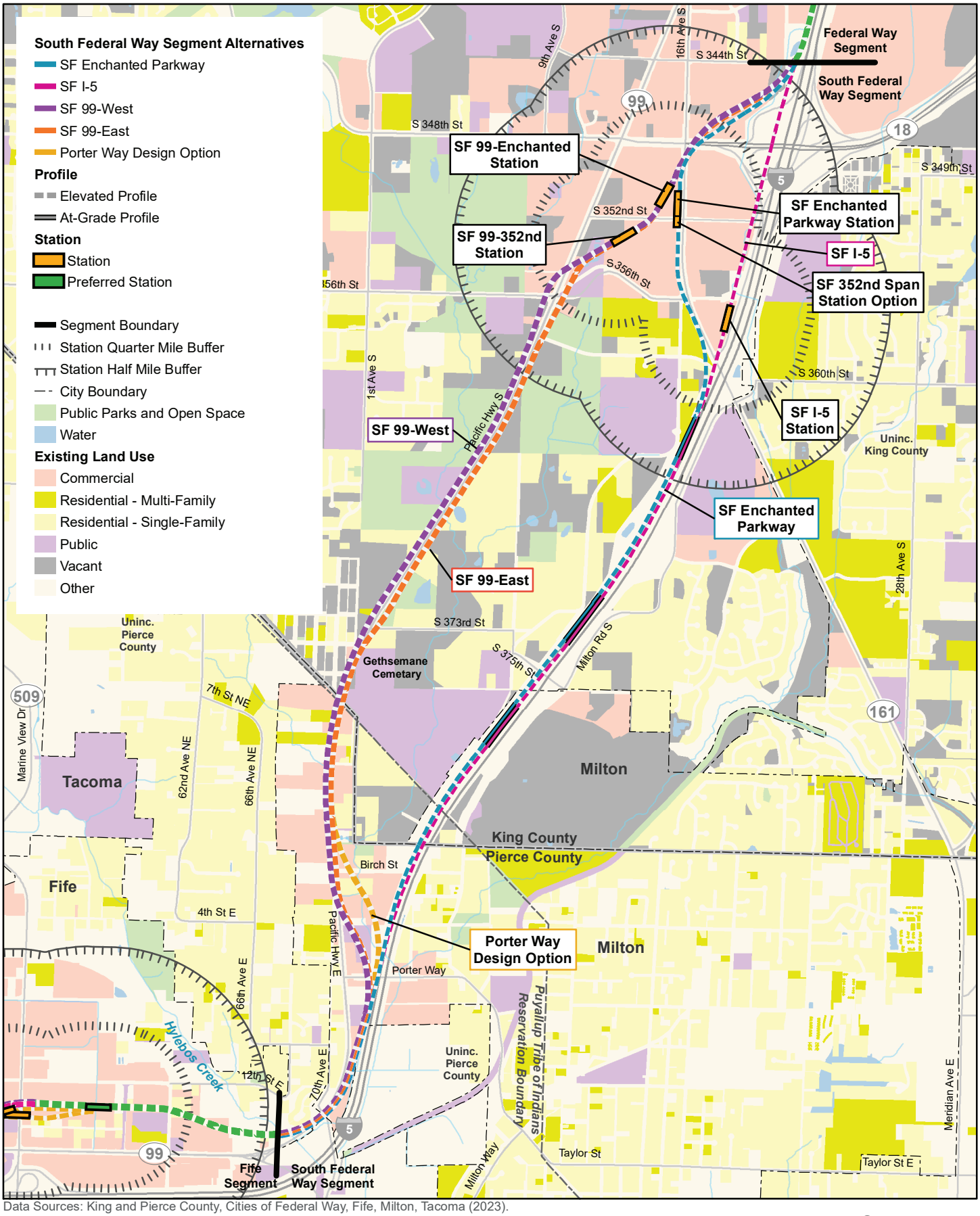
Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

FIGURE 4.2-3
Generalized Land Use Designation
South Federal Way Segment

Tacoma Dome Link Extension

N

0 0.5 1 Mile



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

FIGURE 4.2-4
Generalized Existing Land Use
South Federal Way Segment

Tacoma Dome Link Extension

N

0 0.5 1 Mile

Within the study area in Milton, the West Milton Commercial District Special Planning Area has been designated as an area to concentrate non-residential development. The West Milton Commercial District Special Planning Area is an existing commercial corridor where additional business and light manufacturing uses, as well as flex space and business incubation centers, are encouraged. A small portion of TDLE would also traverse unincorporated Pierce County between Milton and Fife, zoned primarily single-family residential, with a small area zoned mixed-use. Like other jurisdictions where TDLE would be located, Pierce County's Comprehensive Plan includes a goal to encourage alternate travel modes within an efficient multimodal transportation system.

Existing land uses in the South Federal Way Segment include commercial, multi-family residential, public, and single-family residential use. Most of the existing uses in the corridor are generally consistent with their comprehensive plan land use designations, although many of the areas along Pacific Highway that are designated as single-family are currently parks and open space that are unlikely to be used for single-family residential.

Most of the existing commercial uses in this segment near I-5 and Pacific Highway are automobile-dependent businesses that are set back from the street frontage and surrounded by surface parking, ranging from small, single businesses to "big-box" retail, strip malls, and the regional shopping center described above. The existing land uses in the area around the SF Enchanted Parkway Station, SF 99-Enchanted Station, SF 99-352nd Station, and SF 352nd Span Station Option, are predominantly commercial big-box retail, whereas the area around the SF I-5 Station includes a mix of commercial, multi-family, and single-family residential uses. There are also several vacant properties with no current use throughout this segment. Some single-family uses exist along a small portion of the segment, consolidated in unincorporated Pierce County to the north of the Fife curve. Figure 4.2-4 illustrates the existing land uses of properties at the time the Draft EIS is published.

4.2.2.3 Fife Segment

The Fife Segment begins at the Fife city limit near Wapato Way E and continues through the City of Fife and the ancestral and reservation lands of the Puyallup Tribe of Indians to the Fife/Tacoma city limit.

The Land Use Element of Fife's Comprehensive Plan provides policy direction for achieving the City's vision of the future, including where expected growth will go and in what densities, forms, and quantities. It encourages a land use pattern that supports projected employment growth while preserving and strengthening the City's residential qualities. As a result, much of the City's future growth and redevelopment is to be focused in mixed commercial/high-density residential districts along the I-5 and Pacific Highway corridors. Fife's Comprehensive Plan also includes a goal to provide for "a well-connected, efficient transportation system that offers choices in travel modes, seeks to reduce traffic congestion in Fife, and reduces dependence on the single occupancy vehicle."

The land use designation directly surrounding the preferred Fife Station allows industrial use, but the area just to the south of the proposed station encourages mixed-use developments that include high-density residential in addition to commercial uses. The Fife 54th Avenue Station Option and the Fife 54th Span Station Option would both be within the area designated for high-density residential and commercial use. Generalized land use designations in the Fife Segment are shown in Figure 4.2-5. The City of Fife is undertaking a City Center planning effort that would further inform land use designations in the station area. The City's adopted Comprehensive Plan notes that there are districts that are underutilized compared with the maximum development already allowed.

The Puyallup Tribe of Indians Comprehensive Plan, updated in August 2023, guides the Tribe's future vision through an integrated approach to development and related economic and social issues, with an emphasis on environmental sustainability and climate resilience, and creates a framework for management of the Tribe's land and properties, including consultation with other municipalities. The updated plan includes goals related to creating a safe and reliable transportation network, partnering with local jurisdictions to address tribal transportation concerns and priorities, complete streets, and transportation system integration with land use plans.

The Fife Segment consists primarily of commercial use, including a high concentration of vehicle sales uses along the I-5 corridor. In addition, the Emerald Queen Hotel and Casino at Fife, owned by the Puyallup Tribe of Indians, is within this segment, within 0.25 mile south of all of the proposed stations in the Fife Segment. The generalized existing land use is shown in Figure 4.2-6.

4.2.2.4 Tacoma Segment

The Tacoma Segment begins at the Fife/Tacoma city limit, just east of the Puyallup River, and is entirely within the Tacoma city limits and partially on Puyallup Tribe of Indians Reservation.

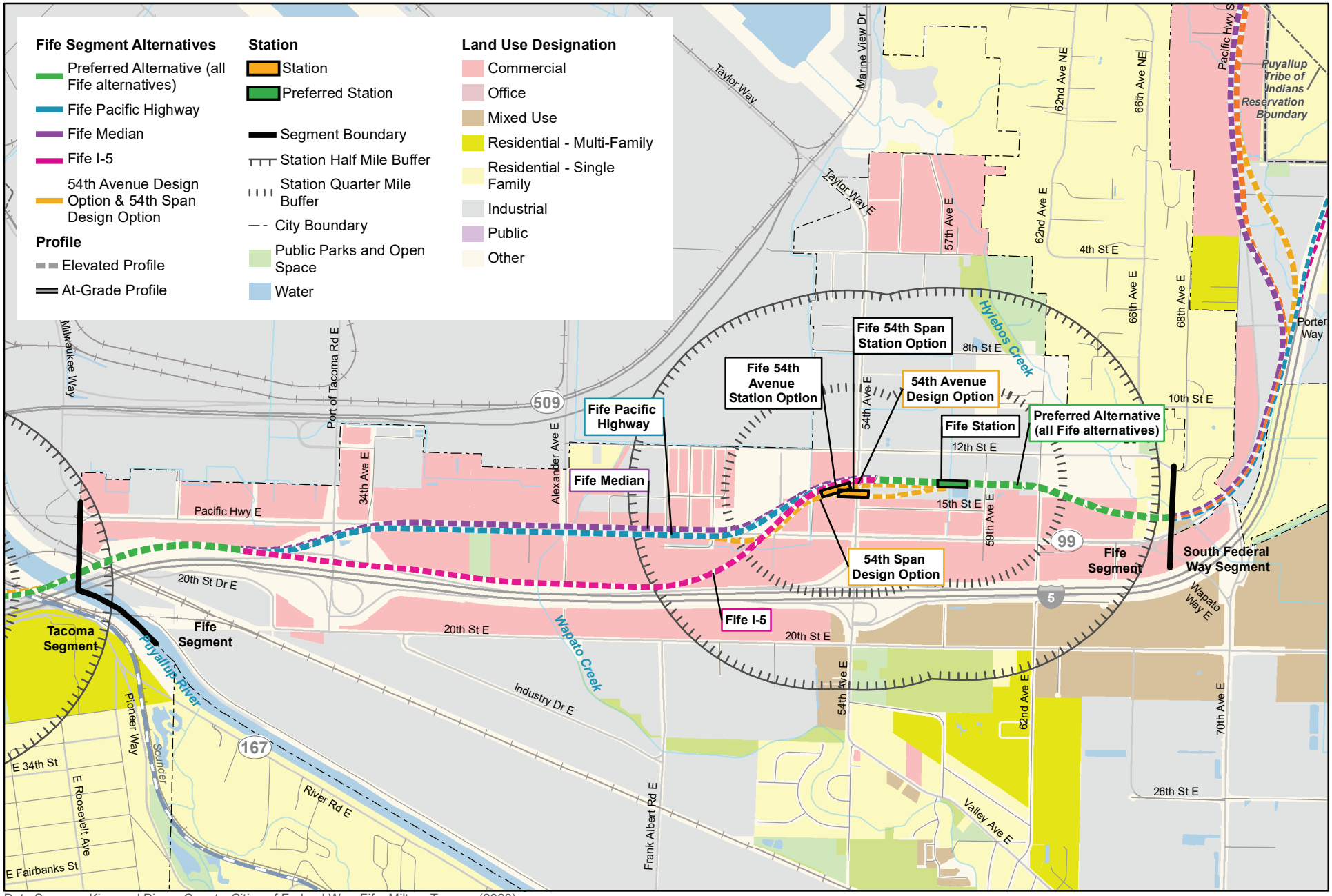
The land use designations surrounding the proposed Portland Avenue Station are primarily industrial. The area near the western terminus of the Tacoma Segment and the Tacoma Dome station locations, west of East G Street, is designated as mixed use. Generalized land use designations in the Tacoma Segment are shown in Figure 4.2-7.

One of the key objectives of Tacoma's comprehensive plan, One Tacoma, is to accommodate future growth, which is expected to gain 127,000 new residents and 97,000 new jobs by 2040 (One Tacoma 2015, as amended in 2022). Much of the City's growth is intended to occur within 18 Mixed Use Centers as designated in Tacoma's Municipal Code, which are intended to be "urban villages." Both the Downtown and McKinley Mixed Use Centers are within the TDLE study area.

All the Tacoma Dome station alternatives are in the comprehensive plan designated Downtown Regional Growth Center, which is intended to accommodate the highest concentration of urban growth anywhere in the city. The Portland Avenue Station is in an area designated as light industrial, which is intended to serve as a buffer or transition between heavy industrial areas and less intensive commercial and/or residential areas. To the north of the Portland Avenue Station is an area designated as general commercial, which is intended to serve a large community base with a broad range of larger-scale uses, including a wide variety of residential development, community facilities, institutional uses, and some limited production and storage uses. The area just south of the proposed Portland Avenue Station, across I-5, is designated as a crossroads center, which is an area where mid-rise development and a greater mix of uses, including substantially more residential use, are desired.

Tacoma's South Downtown Subarea Plan (2014), a component of the comprehensive plan, guides long-range planning with the goal of promoting economic development in South Downtown, leveraging the area's unique assets and existing and planned transportation investments. South Downtown has several districts, with the Tacoma Dome District encompassing most of the study area surrounding the TDLE Tacoma Dome station locations. Please see Appendix H2, Land Use, for a more detailed summary of the goals and policies for Tacoma and VISION 2050.

The existing land uses in the Tacoma Segment consist primarily of light industrial and commercial use, particularly near the proposed track alignments, but also include some institutional and public uses, as well as a few vacant properties. Some single-family and multi-family residential uses exist within the study area to the south of I-5. The generalized existing land use in the Tacoma Segment is shown in Figure 4.2-8.



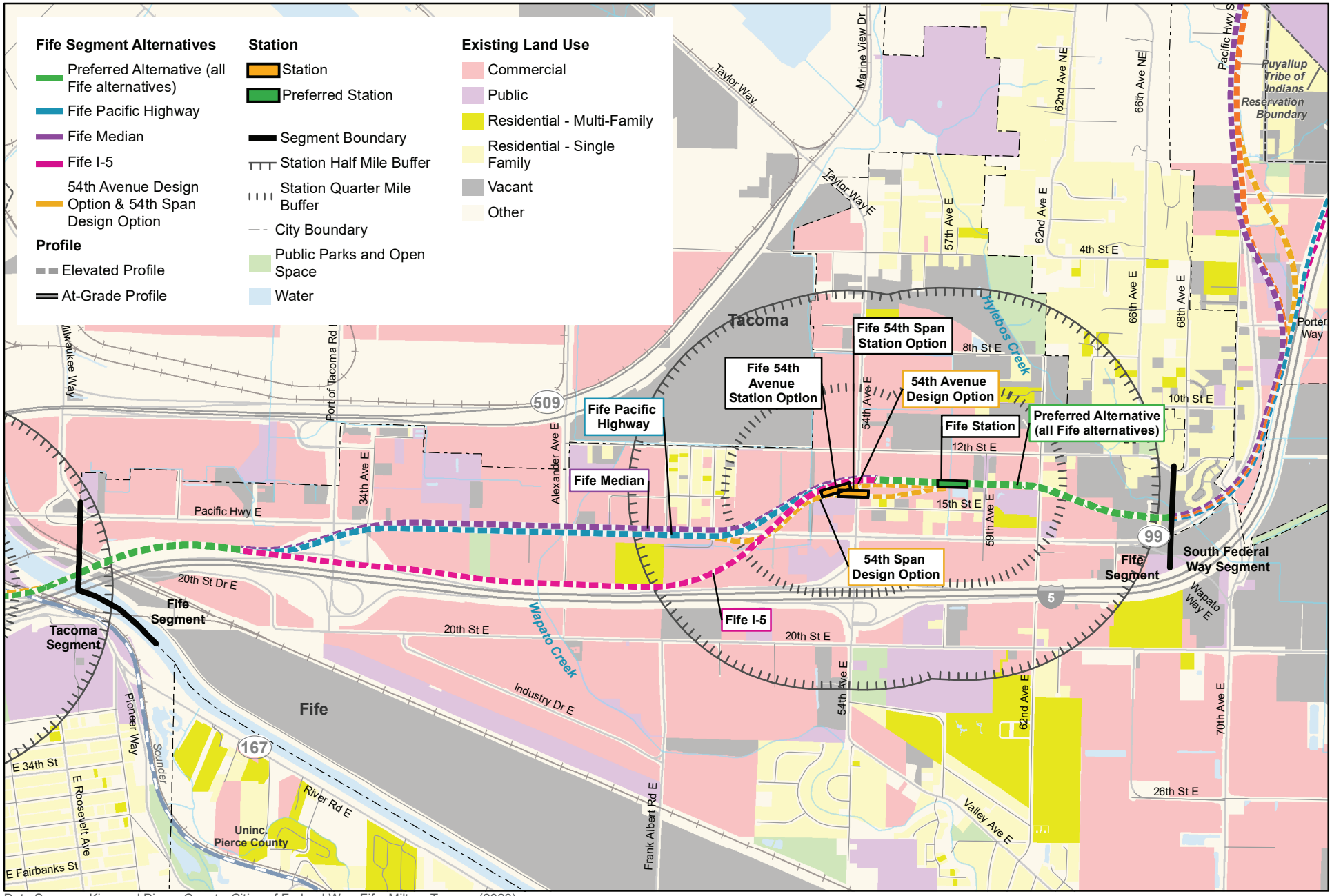
Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

0 0.5 1 Mile

FIGURE 4.2-5
Generalized Land Use Designation
Fife Segment

Tacoma Dome Link Extension



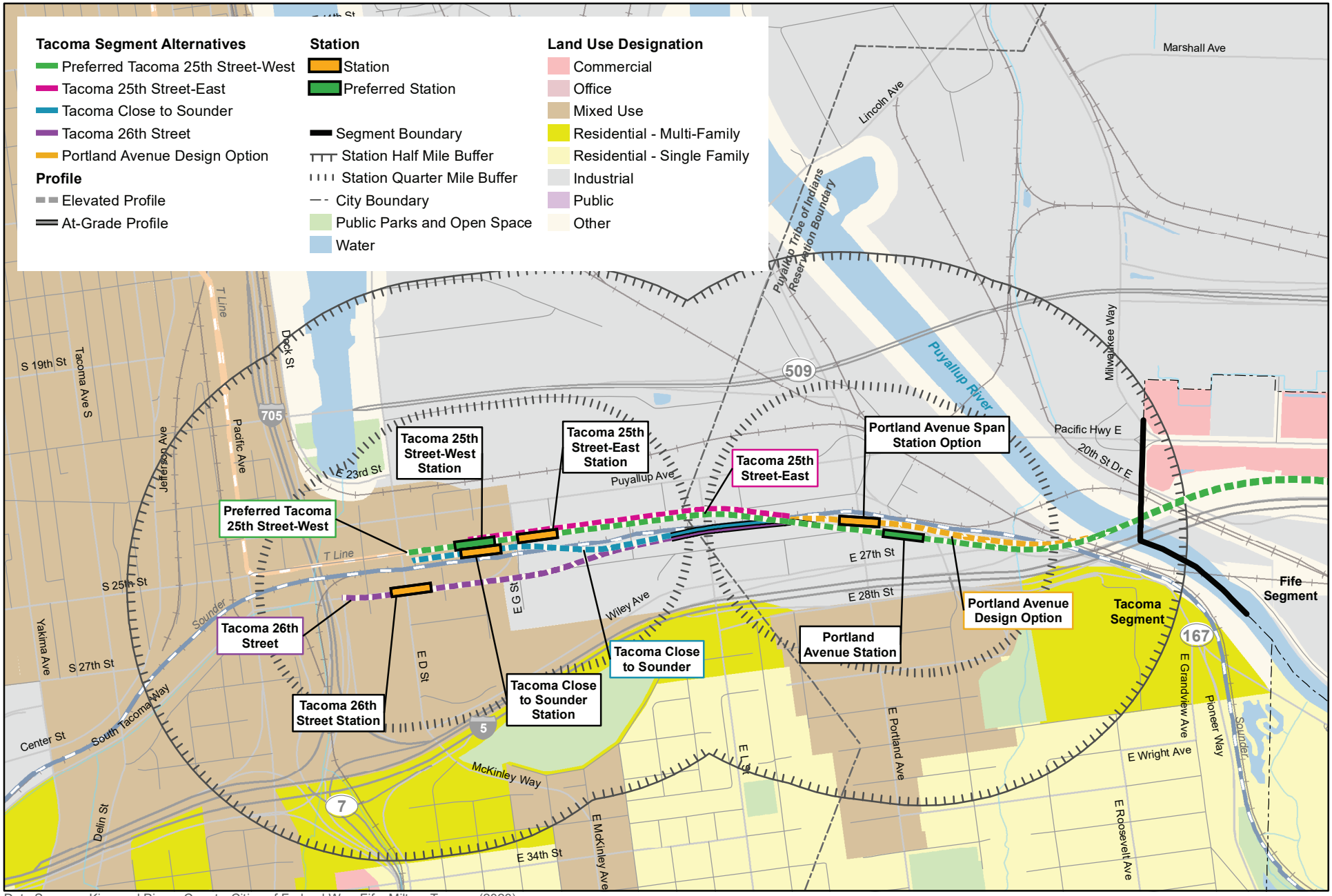
Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

0 0.5 1 Mile

FIGURE 4.2-6
Generalized Existing Land Use
Fife Segment

Tacoma Dome Link Extension



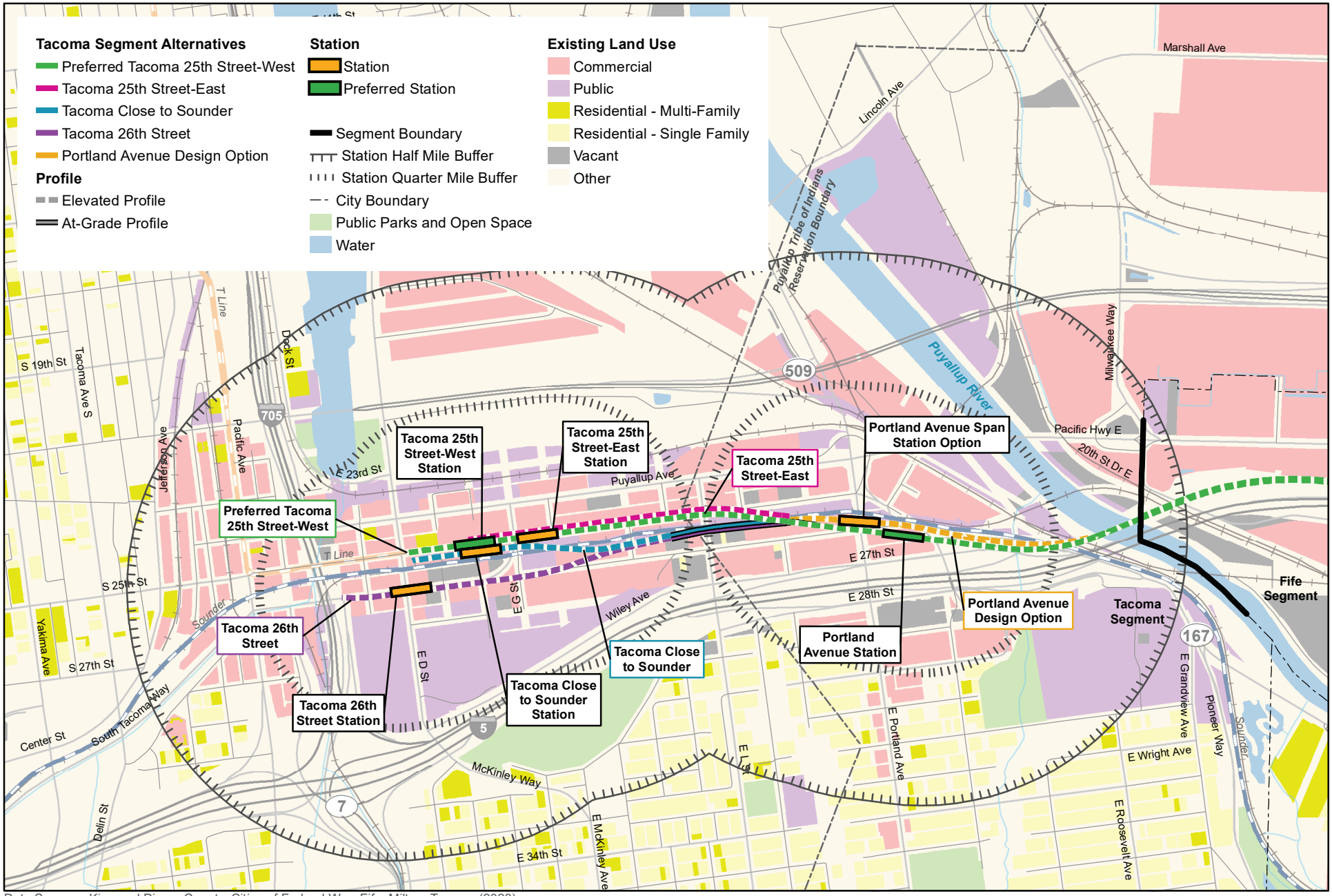
Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

0 0.5 1 Mile

FIGURE 4.2-7
Generalized Land Use Designation
Tacoma Segment

Tacoma Dome Link Extension



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

0 0.5 1 Mile

FIGURE 4.2-8
Generalized Existing Land Use
Tacoma Segment

Tacoma Dome Link Extension

4.2.3 Environmental Impacts

TDLE would have long-term direct and indirect impacts on surrounding land uses as well as short-term construction impacts. Direct land use impacts would include conversion of private or public land to transportation uses, displacing existing and planned land uses. Indirect impacts could include changes in development patterns, particularly near stations or on surplus property, where local land use regulations allow for such change in development.

4.2.3.1 No-Build Alternative

The No-Build Alternative includes projects, funding packages, and proposals in the central Puget Sound region that are planned to occur with or without TDLE, as described in Chapter 2 (Section 2.2).

PSRC's 2042 population and employment growth projections inform the No-Build and build alternatives analyses. Under the No-Build Alternative, no property would be acquired to construct TDLE; however, land use changes may occur due to other planned projects and developments within the study area, including potential conversion of property to a transportation use for OMF South, if one of the potential sites in Federal Way is selected.

The No-Build Alternative would be inconsistent with regional and local land use plans and policies because a mass transit improvement serving the study area would not be implemented. This would be inconsistent with regional, county, and city land use plans that seek to manage growth by offering high-quality connections between centers and would not support land use goals that encourage transit-oriented communities.

4.2.3.2 Long-Term Impacts for the Build Alternatives

Direct land use impacts would occur in locations where TDLE alternatives would require property to accommodate the proposed project facilities. The potentially affected properties are detailed in Section 4.1 and Appendix H1, Acquisitions, Displacements, and Relocations.

The existing land use of property acquired for project facilities would convert to a transportation-related use. The project could also cause changes to adjacent land uses through proximity impacts, such as traffic, noise, and visual impacts, which are discussed further in other portions of this Draft Environmental Impact Statement, including Chapter 3, Transportation Environment and Consequences; Section 4.3, Economics; Section 4.5, Visual and Aesthetic Resources; Section 4.6, Air Quality and Greenhouse Gases; Section 4.7, Noise and Vibrations; and Section 4.17, Parks and Recreational Resources. Those sections also identify avoidance and minimization measures that could also apply to potential land use impacts.

Impacts Common to All Alternatives

All build alternatives would require the conversion of property. Table 4.2-1 summarizes the approximate amount of land that would be converted to a transportation use with each alternative. Transportation uses include the construction and operation of TDLE, including areas acquired for light rail guideway and structures, stations, traction power substations, signal houses, stormwater control, and parking facilities. Property that is already public right-of-way for transportation uses is not included in totals because it would remain as a transportation use. In general, the alternatives follow existing transportation corridors, reducing the amount of occupied land that would be converted to a transportation use. The land to be converted would constitute less than 0.5 percent of the total land in Federal Way, Fife, Milton, and Tacoma. As a result, TDLE would not be expected to notably change land use patterns within the affected jurisdictions, although it could alter patterns in localized areas, as further discussed below.

Table 4.2-1 Estimated Conversion of Existing Land Uses to Transportation-Related Use (in acres)

Alternatives	Commercial	Industrial	Public	Multi-Family	Single-Family	Vacant	Total
Federal Way Segment							
Preferred FW Enchanted Parkway	1	0	1	0	6	3	**11**
Preferred FW Enchanted Parkway with Design Option	1	0	1	0	8	3	**13**
South Federal Way Segment							
SF Enchanted Parkway	17	0	0	1	4	2	**24**
SF I-5	12	0	0	0	3	6	**21**
SF 99-West	18	<1	5	0	6	10	**39**
SF 99-West with Porter Way Design Option	19	0	0	0	7	10	**36**
SF 99-East	19	<1	5	0	8	12	**44**
SF 99-East with Porter Way Design Option	20	0	0	0	9	12	**41**
Fife Segment							
Fife Pacific Highway	14	7	0	<1	1	3	**25**
Fife Pacific Highway with 54th Avenue Design Option	19	2	3	0	<1	2	**26**
Fife Pacific Highway with 54th Span Design Option	19	3	3	0	<1	2	**27**
Fife Median	14	7	<1	0	1	3	**25**
Fife Median with 54th Avenue Design Option	19	2	3	0	<1	2	**26**
Fife Median with 54th Span Design Option	19	3	3	0	<1	2	**27**
Fife I-5	14	7	<1	1	<1	3	**25**
Fife I-5 with 54th Avenue Design Option	18	2	3	1	<1	2	**26**
Fife I-5 with 54th Span Design Option	18	3	3	1	<1	2	**27**
Tacoma Segment							
Preferred Tacoma 25th Street-West	5	3	<1	0	0	<1	**8**
Tacoma 25th Street-East	5	4	1	0	0	1	**10**
Tacoma Close to Sounder	7	6	<1	0	0	<1	**14**
Tacoma 26th Street	5	5	2	0	0	<1	**13**

Sources: King County Department of Assessments (2019), Pierce County Assessor (2019).
Notes: This initial analysis is based on businesses located on parcels estimated as being fully acquired.

If TDLE is constructed in phases, the M.O.S. to the station in South Federal Way and the M.O.S. to the station in Fife would convert less property to transportation use than what is shown in Table 4.2-1 and would be less consistent with planning documents that call for the expansion of light rail. The number of parcels affected and land uses at each station in Federal Way and Fife would be the same whether the station was a terminus for the M.O.S. or not.

Federal Way Segment

A large portion of the land needed for all the alternatives in the Federal Way Segment is within I-5 or other transportation rights-of-way and is already a transportation use. Areas needed outside of existing transportation rights-of-way primarily consist of single-family residential and vacant areas. The Preferred FW Enchanted Parkway with Design Option would convert slightly more land from single-family to transportation use.

The presence of the guideway across parts of large parcels, such as the Commons and S 320th Park and Ride, could constrain future development in the areas that would be immediately adjacent. Future development for the majority of the City Center Core area would be unaffected.

South Federal Way Segment

Like the Federal Way Segment, some of the land needed for all build alternatives in the South Federal Way Segment is within existing transportation right-of-way: I-5 or Pacific Highway, depending on the alternative. The SF I-5 Alternative is predominantly within the existing I-5 right-of-way, as is the SF Enchanted Parkway Alternative, to the south of S 359th Street. The alternatives along Pacific Highway would require greater conversion of existing land uses to transportation use. In areas that are needed outside of existing transportation rights-of-way, the alternatives in the South Federal Way Segment would affect primarily commercial, single-family residential, and vacant areas.

The SF 99-East Alternative would convert the most land uses to transportation use, whereas the SF I-5 Alternative would convert the least by traveling along I-5. Where the SF I-5 Alternative approaches the station, it would convert vacant parcels and multiple automobile-related commercial parcels in the southern portion of the larger commercial district surrounding Enchanted Parkway to a transportation use. The SF I-5 Station would be near multi-family residential areas and closer to additional planned residential areas to the east.

With the SF Enchanted Parkway, SF 99-West, and SF 99-East alternatives, most of the commercial land use conversions to transportation use would occur approaching S 348th Street and around the proposed station areas near S 352nd Street, west of Enchanted Parkway. Along Enchanted Parkway near the station areas is part of a larger commercial zone. Smaller commercial businesses and an industrial use would be affected. The SF Enchanted Parkway Station, SF 99-Enchanted Station, SF 99-352nd Station, and the SF 352nd Span Station Option would be in the center of the planned commercial area in the center.

To the south of the commercial area, along Enchanted Parkway near I-5, the SF Enchanted Parkway Alternative would displace part of a market-rate apartment complex that occupies about half of a smaller multi-family zone. The SF 99-West and SF 99-East alternatives would primarily impact commercial property and vacant land as they travel south of S 356th Street, each would impact slightly less land with the Porter Way Design Option.

All of the station alternatives in the South Federal Way Segment may have the potential for joint development opportunities. The station locations for all alternatives are proposed in an area planned to accommodate a diverse mix of industrial, office, and retail sales and services. TDLE parking facilities would be constructed on properties that are acquired for construction staging and station areas, which would not require additional acquisition but would result in permanent conversion of land. The configuration of parking facilities may affect the remaining land available for TOD.

In Milton, all the build alternatives would convert to transportation use property that is currently used for commercial, public, and other uses and is designated for future light industrial. TDLE would remove some commercial parcels within the West Milton Commercial District Special Planning Area. The area is currently underdeveloped but does have some existing commercial uses that would be displaced.

Given the comparatively small proportion of land that would be converted by any of the alternatives in the South Federal Way Segment compared with available land within the zones where they would be located, none of the alternatives in the South Federal Way Segment are likely to conflict with future development patterns as designated in the Federal Way Comprehensive Plan or the City of Milton West Milton Commercial District Special Planning Area.

Fife Segment

All of the alternatives would convert approximately the same amount of land to transportation use, as shown in Table 4.2-1. Most of the properties that would be converted to transportation use are in areas designated as mixed commercial and high-density residential.

All of the alternatives in the Fife Segment begin with a common alignment and common impacts, from the end of the South Federal Way Segment until the preferred Fife Station, located west of 59th Avenue E. Most of the properties that would be converted to a transportation use in these areas are commercial, light industrial, or vacant.

The preferred Fife Station and the Fife 54th Avenue and Fife 54th Span station options would be just west of an Urban Growth Area and in an area designated as Phase 2 Downtown District Center. The Fife Comprehensive Plan contemplates a more vibrant mixed use City Center and the development of a subarea plan that provides for a Downtown District/City Center focused around the 54th Avenue E/I-5 interchange, which is just southwest of the preferred Fife Station and in the location of the Fife 54th station options. The addition of a regional light rail station is likely to be compatible with ongoing planning for a new City Center. The preferred Fife Station location is closer to the proposed City Center than the other station locations. All of the potential stations in Fife may create the potential for joint development opportunities. TDLE parking facilities would be constructed on properties that are acquired for construction staging and station areas, which would not require additional acquisition but would result in permanent conversion of land. The configuration of parking facilities may affect the remaining land available for TOD.

To the west of all of the proposed stations in Fife, all the alternatives would cross an area planned for mixed commercial and high density residential, with existing uses that include a mix of commercial properties, a large multi-family housing complex, several automobile dealerships, and Puyallup Tribal Integrative Medicine. Because the amount of land that would be converted is relatively small compared to the available property as a whole, the alternatives in Fife would be unlikely to directly change the existing or planned general land use patterns in the area. However, all of the alternatives in Fife would have localized effects on some individual land uses.

The Fife Pacific Highway and Fife Median alternatives would affect portions of the same properties along Pacific Highway. The two alternatives would be different in the location of the guideway relative to the nearby land uses.

Both the Fife Median Alternative and Fife Pacific Highway Alternative would use the frontage of parcels adjacent to Pacific Highway but would not change the use of the remaining parcel because of the large parcel size and building setbacks.

Similarly, the Fife I-5 Alternative would be along the commercial parcels adjacent to I-5. While some of the businesses actively use these areas, the land use of the remaining areas is not anticipated to change. For example, the elevated guideway would occupy strips of parcels adjacent to I-5 used by several automobile and recreational vehicle dealers, which could still continue operating that use. At a large low-income apartment complex (Chateau Rainier Apartments), the guideway would occupy parking areas adjacent to several complex buildings.

Given the comparatively small proportion of land that would be converted by any of the alternatives in the Fife Segment compared with available land within the zones where they would be located, none of the alternatives in the Fife Segment is likely to conflict with future development patterns as designated in the Fife Comprehensive Plan.

Tacoma Segment

All the alternatives in the Tacoma Segment follow a similar alignment across the Puyallup River to the Portland Avenue Station, where all alternatives would convert commercial and industrial uses, primarily warehouse and storage businesses, to transportation use. The Portland Avenue Span Station would affect slightly different, but similar, properties.

For all alternatives, an optional Portland Avenue bike and pedestrian bridge is being considered that would connect the Portland Avenue Station or the Portland Avenue Span Station to the neighborhoods and Puyallup Tribe of Indians facilities on the south side of I-5. The bridge is not currently part of TDLE and there is no identified funding source. Either of the options for this bike and pedestrian bridge would require a permanent airspace easement over I-5 and additional acquisitions and easements on several Tribally owned parcels beyond those that have been identified for TDLE in this Draft Environmental Impact Statement. Overall, however, the optional Portland Avenue bike and pedestrian bridge, if constructed, would not substantially change the impacts to land use in the area given the number of uses that would be converted to transportation use in the context of the surrounding area.

As the alternatives in the Tacoma Segment diverge, the Preferred Tacoma 25th Street-West Alternative would convert the least amount of property to transportation use. The Tacoma Close to Sounder Alternative would convert several more acres of property to transportation use than the Tacoma 25th Street-East and the Preferred Tacoma 25th Street-West alternatives, but only about an acre more than the Tacoma 26th Street Alternative. All of the alternatives in the Tacoma Segment would use land currently in commercial use and in an area currently designated for industrial use.

The Tacoma Dome Close to Sounder Station Alternative conceptual design incorporates a potential joint development opportunity to provide non-transit uses (e.g., retail and/or other uses that support both transit ridership and the vibrancy of the surrounding neighborhood) underneath the potential elevated station and guideway. The scope of such potential joint development is unknown and not addressed in this Draft EIS.

The biggest change to land use associated with the Tacoma 26th Street Alternative would be the potential effects to the City Light Substation and Yard at East G Street and E 26th Street related to potential bus layover space.

All the alternatives in the Tacoma Segment would convert some property in the Downtown Regional Growth Center to transportation use. Some of the property that would be converted is currently underdeveloped or nonconforming, and the remaining land in the area would be able to accommodate the growth anticipated in the Downtown Regional Growth Center.

All the Tacoma Dome station locations provide additional transportation choices, as called for in the South Downtown Subarea Plan, and would be within the Comprehensive Plan designated Dome District, where transit-oriented design and transit-supportive land uses are prioritized. Although no specific TOD has been identified, the Dome District has long-term potential for TOD.

Given the comparatively small proportion of land that would be converted by any of the alternatives in the Tacoma Segment compared with available land within the zones where they would be located, none of the alternatives in the Tacoma Segment is likely to conflict with future development patterns as designated in One Tacoma, Tacoma's comprehensive plan.

4.2.3.3 Construction Impacts for the Build Alternatives

Impacts Common to All Alternatives

Potential construction impacts on the existing land uses in the TDLE study area include use of land for construction, including for access, utilities, and staging.

The analysis of construction impacts also considers temporary changes in noise, air emissions, visual conditions, and transportation. During construction, some nearby businesses and residents may experience hardships. Proximity and construction impacts for adjacent properties, however, were considered based on the findings of other environmental analysis, including TDLE's practices to avoid impacts as well as to reduce them through minimization measures and the mitigation proposed for these other environmental topics.

Construction staging areas would be needed along the length of the project and could include large, consolidated sites. Areas needed for construction activities would include the lands needed for the permanent project footprint as well as adjacent areas, including the areas of full parcels acquired by the project. The potential future reuse of construction staging areas not needed for the permanent project (potential surplus property) is described in Section 4.3.2.4, Indirect Impacts. Appendix F, Conceptual Design Drawings, identifies the areas that are potentially needed for construction.

TDLE parking facilities would be constructed on properties that are acquired for construction staging and station areas, but construction of parking facilities at the South Federal Way and Fife stations may be deferred for up to 3 years after light rail service begins. During that delay, the property would be surrounded by fencing, used for surface parking, or other measures identified in coordination with the local jurisdiction. Delay would result in variation on the timing of construction impacts, but the land use impacts would be the same.

In addition to the permanent property acquisitions and easements needed for the project, Sound Transit or construction contractors may obtain the rights to stage construction on other properties, including vacant land or unused parts of larger parcels that may be available. Sound Transit may also negotiate to use right-of-way owned by WSDOT and local jurisdictions. These construction uses might occur adjacent to residential, commercial, industrial, and public properties throughout the study area, as permitted. For these areas that are only temporarily needed, upon completion of construction activities, Sound Transit or its contractors would return the property to the conditions negotiated with the owner and as applicable permit conditions require.

4.2.3.4 Indirect Impacts

Indirect Impacts Common to All Alternatives

Potential Benefits

TDLE could indirectly impact land use by acting as a potential catalyst for others to develop or redevelop land near project facilities. This is particularly the case in station areas where the project's mobility benefits would be focused, but it can also occur where Sound Transit may make surplus land available after construction is complete. Land use planned for higher density or intensity in the vicinity of transit stations may support TOD, which generally occurs when a station area is in a prime regional or community center that is attractive to typical market forces, has an active regional and local real estate market with willing investors, and has public policies and regulations that encourage intensive development.

There is also the potential for joint development of transit facilities with other compact residential or commercial development done in partnership with others. TDLE may also offer Agency TOD and/or joint development opportunities, which would have additional direct and/or indirect impacts, depending on the nature of the opportunity. Although joint development or TOD may occur in TDLE station areas or on surplus property as part of delivery of the transit project, no specific opportunities for joint development or TOD have been identified at the time this Draft EIS was being prepared. Any potential joint development that evolves further following issuance of this Draft EIS would be identified in the Final EIS.

The Sound Transit Board adopted the Equitable Transit Oriented Development Policy in 2018 (Board Resolution No. R2018-10, TOD Policy). This policy addresses how the agency should consider potential for TOD near transit facilities being planned and studied and provides guidance on implementing and integrating equitable TOD throughout transit projects.

The TOD Policy supports land use changes and economic development that would maximize ridership while supporting achievement of comprehensive and regional plans and improving quality of life. During alternatives development and design, this policy guides Sound Transit to incorporate TOD criteria as a decision-making factor that considers local and regional comprehensive plans. Sound Transit's TOD policy promotes TOD within station areas and on Sound Transit property that is no longer needed for transit and seeks proposals from developers that support various income levels and family sizes. It also provides guidance to engage communities equitably in planning for TOD, particularly for low-income communities and communities of color and contains goals to support and encourage equitable economic development and opportunities for existing residences and businesses.

Transit Oriented Development (TOD)

TOD is a pattern of development that includes a mix of residential, commercial, and civic uses near a high-capacity transit station. TOD helps to harmonize the relationship between land use and transit, with more residences and jobs accessible from transit, and vice versa. TOD is influenced through real estate markets, infrastructure investment, and zoning, and is implemented through individual decisions by property owners and developers.

Agency TOD

"Agency TOD" refers to TOD that Sound Transit facilitates on property it owns. Agency TOD could occur on property purchased for construction staging that Sound Transit does not need long-term, or through joint development. Agency TOD is implemented through partnerships with public, nonprofit, or private developers. Sound Transit's Equitable Transit Oriented Development Policy prioritizes partnerships with developers of affordable housing.

Joint Development

Joint development refers to a type of Agency TOD that has a direct, integral physical interface with a transit project, and is often designed and constructed along with the transit project. FTA defines joint development (FTA 2024) as "a public transportation project that integrally relates to, and often co-locates with commercial, residential, mixed-use, or other non-transit development. Joint development may include partnerships for public or private development associated with any mode of transit system that is being improved through new construction, renovation, or extension. Joint development may also include intermodal facilities, intercity bus and rail facilities, transit malls, or historic transportation facilities."

Sound Transit's TOD policy supports exploring the development potential associated with transit project decisions and the pursuit of joint or co-development of transit facilities, as appropriate. The policy prioritizes partnerships that deliver affordable housing, consistent with a state requirement to offer at least 80 percent of suitable surplus property to qualified developers of affordable housing. The developers must ensure 80 percent of the constructed housing units are affordable to those earning 80 percent or less of the county area median income.

Although TDLE would directly affect land use through property acquisitions, the project would not directly change surrounding land use designations. Cities, counties, and Tribal governments control land use and development regulations, including zoning, and property owners make decisions about developing or redeveloping their property. In other cases, areas near TDLE but with zoning regulations that are not supportive of TOD would be less likely to attract redevelopment activity, unless local jurisdictions implemented zoning changes.

Federal Way Segment

There is no station in the Federal Way Segment, and no indirect impacts are anticipated.

South Federal Way Segment

Zoning in the South Federal Way Station area would not currently support TOD, so without changes to the zoning code, the potential for indirect impacts due to TOD or redevelopment activity from TDLE would be low. However, the South Federal Way Station area has been designated as a Countywide Growth Center Candidate and is currently engaged in subarea planning, intended to foster new and diverse residential, commercial, and employment opportunities and to enhance connectivity for all throughout the subarea and to and from the future station. Other commercial redevelopments could occur if surplus properties were made available after construction. The adoption of plans, policies, or regulations that support TOD would result in a greater likelihood of indirect impacts from additional development.

Fife Segment

Zoning in the Fife station area is not currently supportive of TOD. However, the City of Fife has long been pursuing a City Center planning effort that would implement changes to the station area to support the creation of a compact city center area oriented to the light rail station. Changes to reflect this planning effort have not been adopted at the time of Draft EIS publication. The adoption of plans, policies, or regulations that support TOD would result in a greater likelihood of indirect impacts from additional development.

Tacoma Segment

Zoning in the Portland Avenue Station area currently does not support TOD. The Portland Avenue Station is in an area designated as an industrial/commercial buffer zone, between the core of the industrial center and the adjacent neighborhoods. Although at the time of Draft EIS publication, Tacoma is developing the Tideflats Subarea Plan, a collaborative effort with the Port of Tacoma and the Puyallup Tribe of Indians, which will establish a long-term vision for the area, the potential for indirect impacts from additional development has a lower likelihood.

With the exception of the Portland Avenue Station and Portland Avenue Span Station, the station locations in the Tacoma Segment are within a designated regional growth center, where density is encouraged and zoning that supports TOD is in place. This area is already well served by multiple transit operators, and high-density development activity is already underway in the station area. This station area is most likely to be indirectly impacted by additional development activity.

4.2.4 Consistency with Land Use Plans, Policies, and Regulations

The plans, policies, and regulations related to TDLE are described in Appendix H2, Land Use. The GMA, adopted in 1990, requires state and local governments to manage Washington's growth by identifying and protecting critical areas and natural resource land, designating urban growth areas, and preparing and implementing comprehensive plans through capital investments and development regulations. TDLE is a "regional transit authority facility," which is an essential public facility under the GMA and is considered through local land use planning processes and development regulations.

The GMA, VISION 2050, and County and City land use plans covering the study area all connect future land use to a transportation system that can effectively support their development. For the regional and local jurisdictions in this study area, this has resulted in plans and policies that call for increased transit options, reduced reliance on single-occupancy vehicles, and the connection of regional growth centers. Specifically, PSRC's VISION 2050, adopted in 2020, articulates the region's integrated long-range growth management strategy: to guide growth, concentrate new employment in designated centers, and link the centers with high-quality multimodal transportation systems. Downtown Federal Way and Tacoma have been designated as regional growth centers for housing, employment, and public services growth, as well as for multimodal transportation connections and regional funding. TDLE will connect those regional centers to each other and beyond.

TDLE is included in Sound Transit's Long-Range Plan and in PSRC's Regional Transportation Plan. Local land regulations focus on the types of land uses permitted within certain zones and the scale to which development is allowed within these zones. Federal Way and Fife have provisions for the siting of Essential Public Facilities, which includes light rail.

Where local jurisdictions have adopted zoning regulations that encourage higher-density development and TOD where stations are planned, TDLE would be consistent with the intent and purpose of those regulations.

Sound Transit reviewed regional, state, and local plans, policies, and regulations to determine whether the project would be consistent. Each TDLE build alternative generally supports long-range planning and growth management visions. At the regional level, all the build alternatives would provide a regional transit system serving a growing transportation need in or near planned high-density areas, connecting Tacoma, Fife, and Federal Way to other regional growth centers, such as downtown Seattle. Consistency with local plans, policies, and regulations will also be addressed as part of the local approval process for siting TDLE.

4.2.5 Avoidance and Minimization of Impacts

The primary means of avoiding or minimizing land use impacts would be to locate the project within existing right-of-way. Change in land use from commercial, residential, or industrial use to transportation use, as well as zoning changes for TOD near stations, can result in impacts to transportation, economics, visual and aesthetic resources, air quality and greenhouse gases, noise and vibration, or park and recreational resources. Chapter 3, Transportation Environment and Consequences; Section 4.3, Economics; Section 4.5, Visual and Aesthetic Resources; Section 4.6, Air Quality and Greenhouse Gases; Section 4.7, Noise and Vibrations; and Section 4.17, Parks and Recreational Resources identify avoidance and minimization measures that would address TDLE's changes to land use. For example, visual impacts could be minimized by preserving existing vegetation when possible and adhering to local development standards,

design standards, guidelines, and design review, and construction impacts to adjacent businesses would be minimized through implementation of practices such as providing a 24-hour construction hotline and providing detour, open for business, and other signage as appropriate.

4.2.6 Potential Mitigation Measures

No mitigation beyond the avoidance and minimization measures described above would be anticipated.

4.3 Economics

4.3.1 Introduction to Resource and Regulatory Requirements

This section identifies the potential effects on the local and regional economies. Large transit projects that displace businesses and employees can cause the loss of property tax revenue from land converted to transportation facilities. These conversions in land uses along the proposed transit corridor can be disruptive to businesses and communities but can also present new opportunities for economic activity. This economic analysis addresses the ways that land acquisition, construction, and operation of TDLE may impact local economic conditions along the project corridor and in the broader economic area.

In addition to the federal and state regulations, policies, and related resources that guide a major transit project environmental impact statement, the following regulatory and resource requirements were considered in the assessment of economic effects: Title 42 United States Code Section 4601, Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended; the Transit Cooperative Research Program (TCRP) Synthesis 128, Practices for Evaluating the Economic Impacts and Benefits of Transit (TCRP 2017); and the Economic Impact Case Study Tool for Transit (TCRP 2016).

4.3.2 Affected Environment

This analysis includes an assessment of potential economic effects of the proposed project alternatives across three different geographic scales:

- **Segment**: For each segment, site-specific business and employment impacts were evaluated from potential displacement of business activity and other changes in area economic conditions, including during project construction.
- **Municipal:** Potential displacement of business activity and loss of tax revenues were evaluated for the cities of Federal Way, Milton, Fife, and Tacoma.
- **Regional:** Potential impacts to regional economic activity, including the effects on jobs, labor, income, and gross regional product and labor, were assessed for project construction. Broader economic considerations associated with project operation were examined for King, Kitsap, Pierce, and Snohomish counties (located within an area referred to as the Puget Sound region study area). The regional area was studied to account for changes in the population's demand for goods and services within and outside the project corridor study area.

4.3.2.1 Regional Demographic and Economic Trends

As of 2020, the central Puget Sound region had a population of 4.3 million and 2.3 million jobs, and it is anticipated to grow considerably, reaching nearly 6 million residents by 2050 (PSRC 2021). This growth is characterized by the transformation of smaller cities and suburban areas like Tacoma and Federal Way into denser urban centers. Key industries driving this expansion include Aerospace, led by Boeing with 121,000 employees, and the Information and Communication Technology sector, which grew at an annual rate of 10.6 percent from 2015 to 2020 and employed over 260,000 people in 2020. Major companies such as Microsoft and Amazon are substantial contributors to this growth, employing 58,000 and 75,000 workers, respectively. Other important sectors, like Maritime and Military and Defense, also play vital roles in the regional economy, with facilities such as Naval Base Kitsap providing $4 billion in annual economic impact and employing over 33,000 workers.

Despite these economic strengths, the region experiences considerable disparities in economic prosperity and access to opportunities. Median household incomes vary widely by county, with King County leading at $95,000, while Kitsap and Pierce counties are below $77,000. Racial and ethnic disparities are also prominent, as Asian households have the highest average income of $104,000, while Black, Hispanic/Latino, and Pacific Islander households earn notably less. Black households earn an average of $58,000, which is $30,000 below the regional median. These disparities highlight ongoing challenges in ensuring equitable access to the region's economic growth and opportunities (PSRC 2021). Overall, the trends of continued growth in employment and income in the region support the forecasts of continued growth in travel demand within the region and along the TDLE corridor. See Appendix H3, Economics Supporting Information, for more details.

4.3.2.2 Demographic and Economic Trends in TDLE Segments

Demographic and economic trends in the TDLE study area were assessed by using Forecast Analysis Zone estimates developed by PSRC as part of their Land Use Vision – Implemented Targets (PSRC 2023). The growth trend seen at the regional level is reflected in each segment of TDLE. Within each segment, population, and household, all the employment categories are projected to grow at least of 0.9 percent per year between 2018 and 2050. Appendix H3, Economics Supporting Information, contains additional detail about growth rates.

4.3.2.3 Local Revenue Sources

Table H3-3 in Appendix H3, Economics Supporting Information, provides a tax revenue breakdown for the cities of Federal Way, Milton, Fife, and Tacoma. In Federal Way, the total tax revenue for the 2023 budget year is approximately $145.7 million, with property tax and sales tax contributing 8.07 percent and 13.06 percent, respectively. Milton’s total tax revenue is around $5.8 million, primarily from property tax (26.95 percent) and sales tax (37.54 percent). Fife generates approximately $24.7 million in total revenue, with taxes constituting 70.65 percent of this amount. Tacoma has the highest tax revenue among the cities, totaling about $615.2 million (biennial total), mainly from property tax (22.03 percent), sales tax (23.91 percent), and utility tax (19.60 percent). Revenue sources from Pierce County are not included because no businesses would be displaced in unincorporated Pierce County.

4.3.2.4 Regional Transportation of Goods and Services

Washington’s economy is heavily reliant on efficient freight corridors. Both consumers and businesses in the Puget Sound region depend on the efficient and safe movement of goods. The primary truck freight corridor for regional and interstate commerce is I-5, which is congested during peak travel times. This congestion leads to longer travel times, increased operating costs, increased consumption of carbon-based fuels, reduced air quality, and decreased freight mobility and reliability. Existing congestion can be a burden on industries that rely on existing freight corridors to move goods to market.

Despite this existing condition, freight mobility and access are expected to improve after completion of the SR 167 Completion Project, which is planned to be completed by 2028. The SR 167 project would create a new regional highway connection to and from I-5 within the TDLE study area and would be a major freight route. The highway expansion project would allow freight traffic to travel directly to SR 509. As a result, freight mobility may be improved between major freight activity centers, such as the Port of Tacoma.

The City of Tacoma also plans to implement a Portland Avenue Freight Access Improvement Project, which includes lane changes and traffic signal changes that could increase freight mobility. The City's multimodal planned improvements along Puyallup Avenue may add some vehicle delay and congestion to Puyallup Avenue. More specific information about what these projects entail is included in Chapter 3, Transportation Environment and Consequences.

4.3.2.5 Comprehensive Plans and Regional Growth Centers

TDLE alternatives are within the cities of Federal Way, Milton, Fife, and Tacoma, and in King and Pierce counties. These jurisdictions have a range of comprehensive, manufacturing, and industrial, and sub-area plans and policies and goals, and the project alternatives can be considered in the context of these various plans and designations. Appendix H3, Economics Supporting Information, includes a discussion of key comprehensive land use planning factors for each TDLE segment along with a discussion of the relevant project corridor segment alternatives.

4.3.3 Environmental Impacts

4.3.3.1 No-Build Alternative

The No-Build Alternative includes projects, funding packages, and proposals in the central Puget Sound region that are planned to occur with or without TDLE, as described in Chapter 2 (Section 2.2). These projects may contribute to the alleviation of traffic congestion, but the No-Build Alternative would leave a gap in the regional light rail system and would not improve local or regional transit access to communities served by TDLE. Without the proposed TDLE, the resulting level of service across the local and regional transit system would be lower than planned under Sound Transit 3.

Absent TDLE, localized traffic congestion could be worse under the No-Build Alternative. Traffic congestion can increase living expenses and the costs associated with doing business, as well as reduce the attractiveness of a location to potential consumers, businesses, and residents. Under the No-Build Alternative, future economic development near the proposed station areas would continue on its current course for the foreseeable future and in accordance with current planning goals.

While it is likely that a No-Build Alternative would result in a different pattern of economic development and property development than with TDLE, changes to the local business environment would occur regardless of whether TDLE is built. This includes business and employee displacements that could happen in the natural process of changing business dynamics and land development.

4.3.3.2 Long-Term Impacts for the Build Alternatives

The TDLE project has the potential to advance local and regional plans by enhancing the transportation network to include additional light rail travel options, promoting vibrant dense community development supportive of less reliance on automobiles, and increasing economic development. Changes to the local business environment and surrounding neighborhoods may occur as a result of extending the light rail to the area. The continued viability of surrounding businesses depends in some cases on the effects of these changes, which are classified as either direct, indirect, or cumulative impacts. Cumulative impacts are discussed in Chapter 5, Cumulative Impacts. Direct economic impacts include business and employee displacements, potential tax impacts associated with business displacements, changes to regional transportation of goods and services, and changes in development patterns. Indirect economic impacts include

changes that occur as a result of the project's presence in certain areas and the TOD that may follow. Indirect economic impacts are discussed in Section 4.3.3.4, Indirect Impacts.

Impacts and Benefits Common to All Alternatives

All TDLE build alternatives would displace businesses and acquire commercial, industrial, and institutional properties as discussed in Section 4.1, Acquisitions, Displacements, and Relocations. These acquisitions and displacements would change economic activity at or near the alternatives and the affected city or broader Puget Sound region. For example, corresponding effects on property taxes may shift the tax burden to other businesses and residents within that city. An increase in passenger rail capacity could help to minimize future increases in traffic congestion. If displaced businesses relocate outside of the city or region, business and occupation taxes and retail sales taxes may initially experience a reduction in revenue for that area. Lastly, major changes in commercial zoned land may result in new development patterns that deviate from recent trends. However, the regional economic impacts from all the build alternatives would be small since most displaced economic activity would likely relocate somewhere in the region.

If TDLE is constructed in phases, the M.O.S. to the station in South Federal Way and the M.O.S. to the station in Fife would have the same type of economic impacts and benefits, just in a smaller geographic area. Impacts would include the displacement of businesses and employees and the potential to slightly reduce sales tax revenue. Benefits would include additional jobs associated with construction and operation.

Potential Benefits

The potential benefits of the project come from two sources. Light rail construction will stimulate job growth in the Construction sector from the one-time construction-related spending. There will also be ongoing benefits from the efficacy of mobility gains that occur in and around light rail stations. These ongoing benefits are discussed in more detail as indirect impacts of the project; however, they do not cover real estate and economic development gains around station areas.

Business and Employee Displacement

The building of the light rail line requires new right-of-way acquisitions of properties that may disrupt or displace businesses along the transit corridor. The effects of potential business displacement are complex and can be a sensitive topic in the impacted communities. Displacement of local businesses can affect residents and businesses alike.

Often the direct impacts for displaced businesses are financial, but this does not capture the broader business characteristics associated with potential displacement. Businesses are affected differently based on their characteristics such as firm size, prominence in the community, and employment impact. For example, small and minority-owned businesses that rely on a localized customer base may have more difficulty finding substitute locations for relocation. Businesses that use machinery or hazardous substances may require large parcels or certain zoning or have undesirable production outcomes, such as waste and pollution, that make relocation difficult. Access to substitute locations may allow businesses to relocate but could also diminish access to existing pools of labor.

Direct displacement can occur as a result of property being acquired for project needs, which requires the business to move operations. Table 4.3-1 shows the estimated businesses and employee displacements.

Table 4.3-1 Estimated Businesses and Employees Displacements

Alternative	Business Displacements	Estimated Employee Displacements
Federal Way Segment		
Preferred FW Enchanted Parkway	0	0
Preferred FW Enchanted Parkway with Design Option	0	0
South Federal Way Segment		
SF Enchanted Parkway[1]	14	200
SF I-5	7	40
SF 99-West	25	250
SF 99-West with Porter Way Design Option	23	240
SF 99-East	25	300
SF 99-East with Porter Way Design Option	24	290
Fife Segment		
Fife Pacific Highway	28	280
Fife Pacific Highway with 54th Avenue Design Option	50	160
Fife Pacific Highway with 54th Span Design Option	54	250
Fife Median	12	240
Fife Median with 54th Avenue Design Option	24	120
Fife Median with 54th Span Design Option	28	210
Fife I-5	17	120
Fife I-5 with 54th Avenue Design Option	34	230
Fife I-5 with 54th Span Design Option	40	270
Tacoma Segment		
Preferred Tacoma 25th Street-West	9	90
Tacoma 25th Street-East	9	90
Tacoma Close to Sounder	43	140
Tacoma 26th Street	13	100

Sources: King County Department of Assessments (2023), Pierce County Assessor (2023), U.S. Department of Energy Information Administration workbook (2016). The employee numbers are estimates and rounded to the closest 10.

Notes: This analysis is based on affected businesses estimated to be displaced by project alternatives from property acquisition. The associated number of displaced employees due to property acquisition is an estimate and was based on the building size (King County Department of Assessment and Pierce County assessor data) and the type of business activity using square-foot-per-employee factors from the U.S. Department of Energy.

Federal Way Segment

The alternative and design option in the Federal Way Segment would primarily impact residential uses adjacent to I-5. Both the Preferred FW Enchanted Parkway Alternative and Preferred FW Enchanted Parkway with Design Option have no anticipated business displacements.

South Federal Way Segment

The alternatives in the South Federal Way Segment would primarily impact food, retail, and service businesses located on commercial land uses near I-5, along Enchanted Parkway, or along Pacific Highway (SR 99).

The SF Enchanted Parkway Alternative would displace an estimated 14 businesses, primarily adjacent to the Federal Way Shopping Center, including Heidelberg Materials, a ready-mix concrete supplier, and the Campus Square Shopping Center, including a large number of restaurants, such as Popeyes and Olive Garden. The SF I-5 Alternative would displace an estimated seven businesses, including the Jet Chevrolet and a car repair center. The SF 99-West Alternative would displace an estimated 25 businesses in shopping centers, such as the Campus Square Shopping Center and others that contain a small number of restaurants. It would also displace Fire King of Seattle: Fire Safety & Cylinder Services, Daffodil Storage, and other RV and auto-related services. The SF 99-East Alternative would also displace an estimated 25 businesses, many of which are the same businesses as the SF-99 West Alternative, as well as the DBM Contractors office building and equipment site and 7-Eleven. The inclusion of the Porter Way Design Option would reduce displacements by approximately one or two business for the SF 99-East and SF 99-West alternatives. Table 4.3-1 shows the estimated employee displacements associated with the businesses.

Fife Segment

A majority of potentially affected properties in the Fife Segment are on commercial zoned land. These properties include mostly food, retail, and service businesses adjacent to Pacific Highway and I-5.

The Fife Pacific Highway Alternative would displace an estimated 38 businesses. This alternative would avoid displacement of car dealerships, but would displace several retail buildings. These displacements include three buildings within the Fife Business Park, two of which are fast food restaurants, and the other building include approximately six retail storefronts, and the Fife Pacific Plaza, which includes about 15 smaller commercial and food service stores. It would also displace the Pick-Quick Drive In, a local small business. The Fife Pacific Highway Alternative with the 54th Avenue Design Option or the 54th Span Station Option would displace 12 to 14 additional businesses, mostly commercial, within the Fife Square Shopping Mall.

The Fife Median Alternative would displace an estimated 12 businesses. It differs from the Fife Pacific Highway Alternative by not displacing the properties along the south side of the Pacific Highway between Willow Road E and Alexander Avenue E. The Fife Median Alternative with the 54th Avenue Station Option or the 54th Span Station Option would displace 12 to14 additional businesses in shopping centers and office spaces.

The Fife I-5 Alternative would displace an estimated 17 businesses. More than half of the Fife I-5 Alternative displacements would be within the Fife Business Center, including the New Community Church. The elevated guideway along I-5 could visually block signage for car dealerships and other businesses, but the businesses would remain visible. The Fife I-5 Alternative with the 54th Avenue Station Option or the 54th Span Station Option would displace 17 to 23 additional businesses.

Tacoma Segment

In the Tacoma Segment, the alternatives would primarily affect properties with industrial and commercial uses and institutional and vacant land.

Both the Preferred Tacoma 25th Street-West and the Tacoma 25th Street-East alternatives would impact the same number of businesses (nine), the largest of which include a piping contractor, a recreational soccer and martial arts business, and U-Haul. For these alternatives,

the business displacements at the Portland Avenue Station account for the majority of the business displacements.

The Tacoma Close to Sounder Alternative would displace an estimated 43 businesses. It displaces many of the same businesses as the Tacoma 25th Street alternatives, with additional employee displacements due to the potential removal of the Freighthouse Square building, which accounts for about 30 business displacements. Freighthouse Square is a large retail center featuring specialty retailers and food vendors.

The Tacoma 26th Street Alternative would displace an estimated 13 businesses. It would avoid displacing businesses within Freighthouse Square but would displace four businesses for the Tacoma 26th Street Station and another business for a relocated bus facility on E 27th Street between East D and East F Streets.

Raceway Technologies, an industrial-oriented business, (a company providing underground, power, communication, fiber optic, and utility products) would be displaced by all the alternatives in the Tacoma Segment.

Commercial, Industrial, Public, and Institutional Properties Acquired

All the build alternatives would require property acquisitions and have changes in commercial land uses to support public transportation uses. Businesses on commercial, industrial, and institutional properties generate local tax revenues; provide employment opportunities; and contribute to the local economy. Displacement of such businesses and a reduced inventory of commercial property could result in slightly reduced sales tax revenue unless 1) zoning regulations are amended to allow for more commercial development or more intense commercial development uses; 2) displaced businesses relocate in the same city; or 3) new commercial development increases.

Table 4.2-1, in Section 4.2, Land Use, provides a summary of commercial and industrial land use conversions to public transportation uses. Most commercial and industrial land use conversions would occur within the Fife and South Federal Way segments. For all segments and alternatives, Table 4.1-3, in Section 4.1, Acquisitions, Displacements, and Relocations, provides more detail on the commercial, industrial, public, and institutional property acquisitions that would be affected.

Federal Way Segment

The Preferred FW Enchanted Parkway with or without the FW Design Option would not displace any businesses. However, each segment option would remove an acre of commercially zoned land. These options are not expected to have any impact on the city's sales tax base.

South Federal Way Segment

All alternatives in the South Federal Way Segment would acquire just 0.2 percent of commercial or industrial zoned land within the City of Federal Way.

Fife Segment

All Fife Segment alternatives would acquire at least 1.3 percent of the City of Fife's commercial and industrial zoned land. With similar levels of acquisitions and land use conversions, all of the build alternatives would have a similar impact on sales tax revenues for the City of Fife.

Tacoma Segment

None of the alternatives would require acquisition of more than a negligible share of the City of Tacoma's commercially zoned land; however, the Tacoma 26th Street Alternative would acquire the most, accounting for 0.02 percent of the city's mixed-use land. It would have the most commercial, industrial, public, and institutional acquisitions, the second-highest acreage of land use conversions, and the largest acquisition of mixed-use land.

Impact of Acquisitions and Displacements on Tax Base of Cities

All TDLE alternatives would acquire parcels that have existing commercial or industrial activity; businesses located within these parcels pay sales and/or Business and Occupation tax, and their acquisition could result in the initial reduction of these taxes. Calculating the potential tax reduction is difficult given the inability to know exactly how many businesses would relocate and remain within each city. If such businesses were to relocate within the city, they would continue paying sales and Business and Occupation taxes, and there would be no effect on the city tax base.

As with sales and Business and Occupation taxes, it is difficult to calculate specific property tax impacts due to the complexity of property tax policies in the State of Washington. The acquisitions would not initially reduce property taxes due to the budget-based system that limits the growth of property tax revenues (Washington State Initiative 747 and subsequent legislative action cap city property tax revenue growth at 1 percent per year, plus some add-on value from new construction). In addition, the conversion of taxable assessed valuation to exempt assessed valuation would shift the property tax burden to other residential and commercial taxpayers, which initially contributes to minimizing impacts to property taxes.

The reduction of developable properties may also decrease property tax revenues by lowering the potential for new construction on acquired properties. This may require changes in local government budgets or an increase in rates to taxpayers to recover budgeted funds. On the other hand, taxes on new construction in close proximity to station areas (TOD or transit-adjacent developments) may increase property tax revenues in future years. Table 4.3-2 displays the total taxable assessed valuation of real property for TDLE acquisitions by alternative.

The overall impact to each city's tax base is expected to be small given the reduction in taxable assessed valuation of acquired properties in relation to each city's overall tax base. For all cities, the total taxable assessed valuation of real property for TDLE acquisitions with a business displacement would account for less than 1.2 percent of the city's overall assessed valuation in 2020 (2022 values are updated for City of Fife).

These initial effects do not capture the full potential long-term fiscal impacts that could occur as a result of the project. Some of the initial tax revenue displacement may be offset by future construction elsewhere in the jurisdiction. Not all the land required by Sound Transit may be needed permanently, and unused surplus land could be redeveloped after project completion. The long-term implications of the fiscal impacts associated with the project also depend on business decisions and consumer demands. For example, some displaced businesses may relocate to other sites in the local area. Retaining those displaced businesses could reduce the effect on local sales taxes. Moreover, if the project were to promote future development and investment in local municipalities, property tax assessments may foreseeably expand, increasing overall property tax bases for local municipalities. Overall, long-term property tax impacts are expected to be small, and it is difficult to determine if the result of TDLE on property tax assessments would be a net gain or loss to the region.

Table 4.3-2 Total Existing Taxable Assessed Valuation by Alternative

Alternative	Total Taxable Value	Jurisdictional Total Taxable Value	Acquired Jurisdictional Taxable Value %
Federal Way Segment			
Preferred FW Enchanted Parkway	$0	$11,006,767,650	0.0000
Preferred FW Enchanted Parkway with Design Option	$0	$11,006,767,650	0.0000
South Federal Way Segment			
SF Enchanted Parkway	$25,624,200	$11,006,767,650	0.0023
SF I-5	$7,087,400	$11,006,767,650	0.0006
SF 99-West	$31,515,200	$11,006,767,650	0.0029
SF 99-West with Porter Way Design Option	$28,973,900	$11,006,767,650	0.0026
SF 99-East	$29,884,500	$11,006,767,650	0.0027
SF 99-East with Porter Way Design Option	$27,519,400	$11,006,767,650	0.0025
Fife Segment			
Fife Pacific Highway	$47,142,700	$3,792,462,521	0.0124
Fife Pacific Highway with 54th Avenue Design Option	$22,701,600	$3,792,462,521	0.0060
Fife Pacific Highway with 54th Span Design Option	$30,123,900	$3,792,462,521	0.0079
Fife Median	$38,190,600	$3,792,462,521	0.0101
Fife Median with 54th Avenue Design Option	$13,749,500	$3,792,462,521	0.0036
Fife Median with 54th Span Design Option	$21,171,800	$3,792,462,521	0.0056
Fife I-5	$15,668,300	$3,792,462,521	0.0041
Fife I-5 with 54th Avenue Design Option	$22,248,400	$3,792,462,521	0.0059
Fife I-5 with 54th Span Design Option	$26,392,800	$3,792,462,521	0.0070
Tacoma Segment			
Preferred Tacoma 25th Street-West	$10,126,700	$32,680,634,175	0.0003
Tacoma 25th Street-East	$10,282,100	$32,680,634,175	0.0003
Tacoma Close to Sounder	$15,378,100	$32,680,634,175	0.0005
Tacoma 26th Street	$13,782,900	$32,680,634,175	0.0004

Source: Pierce County Assessor Data, April 2023, for Fife and Tacoma segments. Pierce County Assessor Data, April 2023, and King County Department of Assessments Data, April 2023, are used for the South Federal Way Segment. King County Department of Assessments Data, April 2023, is used for Federal Way Segment. The parcels within the cities of Fife, Federal Way, Tacoma, and Milton were selected and summarized to provide the jurisdictional totals.

Long-Term Impacts on Tribal Fishing

Tribal coordination and consultation will occur as the project progresses to avoid or minimize long-term impacts to fish, fish habitat, Tribal fishing, and the economics of Tribal fishing.

Between 1854 and 1856, the United States government negotiated a series of federal treaties with western Washington Tribes. As part of the treaties, Tribes ceded millions of acres of land and were relocated onto small reservations; however, they reserved their rights to fish, hunt and gather in their usual and accustomed places. The TDLE project would cross the Puyallup River and other streams draining into Commencement Bay, which are within the ancestral and reservation lands of the Puyallup Tribe of Indians and where the Puyallup Tribe has treaty-protected fishing rights.

All TDLE alternatives would include a bridge over the Puyallup River at approximately the same location, just north of the I-5 bridge. There are existing transportation facilities that cross the river and impact the aquatic environment in this immediate area. The potential impact of the alternatives to aquatic habitats and Tribal fishing within the Puyallup River would differ based on whether a long-span bridge option or pier-supported bridge option is selected. Long-term impacts of a new bridge could affect salmon and Tribal fisheries in the Puyallup River.

- Long-span bridge option – With a long-span bridge, there would be fewer impacts on aquatic habitats and Tribal fisheries. The long-span bridge would be narrower and higher above the water than the existing I-5 bridge (approximately 110 feet above water and about 50 feet above the I-5 bridge) and no in-water structures would be needed to support the bridge. The higher, narrower structure spanning the river would have less shading than the pier-supported bridge option.
- Pier-supported bridge option – With a pier-supported bridge, Tribal fisheries and habitat conditions for fish such as the ESA-listed Chinook salmon, steelhead, and bull trout would be affected by the piers and the bridge. The pier-supported bridge would be approximately 60 feet above the water, which is about 10 feet above the I-5 bridge and about 50 feet lower than the long-span bridge. Shade from the pier-supported bridge and new areas of slow water resulting from the new piers could increase the risk of predation on juvenile salmonids.

Additional information on long-term impacts and mitigation measures to the aquatic habitats of the Puyallup River are discussed in Section 4.9, Ecosystems.

TDLE would add an additional crossing over the Puyallup River, but is not anticipated to have long-term economic impacts to Tribal fishing.

4.3.3.3 Construction Impacts for the Build Alternatives

Construction often results in short-term impacts and changes to the surrounding area. The benefits of construction mainly come in the form of capital expenditures, opportunities for entering the labor market through construction jobs, the purchasing of local goods and services needed for construction, and construction employees spending money in the community. Other potential effects of construction are often associated with limiting business visibility and access, traffic delays, noise, and rerouting traffic in ways that increase travel time and make access to locations difficult.

Potential Beneficial Economic Impacts from Construction

The current TDLE project schedule estimates project construction beginning in 2029 and being completed by 2035. Capital expenditures on light rail projects could support regional economic activity through the purchase of goods and services and labor in the study area. The economic contributions from construction projects are often temporary in nature and occur as construction spending unfolds. However, expansionary projects that strengthen the capacity of a region to increase economic output more efficiently may have broader long-run benefits than what is typically measured in short-run economic impact analyses. How much construction increases employment and spending depends on the source of project funding and the types of workers used during project construction.

Table 4.3-3 provides an estimated range of the direct expenditures and the number of employees who would be hired based on cost estimates of the alternatives. The number of direct employees was calculated using the Washington Office of Financial Management Input-Output Model (a detailed accounting of the structure of the Washington State economy including industry linkages).

The preferred approach for this type of analysis is to account only for new capital funding, not supported by local tax dollars, that would flow into the region for each alternative. Since that information is not available yet, the values represent the gross contributions, or an “economic footprint” associated with each alternative. As such, it represents an upper-bound estimate of economic activity associated with the project.

Overall, the proposed alternatives would support economic activity in the region by increasing demand for the construction industry. Additionally, the wages paid to workers in construction and supporting industries would increase consumption in the region. However, as this is not a net analysis, these results do not delineate between new economic activity and activity postponed because of the project. Additionally, the analysis does not account for the opportunity cost of spending the funds associated with the project on another public project.

The direct estimates represent spending and jobs directly related to the project build alternatives. Total employment accounts for both the direct and secondary (supply chain and consumption) effects associated with each alternative. These secondary effects are represented by economic multipliers, which trace how spending is distributed across other industries to support economic activities in a study region.

Construction spending (excluding land and equipment) tends to have a high multiplier as many of the labor and capital inputs are supplied locally. This analysis generalized output multipliers to describe the potential economic impact. Based on the multipliers in the 2021 update of the Washington State Input-Output model, every $1 million spent on construction activity supports an additional $574,000 in economic output. As mentioned previously, expansionary projects can result in increased economic capacity but contribute directly to only a short-run increase in output and jobs. Often the impacts calculated from construction spending dissipate as project spending declines.

Table 4.3-3 Estimated Direct Expenditures and Direct Employment during Construction[1]

Cost Estimates and Employment (FW Enchanted Parkway to SF Enchanted Parkway to Fife Pacific Highway to Tacoma 25th-West)	Project Construction
Direct expenditures[2] ($B)	$2.935
Total (direct and secondary) employment (job-years[3])	18,410
Cost Estimates and Employment (FW Enchanted Parkway to SF Enchanted Parkway to Fife I-5 to Tacoma 25th-West)	**Project Construction**
Direct expenditures[2] ($B)	$2.943
Total (direct and secondary) employment (job-years[3])	18,460
Cost Estimates and Employment (FW Enchanted Parkway to SF 99-West to Fife Pacific Highway to Tacoma 25th-West)	**Project Construction**
Direct expenditures[2] ($B)	$2.850
Total (direct and secondary) employment (job-years[3])	17,880
Cost Estimates and Employment (FW Enchanted Parkway to SF 99-West to Fife I-5 to Tacoma 25th-West)	**Project Construction**
Direct expenditures[2] ($B)	$2,858
Total (direct and secondary) employment (job-years[3])	17,930
Cost Estimates and Employment (FW Enchanted Parkway to SF 99-East to Fife Pacific Highway to Tacoma 25th-West)	**Project Construction**
Direct expenditures[2] ($B)	$2.951
Total (direct and secondary) employment (job-years[3])	18,510
Cost Estimates and Employment (FW Enchanted Parkway to SF 99-East to Fife I-5 to Tacoma 25th-West)	**Project Construction**
Direct expenditures[2] ($B)	$2.958
Total (direct and secondary) employment (job-years[3])	18,560

Source: Sound Transit and Washington Office of Financial Management (OFM) Input-Output Model, 2021 Update Model.

Notes:

(1) Estimates were done for representative alignment scenarios. All scenarios include the Preferred FW Enchanted Parkway and Preferred Tacoma 25th-West alternatives.

(2) Direct expenditures exclude contingency, vehicles, right-of-way, and equipment (guideway, systems) spending.

(3) A job-year is defined as full-time employment for one person over the course of a year (assuming 2,080 hours of employment per year). A job-year could occur in a single calendar year, could involve more than one position within a calendar year, or be spread out over more than one calendar year.

(4) The multipliers from the Washington OFM Input-Output Model represent the State of Washington and differ from economic multipliers created for the four-county PSRC region.

Other Potential Economic Impacts from Construction

Construction of TDLE could change traffic circulation, parking, access, noise, and visual effects, all of which have the potential to affect local businesses and workers near the construction area. Potential impacts could include reduced sales resulting from changes to traffic, parking, access, noise, and visuals, as patrons might choose to avoid construction areas or have greater difficulty accessing retail businesses near construction activity. These construction impacts affect retail and service businesses most directly, with associated loss in sales tax revenues. The extent and duration of the interference, the location of competitors, and the type of affected

business would all influence the degree of economic effects to local businesses resulting from construction.

Construction Impacts on Tribal Fishing

Construction of TDLE may have a potential impact on Tribal fishing within the Puyallup River. A pier-supported bridge option crossing the Puyallup River would have greater construction-related impacts on aquatic habitats and aquatic life within the Puyallup River as compared to the long-span bridge, including possible injury and mortality of fish, shade from overwater work trestles, and localized increases in turbidity. Construction of cofferdams or steel casings in the river for the pier-supported bridge option could temporarily limit the space available for fishing and temporarily restrict navigation on the river around active construction areas. Barges or over-water access structures would be required to construct foundations in water and would be moored outside of the navigation channels, which may disrupt space available for Tribal fishing boats to navigate the river. Species that support Tribal fisheries may face adverse effects as a result of the changes that construction of the pier-supported bridge would bring. The environmental documentation associated with WSDOT's installation of the I-5 bridge between 2015 and 2019 identified adverse impacts due to the mortality or injury of fish during in-water construction and exposure to underwater sound pressure from in-water pile driving. Disruption to salmon populations may have an impact on fishing, both for sustenance and for income, for the Puyallup Tribe of Indians if construction reduces the number of fish. Construction work occurring in water would be subject to work-window restrictions to protect ESA-listed and other fish, along with timing restrictions for Tribal fishing and ceremonial activities. The precise timing of the work windows will be determined during the environmental approval process with USFWS, NMFS, USACE, and the Puyallup Tribe of Indians. No in-water construction work would be required for building the long-span bridge option. Additional information on construction impacts to the aquatic habitats of the Puyallup River is discussed in Section 4.9, Ecosystems.

The construction of the long-span bridge may also impact aquatic life within the Puyallup River when the support columns immediately adjacent to the river are constructed. Noise and vibration could possibly cause injury and mortality of fish. There would be shade from overwater work trestles during construction.

During construction of either bridge option, boat traffic may be directed to navigate in the center of the river to avoid active construction areas. The river would remain navigable to ensure Tribal members' rights to their fisheries along with maintaining their economic and cultural importance.

Construction Impacts Common to All Alternatives

Construction-related disruptions to traffic, transit operations, freight access, nonmotorized access, and the availability of nearby parking could potentially impact business operations within the construction vicinity.

Different businesses have unique needs. For example, destination businesses, with a customer base familiar with the business and seeking its location as a destination, would be concerned about the general performance of the transportation infrastructure. Opportunity businesses, such as restaurants, which rely on incidental patronage from customers passing by, would be concerned about localized factors, such as business visibility, ease of access to the specific site, parking, pedestrian accessibility, and amenities.

Longer intersection queues and slower travel times may lead some consumers to opt for more accessible alternatives, make it more difficult for delivery trucks to deliver goods, and increase the costs incurred by employees when traveling to work. These changes in transportation costs

could change the cost of production and the quantities of goods and services produced by impacted businesses.

Avoidance and Minimization of Construction Impacts

Sound Transit has established standard practices, which includes early collaboration with jurisdictions, to avoid and minimize impacts during construction, many specifically to address and respond to the needs of businesses through the course of construction. The following practices would be part of the project and incorporated into construction plans as applicable:

- Provide a 24-hour construction telephone hotline.
- Provide business cleaning services on a case-by-case basis.
- Provide detour, open for business, and other signage as appropriate.
- Establish effective communications with the public through measures such as in-person and remote meetings, construction updates, alerts, and schedules.
- Implement promotion and marketing measures to help affected business districts maintain their customer base, consistent with Sound Transit policies, during construction.
- Maintain access as much as possible to each business and coordinate with businesses during times of limited access.
- Facilitate cross-jurisdictional meetings during construction planning and implementation to minimize impacts and coordinate communication with businesses.
- Coordinate with local jurisdictions on holiday moratoriums.
- Provide an ombudsman consistent with Sound Transit policy. In the event that complaints arise about construction impacts that cannot be resolved by community outreach staff or the relevant department director, the ombudsman policy provides a process for addressing those complaints in an impartial, fair, and timely manner that ensures effective stewardship of public resources and minimizes construction impacts.

Impacts on fish and fish habitat would be avoided and minimized through environmental permitting and reviews, including the following:

- Tribal coordination, consultation, and reviews, including with the Puyallup Tribe of Indians and Muckleshoot Indian Tribe, which both have usual and accustomed fishing rights in the Puyallup River.
- ESA Section 7 consultation with USFWS and NMFS (applies to Chinook salmon, steelhead, and bull trout).
- Review of potential effects on essential fish habitat, as required under the Magnuson-Stevens Fishery Conservation and Management Act (applies to Chinook, coho, and pink salmon).
- Application for a Hydraulic Project Approval from Washington Department of Fish and Wildlife (WDFW).
- Critical area reviews by local jurisdictions.

As part of the coordination and consultation that will occur as the project progresses, Sound Transit would implement suggestions from Tribes and regulators to minimize impacts to fish and fish habitat, to the extent practicable. Section 4.9, Ecosystem Resources, of this Draft EIS includes additional information on potential construction impact on aquatic species and habitats.

4.3.3.4 Indirect Impacts

TDLE could result in indirect economic impacts on the surrounding area. Indirect impacts are potential effects related to the project but not part of it, and that may occur separated by distance or time but are still reasonably foreseeable. Some changes may include increased economic activities, TOD, increased business activity around transit stations, higher density and mixed land uses, and redevelopment.

Development of the light rail would likely increase economic activity in areas near TDLE stations, resulting in increased development and redevelopment potential, more dense and mixed land uses, and increased property value. All cities within the walk/bike shed of TDLE stations support more mixed land uses and expansion of transportation systems in their comprehensive plans, goals, and policies. TDLE would help accomplish these goals by bringing high-capacity transit and connections to transportation corridors. Appendix H2, Land Use, includes a detailed description of the applicable comprehensive plans and consistency with the proposed project.

TDLE would increase high-capacity transit access to centers within Federal Way and Tacoma and to areas promoting transit development such as in the Federal Way City Center, Fife's planned City Center, and Tacoma's downtown. It would encourage TOD in the urban centers where zoning is in place to accommodate this type of growth. Higher-than-typical densities, consumer retail and services, and pedestrian amenities serve as important supports for TOD. Thus, the degree to which TOD occurs would be influenced by the degree to which the existing built environment context and local land use/development controls in each station area support the creation of compact, walkable, and mixed-use urban environments.

There may also be opportunities for TOD on potential Sound Transit surplus property after construction of the transit project is complete. Sound Transit's Equitable Transit Oriented Development Policy (Board Resolution No. R2018-10, Sound Transit 2018) calls for the agency to explore opportunities for joint or co-development of transit facilities with other uses where feasible, consider TOD potential in project design and property acquisition, and prioritize affordable housing in joint development or surplus property redevelopment decisions. Sound Transit works collaboratively with local and regional stakeholders to realize TOD projects.

As TDLE expands transit and mobility access throughout the project area, it would likely increase the convenience, visibility, and desirability of the surrounding residential and commercial properties. This would cause heavier pedestrian activity near stations and existing nodes of economic activity, which could increase the potential patronage of retail businesses in the area. Convenient light rail access may also bring more employees who are interested in decreasing their commute time to live in the area.

Gains in property values and real estate market performance are often made through the synergy of proximity, density, mixed uses, and pedestrian friendliness (Transportation Research Board 2004; Cervero 2004), all of which TDLE would advance by serving as a catalyst for TOD. Many case studies have found that residential and commercial properties within the vicinity of light rail stations typically experience an increase in property values and are ultimately valued higher than similar properties not located near light rail stations (Transportation Research

Board 2004; Nelson et al. 2015; Nelson 2017), especially if pedestrian infrastructure is added (Bartholomew and Ewing 2011). However, property values may be affected by more than just access to high-capacity transit; property values may also be affected by fluctuations in national and local economies, consumer confidence, and local development pressures. Any gains in property values may also take time to accrue given the time needed for TOD implementation. This is particularly true in new or emerging TOD markets since there may be few comparable projects in the area to help demonstrate market demand for this development product. The development process could be further impeded by a lack of available public infrastructure needed to support greater development intensity, such as roadways and utilities, and due to complex development requirements that may delay a proposed TOD project.

The project could also result in negative effects to surrounding properties along the TDLE corridor. The negative operations effects could include impaired road access and traffic flow shifts or restrictions, decreased parking, noise increases, and impaired visibility that could reduce patronage of a business or property values. These effects would have to be distinctly greater than what currently exists for decreases in business patronage and property values to materialize.

Indirect displacement may also occur as a result of new development patterns that increase rents or saturate the local market area with similar businesses, drawing away sales from existing businesses. Displacement could directly and indirectly occur as the result of changing land uses that require the businesses operations to resume in a different location. Chapter 3, Transportation Environment and Consequences, Sections 4.7, Noise and Vibration, and Section 4.5, Visual and Aesthetics, address traffic, noise, and visual effects and describe these issues in more detail.

4.3.4 Potential Mitigation Measures

Long-term operation of TDLE is not anticipated to result in economic impacts that would require mitigation. Relocation assistance for business displacements is discussed in Section 4.1, Acquisitions, Displacements, and Relocations. Mitigation measures associated with transportation, visual, noise, and vibration impacts are discussed in Chapter 3, Transportation Environment and Consequences; Section 4.7, Noise and Vibration; and Section 4.5, Visual and Aesthetics. Mitigation measures for long-term impacts to aquatic habitats in the Puyallup River are discussed in Section 4.9, Ecosystems.

Construction of the proposed project may result in impacts to nearby businesses due to reduced access or general construction activity. Avoidance and minimization measures for construction impacts are addressed in Section 4.3.3.3, Construction Impacts. Measures presented in Chapter 3, Transportation Environment and Consequences; Section 4.7, Noise and Vibration; Section 4.5, Visual and Aesthetics; Section 4.1, Acquisitions, Displacements, and Relocations; and Section 4.9, Ecosystems, would also minimize and mitigate construction-related impacts discussed in this report.

4.4 Environmental Justice, Social Resources, Community Facilities, and Neighborhoods

4.4.1 Introduction to Resource and Regulatory Requirements

This section discusses how TDLE could affect environmental justice, social resources, including community facilities, neighborhood character, community cohesion, and safety and security within the study area. For the purposes of this section, *social resources* are defined to include community amenities, government and Tribal entities, affordable and senior housing, medical facilities, recreation facilities, religious centers, schools, social service providers, and transportation facilities. *Community cohesion* refers to a community member's sense of belonging to a neighborhood and the degree to which community members interact with other community members and social resources in the neighborhood.

Consistent with FTA Title VI Circular and the FHWA Community Impact Assessment: A Quick Reference for Transportation, four key neighborhood and community issues were used to evaluate the project's potential impact on the study area (FTA 2012; FHWA 2018):

- Changes in neighborhood quality.
- Barriers to social interaction.
- Impacts on community resources.
- Impacts on safety and security.

Sound Transit evaluated potential impacts to Environmental Justice populations consistent with FTA's Environmental Justice Policy Guidance for Federal Transit Administration Recipients Circular 4703.1. These potential impacts are summarized in Section 4.4.3.5, Environmental Justice Summary, and are discussed in more detail in Appendix C, Environmental Justice Assessment.

The analysis in this section utilizes data and findings from other environmental analysis sections, including Chapter 3, Transportation; Section 4.1, Acquisitions, Displacements, and Relocations; Section 4.2, Land Use; Section 4.3, Economics; Section 4.5, Visual and Aesthetics; Section 4.6, Air Quality and Greenhouse Gas Emissions; Section 4.7, Noise and Vibration; Section 4.14, Public Services, Safety, and Security; and Section 4.17, Parks and Recreational Resources.

Additionally, the analysis considers the PSRC displacement risk tool, which uses socio-demographics, transportation qualities, neighborhood characteristics, housing, and civic engagement to identify census tracts that are at a greater risk of displacement based on current neighborhood conditions.

4.4.2 Affected Environment

Figure 4.4-1 shows the neighborhoods within the TDLE study area. Figures 4.4-2 through 4.4-5 show social resources within 0.5 mile of the TDLE build alternatives. Affordable housing was identified in the study area by reviewing information from the United States Department of Housing and Urban Development (HUD), Pierce County Housing Authority, and King County Housing Authority to identify properties and housing developments that provide subsidized housing or housing assistance for low-income and cost-burdened families. Additional nonsubsidized below market rate housing within the study area can be found in private developments, such as apartment complexes, manufactured or mobile home developments, and RV parks. The PSRC displacement risk tool shows that a majority of the project area has a moderate risk of displacement, with a higher risk of displacement in the Federal Way Segment.

The TDLE corridor would cross the ancestral and reservation lands of the Puyallup Tribe of Indians and its treaty-protected Usual and Accustomed Areas and Adjudicated Hunting and Fishing Grounds. The TDLE corridor is also located in the cities of Federal Way, Milton, Fife, and Tacoma; spans the King-Pierce county line; passes just south of the Port of Tacoma; and crosses over the Puyallup River.

4.4.2.1 Community Profile

Federal Way Segment

The FW Enchanted Parkway Alternative and FW Design Option in the Federal Way Segment begin just south of the Federal Way Downtown Station and curve to parallel I-5. I-5 provides north-south connections in the study area and throughout the greater Puget Sound region but creates an east-west barrier to community cohesion.

The northernmost portion of the study area extends into the Steel Lake neighborhood, a mostly commercial area populated by big-box retail stores, chain restaurants, and hotels. From S 320th Street, the Preferred FW Enchanted Parkway Alternative travels south through the Kitts Corner neighborhood and intersects with the Mirror Lake, Steel Lake, Lake Dolloff, and West Campus neighborhoods (Figure 4.4-1). Land uses in the Federal Way Segment study area consist of a mix of commercial and single- and multi-family residential, with some light industrial, office, and open space.

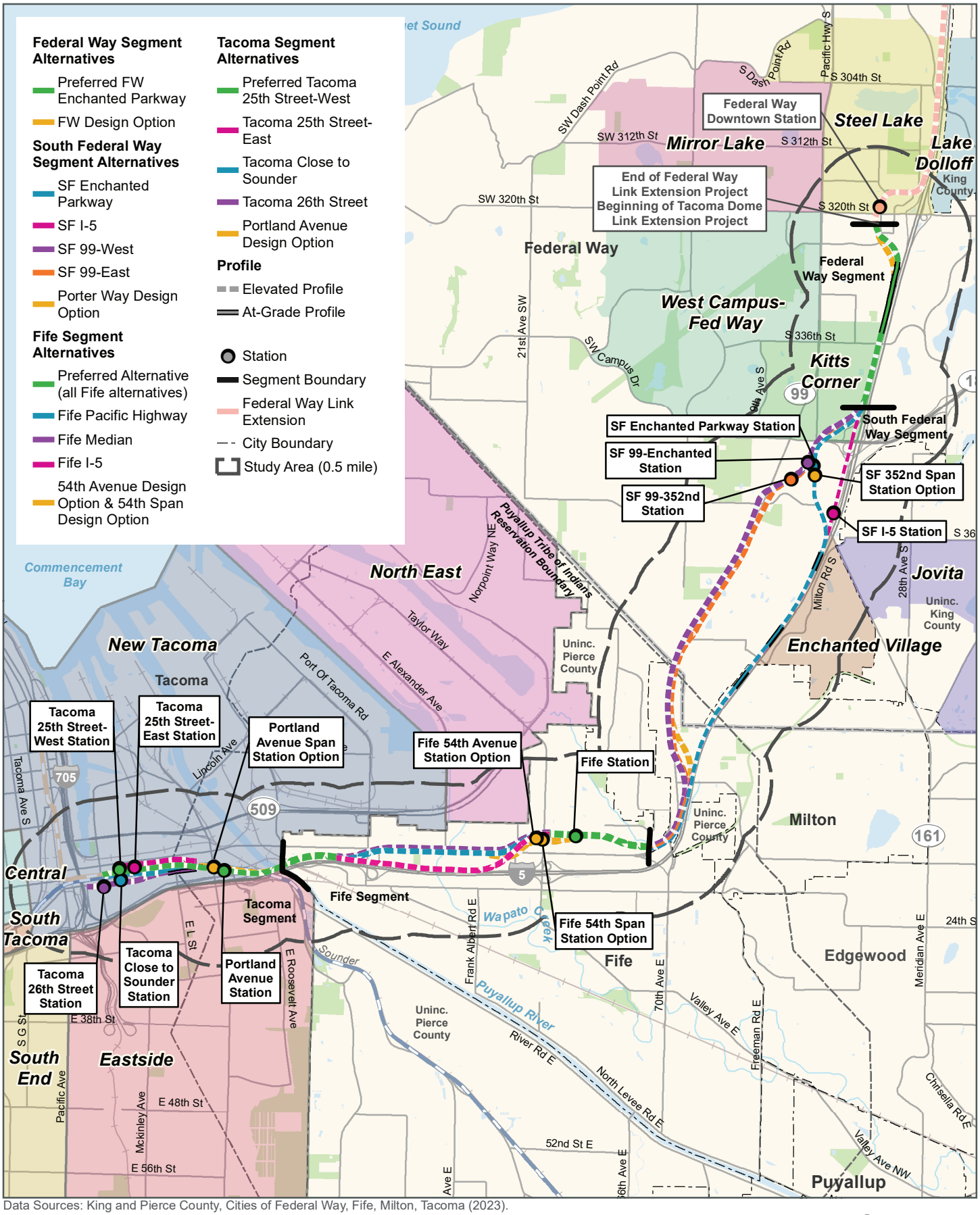
Residential land uses and neighborhoods are generally concentrated in the area west of I-5 between S 324th Street and S 336th Street. Affordable housing in the study area is provided by King County Housing Authority at Kings Court Apartments and Evergreen Court Apartments. Properties offering nonsubsidized below market rate housing in the study area include several manufactured home communities, including Belmor, the Meridian Court Apartments, and the Willamette Court Apartments.

South Federal Way Segment

In the South Federal Way Segment, the main commercial areas are generally bounded by S 344th Street on the north side, I-5 on the east side, S 356th Street on the south side, and Pacific Highway on the west side. Commercial uses in this area are concentrated around Enchanted Parkway and consist mostly of big-box retail developments, with smaller complementary retail stores, chain restaurants, and auto repair shops. There are also a number of commercial uses concentrated around Pacific Highway at the south end of the South Federal Way Segment in Milton, including auto and boat repair and sales, and storage facilities. Commercial development throughout the study area is automobile-oriented, with many large surface-level parking lots. This land use pattern generally limits community cohesion.

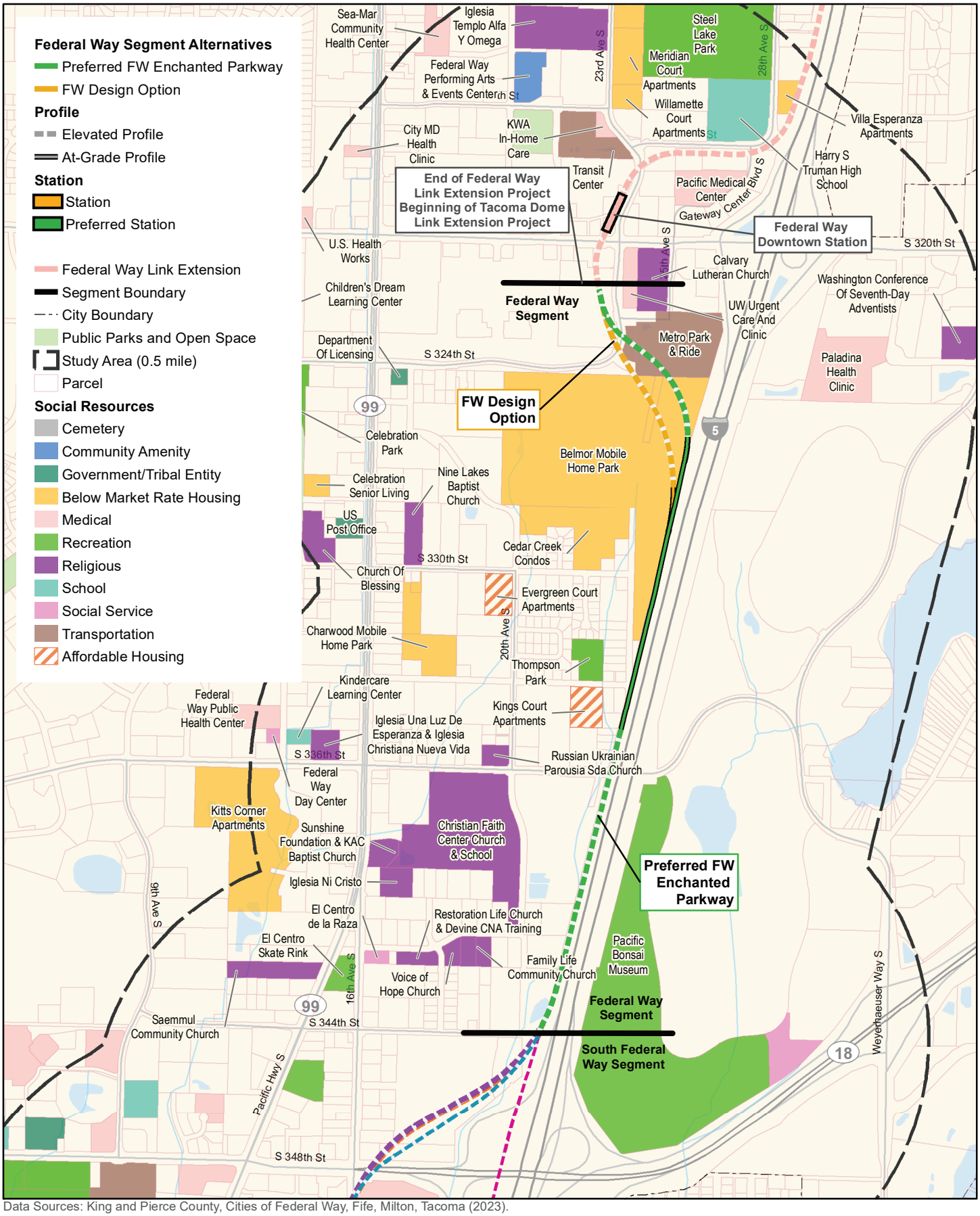
Residential land uses and neighborhoods are generally concentrated east of I-5 from S 348th Street to S 375th Street. Additionally, a concentration of multi-family and single-family residences is located west of I-5 and south of S 356th Street around Todd Beamer High School. Residential housing in the South Federal Way Segment includes a diversity of types, including single-family homes, mobile home parks, gated condominium communities, and various multi-family housing complexes.

Religious facilities are the most common social resource type in the South Federal Way Segment, followed by medical facilities. Other facility types found in the South Federal Way Segment study area include recreation facilities, schools, government services facilities, transportation facilities, and community facilities. Properties offering nonsubsidized below market rate housing in the study area include several manufactured home communities, Park 16 Apartments, Cedars RV Park, Spring Valley Mobile Home Park, and Milton Senior Community.



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

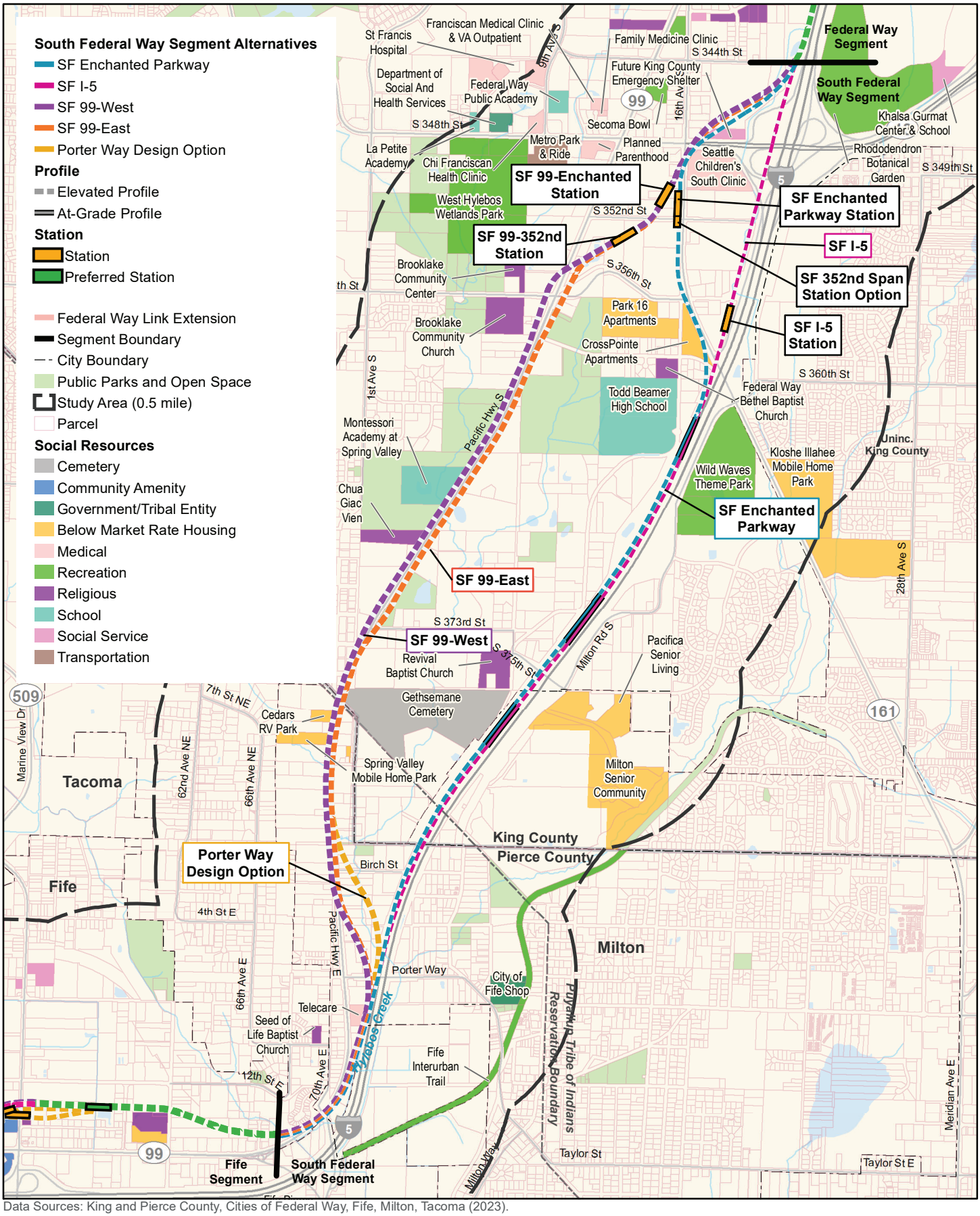
FIGURE 4.4-1
Neighborhoods in the TDLE Study Area
Tacoma Dome Link Extension



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

Figure 4.4-2
Social Resources in the Study Area
Federal Way Segment

Tacoma Dome Link Extension



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

0 0.5 1 Mile

Figure 4.4-3
Social Resources in the Study Area
South Federal Way Segment

Tacoma Dome Link Extension

Based on the residential housing types described above, automobile-oriented nature of development patterns, and barriers created by I-5 and Pacific Highway (SR 99) and other major arterials, community cohesion is limited in this segment.

Fife Segment

The Fife Segment of the study area is made up of varied land uses and community characteristics. The most common land uses in the Fife study area are commercial and industrial, with smaller portions of residential and agricultural uses. Automobile-oriented commercial land uses are primarily concentrated around Pacific Highway and I-5, with a heavy concentration of vehicle dealerships and rental businesses along I-5 and a variety of commercial development types along Pacific Highway, including strip malls, hotels, drive-through restaurants, auto dealerships, and the Emerald Queen Casino.

Residential communities in the Fife study area are generally separate single-family subdivisions or multi-family developments and are mostly south of I-5 with lower levels of community cohesion between development areas. A few single-family residences are in the proposed station area. The main barrier to community cohesion in this study area is I-5, which limits north-south connectivity to highway crossings at 70th Avenue E, 54th Avenue E, and Port of Tacoma Road. These major arterials, as well as Pacific Highway, create additional barriers to community cohesion in the Fife Segment.

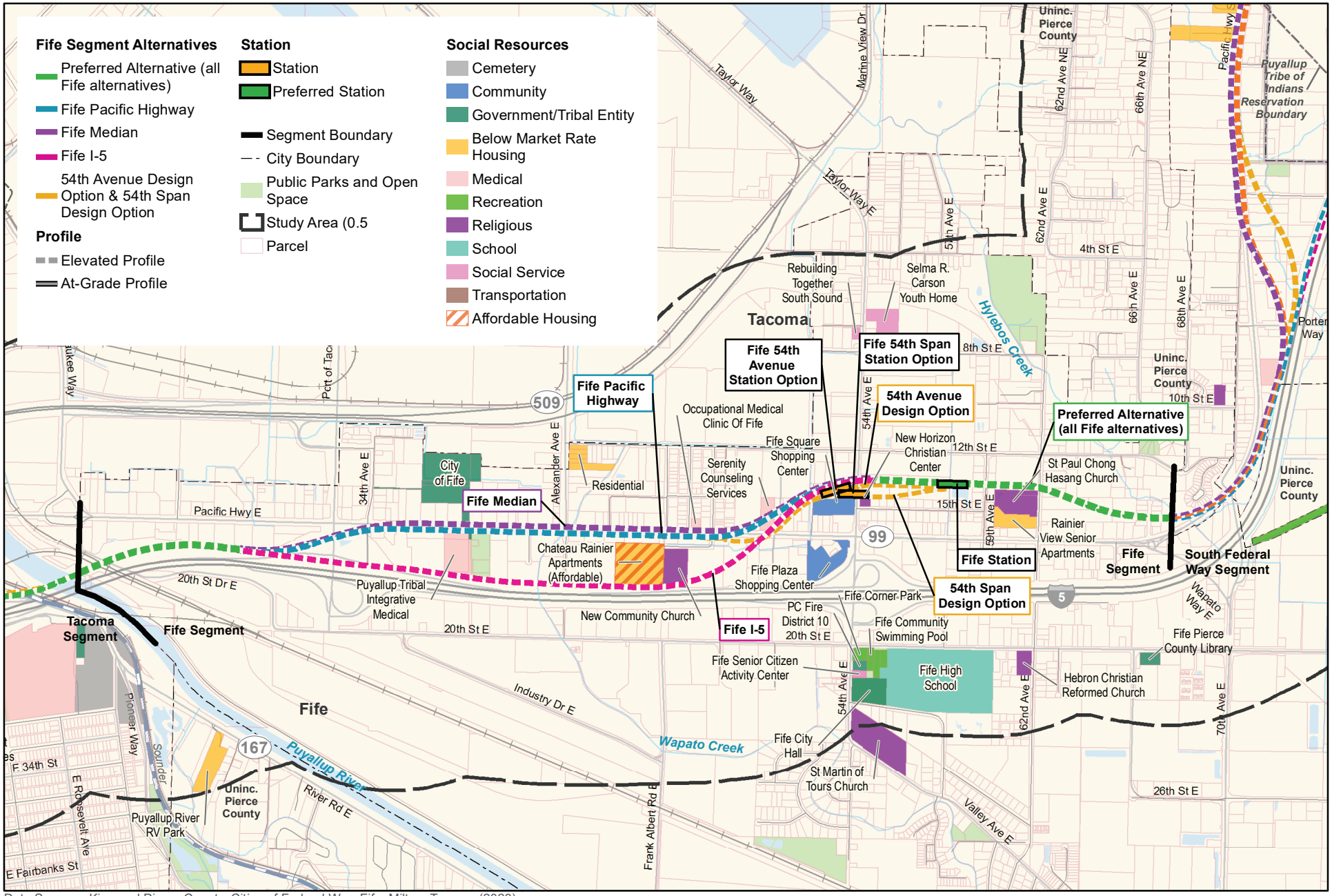
Social resources or centers within the Fife Segment study area include Tribal and government/services facilities, such as the Salish Cancer Center in the Puyallup Tribal Integrative Medicine building, multi-family and affordable housing, and religious facilities, including the St. Paul Chong Hasang Church. Other social centers include medical clinics, recreation facilities, and schools. Affordable housing is present at Pierce County Housing Authority's Chateau Rainier Apartments. Properties that offer nonsubsidized below market rate housing in the Fife Segment include Rainier View Senior Apartments, and other properties depicted on Figure 4.4-4.

Tacoma Segment

The study area for the Tacoma Segment stretches from just east of the Puyallup River to the Tacoma Dome vicinity, within the City of Tacoma.

As part of the Neighborhood Council Program, the City of Tacoma has designated eight neighborhoods. The Tacoma Segment study area falls inside the New Tacoma neighborhood, which includes downtown Tacoma and the Port of Tacoma. Common land uses in the study area include single-family neighborhoods concentrated south of I-5, general warehouse storage, parks, railroad tracks and railyards, and wholesale commercial facilities. The areas directly adjacent to and in proximity to the build alternatives consist of mostly industrial uses and some commercial, with very few residential properties. Due to the limited number of residential properties in the Tacoma Segment, there is currently low community cohesion. The current conditions in Tacoma are likely to change over time, with Tacoma seeing more multi-family residential development and the South Downtown Subarea Plan foreseeing a future with more residential, mixed use, and office developments.

Social facilities in the Tacoma Segment study area include government and Tribal entities, recreation facilities, affordable housing, shopping centers, religious facilities, schools, and medical facilities. Properties offering nonsubsidized below market rate housing in the Tacoma Segment include McKinley Terrace Apartments, Pine Tree Harbor, Tim Jefferson Square, and Puyallup River RV Park, as depicted on Figure 4.4-5.



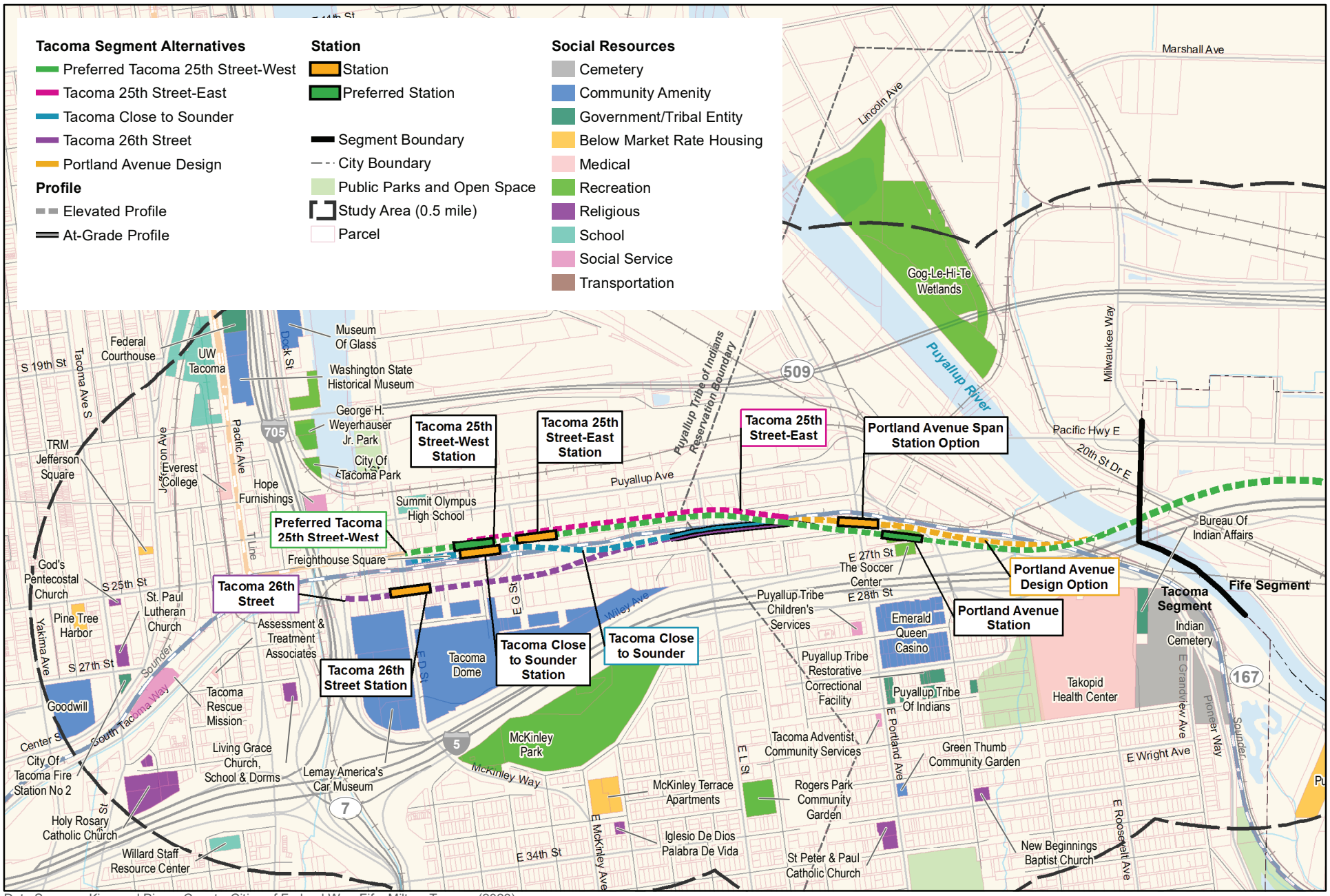
Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

0 0.5 1 Mile

FIGURE 4.4-4
Social Resources in the Study Area
Fife Segment

Tacoma Dome Link Extension



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

0 0.5 1 Mile

FIGURE 4.4-5
Social Resources in the Study Area
Tacoma Segment

Tacoma Dome Link Extension

4.4.2.2 Study Area Population

The following section summarizes study area demographics and population characteristics for each of the TDLE segments and jurisdictions within the segments. Demographic data are reported for census tracts and block groups and are based on 2017-2021 American Communities Survey (ACS) 5-Year Estimates published by the U.S. Census Bureau. For the purposes of this analysis, minority and low-income populations, as well as additional demographic information, are analyzed at the block group level, and the study area for each alternative includes block groups that are either entirely or partially located within 0.5 mile of each segment. A summary of the study area demographics and population characteristics of each segment and each jurisdiction within the study area are shown in Table 4.4-1 and Table 4.4-2.

Table 4.4-1. Study Area Demographics[1]

	Total Population	Minority Population[2]	Low-Income Households[3]	Households with Limited English Proficiency[4]
Sound Transit Service District[5]	3.3 million	42%	20%	6%
Federal Way Segment	20,833	67%	33%	13%
South Federal Way Segment	31,401	50%	25%	7%
Fife Segment	18,899	50%	29%	6%
Tacoma Segment	19,351	51%	39%	4%
City of Federal Way	99,792	60%	29%	8%
City of Fife	10,869	57%	26%	5%
City of Tacoma	217,332	43%	28%	4%
City of Milton	8,501	28%	19%	2%

Source: U.S. Census Bureau, ACS 2017-2021 5-Year Estimates.

Notes:

(1) Percentages represent estimates based on survey data. Survey data are not available at the census-block level; the data represent an estimate of minority and low-income persons in block groups within 0.5 mile of each project alternative.

(2) Minority population includes all categories other than Non-Hispanic White Alone.

(3) A low-income person is a person whose household income is at or below the U.S. Department of Health and Human Services (HSS) poverty guidelines (United State Department of Transportation Order 5610.2C Appendix § 1(b)). The 2023 poverty guideline for a household of one is $14,580 annual income and for a household of four is $30,000 annual income (HHS 2023). Sound Transit's low-income threshold is two times the federal poverty level, which the agency has determined is appropriate for use in determining eligibility for a reduced fare program and reflects the increasingly high cost of living in the region.

(4) A person with limited English proficiency is defined by the U.S. Census Bureau as a person who speaks English "less than well."

(5) The Sound Transit Service District includes portions of King, Pierce, and Snohomish counties.

Table 4.4-2. Population Characteristics[1]

	Total Population	Population under 18 (%)	Population 65 and over (%)	Households with No Vehicle Available (%)	Median Household Income
Sound Transit Service District	3.3 Million	21%	13%	9%	$105,671
Federal Way Segment	20,833	24%	14%	9%	$62,520
South Federal Way Segment	31,401	25%	11%	4%	$81,688
Fife Segment	18,899	21%	11%	3%	$79,485
Tacoma Segment	19,351	18%	12%	10%	$56,727
City of Federal Way	99,792	24%	14%	6%	$72,969
City of Fife	10,869	26%	8%	3%	$75,557
City of Tacoma	217,332	21%	14%	9%	$69,956
City of Milton	8,501	22%	15%	6%	$81,690

Source: U.S. Census Bureau, ACS 2017-2021 5-Year Estimates.

Notes:

(1) Percentages represent estimates based on survey data. Survey data are not available at the census-block level; the data represent an estimate of minority and low-income persons in block groups within 0.5 mile of each project alternative.

Federal Way Segment

The study area for the Federal Way Segment includes approximately 20,800 residents. Of these residents, approximately 33 percent are reported as low-income, and 67 percent are reported as minorities. The Preferred FW Enchanted Parkway, with or without the design option, shares a similar footprint such that the affected area for each of these alternatives is characterized by the same demographic information. Key findings for the Federal Way Segment include:

- The proportion of minority persons within the study area (67 percent) is the highest of the four segments, 7 percent higher than the share for the City of Federal Way as a whole (60 percent), and 25 percent higher than the Sound Transit District as a whole (42 percent).
- The proportion of low-income persons within the study area (33 percent) is 4 percent higher than the City of Federal Way as a whole (29 percent) and 13 percent higher than the Sound Transit District as a whole (20 percent).
- Households with limited English proficiency make up 13 percent of all households in the Federal Way Segment, 5 percent higher than within the City of Federal Way (8 percent) and 7 percent higher than the Sound Transit District as a whole (6 percent).

South Federal Way Segment

The study area for the South Federal Way Segment includes approximately 31,400 residents. Of these residents, approximately 25 percent are reported as low income and 50 percent are reported as minorities. All of the alternatives and design options would affect areas that are characterized by the same demographic information, regardless of the difference in location relative to Pacific Highway and I-5. Key findings for the South Federal Way Segment include:

- The proportion of minority persons within the study area (50 percent) is 10 percent lower than the share for the City of Federal Way as a whole (60 percent) and 8 percent higher than the proportion of minority persons in the Sound Transit District as a whole (42 percent).
- The proportion of low-income persons within the study area (25 percent) is 4 percent lower than the share for the City of Federal Way as a whole (29 percent) and 5 percent higher than the Sound Transit District as a whole (20 percent).

- The South Federal Way Segment includes the greatest overall number (in nominal terms) of low-income and minority persons (7,689 and 15,712 persons, respectively) of the four TDLE segments.
- Households with limited English proficiency make up 7 percent of all households in the South Federal Way Segment, similar to the City of Federal Way (8 percent) and the Sound Transit District as a whole (6 percent).

Fife Segment

The study area for the Fife Segment includes approximately 18,900 residents. Of these residents, approximately 29 percent are reported as low income, and 50 percent are reported as minorities. All of the alternatives and design options in the Fife Segment share similar footprints such that the affected area for each of these alternatives is characterized by the same demographic information. Therefore, the share of low-income and minority persons residing within the study area for each of these alternatives is the same. Key findings for the Fife Segment include:

- The proportion of minority persons within the study area (50 percent) is 7 percent lower than the share for the City of Fife as a whole (57 percent) and 8 percent higher than the Sound Transit District as a whole (42 percent).
- The proportion of low-income persons within the study area (29 percent) is 3 percent higher than the share for the City of Fife as a whole (26 percent) and 9 percent higher than the Sound Transit District as a whole (20 percent).
- Households with limited English proficiency comprise 6 percent of all households in the Fife Segment, slightly more than the City of Fife as a whole (5 percent) and the same as the Sound Transit District as a whole (6 percent).

Tacoma Segment

The study area for the Tacoma Segment represents approximately 19,350 residents. On average, approximately 39 percent of all residents within the study area in the Tacoma Segment are reported as low income, and 51 percent are reported as minorities.

All of the alternatives in the Tacoma Segment share similar footprints such that the affected area for each of these alternatives is similar. The Tacoma 25th Street-East Alternative has a slightly lower low-income population and a slightly higher minority population than the other alternatives, but the difference is less than 1 percent. As shown in Table C3-1, key findings for the Tacoma Segment include:

- The study area in the Tacoma Segment includes the greatest proportion of low-income residents compared with the other TDLE Segments.
- The proportion of minority persons within the study area (51 percent) is 9 percent higher than the share for the City of Tacoma and the Sound Transit District as a whole (42 percent).
- The proportion of low-income (39 percent) populations living within the Tacoma Segment study area is 11 percent higher than the City of Tacoma as a whole (28 percent) and 19 percent higher than the Sound Transit District as a whole (20 percent).
- Households with limited English proficiency within the study area (4 percent) is the same as the City of Tacoma as a whole (4 percent) and 2 percent lower than the Sound Transit District as a whole (6 percent).

4.4.3 Environmental Impacts

This section outlines impacts on social resources, community cohesion, and safety and security within the study area.

4.4.3.1 No-Build Alternative

The No-Build Alternative also includes projects, funding packages, and proposals in the central Puget Sound region that are planned to occur with or without TDLE, as described in Chapter 2 (Section 2.2). Under the No-Build Alternative, existing social resources, community cohesion, and safety and security would not be impacted by the TDLE project. Communities in the study area would continue to develop according to local and regional plans, with the exception of plans that assumed light rail transit improvements and the associated economic benefits. Community cohesiveness would not be temporarily impacted by construction factors such as noise, vibration, or transportation disruptions, but these communities would also not receive long-term increased transit coverage, connectivity, potentially improved access to employment opportunities, and service frequency in the area.

4.4.3.2 Long-Term Impacts for the Build Alternatives

Impacts Common to All Alternatives

TDLE would positively impact communities in the study area by increasing transit reliability, connectivity, service frequency, and potential access to employment opportunities, especially those communities close to the proposed station areas. Areas surrounding proposed stations would most likely experience increased infill development, and the stations and trains would provide meeting points, thereby increasing opportunities for social activity and enhancing social cohesion. Added jobs associated with new development or connectivity between communities would increase community cohesion. Improvements to nonmotorized access in station areas would also be a positive impact to communities in the study area.

All alternatives include mostly elevated track configurations, which would not act as physical barriers to cross streets but would create visual impacts in areas close to the guideway, as well as at stations and other facilities. These visual impacts would include the introduction of the linear structure, blockage of views, and the removal of buildings and vegetation in the study area. Implementing noise mitigations, such as noise walls located at ground level, would also impact visual quality and aesthetics in the track area. Most visual impacts would occur along existing right-of-way that already creates a barrier between neighborhoods, along the elevated guideway. Visual impacts of TDLE are described in Section 4.5, Visual and Aesthetic Resources.

In general, operation of the new light rail facility would create a new source of noise and, in some cases, vibration for adjacent receivers but would not likely impact social resources, community cohesion, or safety and security. The severity of noise and vibration impacts depends upon existing background noise and other factors, such as topography. Sound Transit would provide mitigation for noise and vibration impacts where required. Potential noise and vibration impacts, along with potential mitigation measures, are discussed in Section 4.7, Noise and Vibration.

All alternatives would require acquisition of residential, commercial, and public properties, as well as transportation right-of-way. For all displaced properties, Sound Transit would provide relocation assistance to displaced property owners and renters in accordance with the federal Uniform

Relocation Act at a minimum. More information about applicable acquisition and relocation policies can be found in Section 4.1, Acquisitions, Displacements, and Relocations.

All the build alternatives would have similar impacts on safety and security. TDLE would operate in exclusive right-of-way and not conflict with vehicular, traffic, bicycles, and pedestrians. Light rail train operations would not cross surface streets at grade, and operations would not directly affect emergency and incident response routes or times. However, increases in traffic volumes, transit movements, pedestrians, and bicyclists near each station could increase the risk of traffic conflicts and conflicts between travel modes. All build alternatives include police and security staff facilities for monitoring of stations and parking facilities. Although an increase in crime at transit facilities is not anticipated, research shows that some petty crimes occur at transit stations or park-and-ride lots (Billings et al. 2011; City of Seattle 1999; Loukaitou-Sideris et al. 2002). Parking facilities at the stations in South Federal Way and Fife could be deferred up to 3 years after light rail service begins, which could delay any potential long-term impacts related to parking facilities. Additional information can be found in Section 4.14 Public Services, Safety, and Security.

The number of parcels with social resources that are potentially permanently affected or displaced are listed in Table 4.4-3.

Table 4.4-3 Parcels with Potential Permanent Effects and Displaced Social Resources

Alternative	Potentially Affected Social Resources
Federal Way Segment	
Preferred FW Enchanted Parkway	• Federal Way/S 320th Street Park-and-Ride • Belmor
Preferred FW Enchanted Parkway with Design Option	• Federal Way/S 320th Street Park-and-Ride • Belmor
South Federal Way Segment	
SF Enchanted Parkway	• Future King County Emergency Shelter (former Red Lion Inn) • Seattle Children's South Clinic
SF 99-West	• Future King County Emergency Shelter (former Red Lion Inn) • Seattle Children's South Clinic • Montessori Academy at Spring Valley • Giac Vien Temple
SF 99-West with Porter Way Design Option	• Future King County Emergency Shelter (former Red Lion Inn) • Seattle Children's South Clinic • Montessori Academy at Spring Valley • Giac Vien Temple
SF 99- East	• Future King County Emergency Shelter (former Red Lion Inn) • Seattle Children's South Clinic • Montessori Academy at Spring Valley • Giac Vien Temple
SF 99- East with Porter Way Design Option	• Future King County Emergency Shelter (former Red Lion Inn) • Seattle Children's South Clinic • Montessori Academy at Spring Valley • Giac Vien Temple

Table 4.4-3 Parcels with Potential Permanent Affects and Displaced Social Resources (continued)

Alternative	Potentially Affected Social Resources
Fife Segment	
Fife Pacific Highway	• Puyallup Tribal Integrative Medical Building • Serenity Counseling Services • Telecare (a behavioral health facility) • Fife License and Title • St. Paul Chong Hasang Church
Fife Pacific Highway with 54th Avenue Design Option	• Puyallup Tribal Integrative Medical Building • Serenity Counseling Services • Telecare (a behavioral health facility) • Fife License and Title • St. Paul Chong Hasang Church
Fife Pacific Highway with 54th Span Design Option	• New Horizon Christian Center • Puyallup Tribal Integrative Medical Building • Serenity Counseling Services • Telecare (a behavioral health facility) • Fife License and Title • St. Paul Chong Hasang Church
Fife Median	• Puyallup Tribal Integrative Medical Building • Serenity Counseling Services • Telecare (a behavioral health facility) • Fife License and Title • St. Paul Chong Hasang Church
Fife Median with 54th Avenue Design Option	• Puyallup Tribal Integrative Medical Building • Serenity Counseling Services • Telecare (a behavioral health facility) • Fife License and Title • St. Paul Chong Hasang Church
Fife Median with 54th Span Design Option	• New Horizon Christian Center • Puyallup Tribal Integrative Medical Building • Serenity Counseling Services • Telecare (a behavioral health facility) • Fife License and Title • St. Paul Chong Hasang Church
Fife I-5	• Fife Business Center parcel, which includes the New Community Church • Serenity Counseling Services • Telecare (a behavioral health facility) • Pierce County Housing Authority's Chateau Rainier (no displacements) • St. Paul Chong Hasang Church
Fife I-5 with 54th Avenue Design Option	• Puyallup Tribal Integrative Medical Building • Serenity Counseling Services • Telecare (a behavioral health facility) • Fife License and Title • St. Paul Chong Hasang Church

Table 4.4-3 Parcels with Potential Permanent Affects and Displaced Social Resources (continued)

Alternative	Potentially Affected Social Resources
Fife I-5 with 54th Span Design Option	• New Horizon Christian Center • Puyallup Tribal Integrative Medical Building • Serenity Counseling Services • Telecare (a behavioral health facility) • Fife License and Title • St. Paul Chong Hasang Church
Tacoma Segment	
Preferred Tacoma 25th Street-West	• Tacoma Soccer Center • South Sound Martial Arts
Tacoma 25th Street-East	• Tacoma Soccer Center • South Sound Martial Arts
Tacoma Close to Sounder	• Tacoma Soccer Center • South Sound Martial Arts • Freighthouse Square[1]
Tacoma 26th Street	• Tacoma Soccer Center • South Sound Martial Arts

Notes:
(1) Freighthouse Square contains a high proportion of minority owned businesses and serves as a community gathering place.

If TDLE is constructed in phases, the M.O.S. to the station in South Federal Way and the M.O.S. to the station in Fife would have the same type of impacts and benefits to social resources, community facilities, and neighborhoods, just in a smaller geographic area until the remaining phases were completed. Benefits to the communities in the study area, such as increasing transit reliability, connectivity, service frequency, and potential access to employment opportunities, especially those communities close to the proposed station areas, would only be realized to the station where the M.O.S. terminates.

In addition to long-term impacts common to all alternatives throughout all four segments of TDLE, the specific impacts to social resources and community cohesion within each segment are described below.

Federal Way Segment

Up to two social resources could be affected by the Preferred FW Enchanted Parkway Alternative or the FW Design Option, as noted in Table 4.4-3. Based on the residential housing types and patterns, automobile-oriented nature of development, and barriers created by I-5 and other major arterials, community cohesion is already limited in this segment and not anticipated to be diminished by TDLE.

South Federal Way Segment

The SF Enchanted Parkway, SF 99-West, and SF 99-East alternatives would each have more impacts on social resources and community cohesion than the SF I-5 Alternative. For the SF Enchanted Parkway, SF 99-West, and SF 99-East alternatives, guideway columns may be constructed on the Seattle Children's South Clinic parcel, but long-term impacts through displacement are not anticipated. Although not defined as a social resource, the displacement of some units at CrossPointe Apartments just south of the SF Enchanted Parkway Station would

also impact community cohesion and neighborhood quality within this multi-family housing complex. The SF Enchanted Parkway would displace the future King County Emergency Shelter (former Red Lion Inn) building purchased by King County in 2021. This building is transitioning to an 84-bed emergency shelter. The opening date for the emergency shelter has not been established. The SF 99-West and SF 99-East alternatives would require the acquisition of the northwest corner of the property that is currently a parking lot, but would not displace the entire building. Community cohesion and neighborhood quality in the surrounding neighborhoods would not be largely impacted as cohesion is already limited, and the addition of light rail would be consistent with the existing transportation character of this segment.

The SF I-5 Alternative would have similar effects on social resources as the SF Enchanted Parkway Alternative, except that it would avoid the parcels containing the Seattle Children's South Clinic and the future King County Emergency Shelter. As with the SF Enchanted Parkway Alternative, impacts on community cohesion and neighborhood quality may occur near the CrossPointe Apartments but not in the surrounding neighborhoods where cohesion is already limited.

Fife Segment

All of the alternatives in the Fife Segment would impact several social resources, as described in Table 4.4-3. All alternatives would displace one of the two priest residences at the St. Paul Chong Hasang Church. The second residence could remain in use, but the displaced residence would need to be mitigated in accordance with the federal Uniform Relocation Act, which involves both compensation and relocation assistance. However, relocation of the rectory in proximity of the church may be challenging based on real estate available in close proximity to the church. The loss of proximity of the priest to the church would likely disrupt the community cohesion of the facilities present on site and may affect how the congregation and Korean populations use the church facilities. Noise impacts at the St. Paul Chong Hasang Church property would be mitigated in accordance with Sound Transit's Light Rail Noise Mitigation Policy. The 54th Avenue Span Station Option would also likely displace the New Horizon Christian Center.

For all alternatives, the addition of light rail would be consistent with the existing transportation character of this segment and would not substantially change neighborhood quality. In some locations, the addition of an aerial guideway would change the visual character of Pacific Highway; however, there is no anticipated impact on community cohesion, as it is already very low in this segment.

The Fife Pacific Highway Alternative would have similar impacts on social resources as the Fife Median Alternative and fewer impacts than the Fife I-5 Alternative. The Fife Pacific Highway and Fife Median alternatives would both require the same parcel acquisitions and impact the same social resources, but the Fife Median Alternative could potentially make left turns more difficult for drivers on Pacific Highway. There is no anticipated impact to community cohesion because it is already very low in this segment.

Due to the larger number of potential small business displacements, the Fife I-5 Alternative would have the most impacts of the Fife alternatives.

Tacoma Segment

All alternatives in the Tacoma Segment would impact social resources. The impact to the displaced social resources could be mitigated with relocation and further minimized if the relocation could be nearby. The Preferred Tacoma 25th Street-West Alternative would feature large, elevated structures, which would change the visual character of the street, but this change of character would have a minimal impact on community cohesion since the businesses in this area of E 25th Street are largely industrial and commercial and do not rely on foot traffic or street amenities. The proposed station would positively change community cohesion by providing a regional transportation hub and by incorporating more human-scale streetscape elements around the station. Neighborhood quality would not be largely impacted because the addition of light rail would be consistent with the existing transportation character of this segment. Overall, the Preferred Tacoma 25th Street-West Alternative would have the fewest impacts of the Tacoma alternatives.

Impacts to social resources, community cohesiveness, and neighborhood quality for the Tacoma 25th Street-East Alternative would be the same as described for the Preferred Tacoma 25th Street-West Alternative.

The Tacoma Close to Sounder Alternative would impact thirty-one businesses, primarily local, and their employees would be displaced by the acquisition of Freighthouse Square, which would impact community cohesion of the area. These businesses and those at Freighthouse Square cater largely to the residents of Tacoma and the South Sound, as well as transit center users, Amtrak riders, and those in the area for Tacoma Dome and LeMay Museum events. Based on Sound Transit's outreach, a high proportion of business owners at Freighthouse Square are minority-owned, and successful relocation opportunities may be challenging. Changes to Freighthouse Square, a long-standing community landmark, and the addition of a new aerial guideway and transit station would change the visual character and function of the area. Overall, the Tacoma Close to Sounder Alternative would have fewer property acquisitions in comparison to the other Tacoma Dome build alternatives, but it would have the highest community impacts to cohesiveness and neighborhood quality due to the potential removal of Freighthouse Square, which would displace all the existing retail uses.

The Tacoma 26th Street Alternative would impact the same social resources as the Preferred Tacoma 25th Street-West Alternative.

Potential Benefits

TDLE would increase access to social resources near each of the proposed stations. It could also contribute to the development of additional social resources in those areas and could increase opportunities for social interaction at station areas and for TDLE passengers. TDLE would improve regional connectivity and mobility and provide a reliable means of transportation for populations reliant on public transit, including low-income and minority populations.

While all populations within the project service area would have the same opportunity to realize these benefits, minority and low-income residents may realize greater benefits because they are more likely to rely on transit as a primary and affordable means of transportation. Additional benefits to all populations, including environmental justice populations, would accrue through the addition of new jobs to build the project and the increased purchase and sale of goods and services within the community to facilitate construction. The positive economic effects of construction workers' purchases in food and retail within the community may also benefit businesses that are owned by environmental justice populations.

4.4.3.3 Construction Impacts for the Build Alternatives

Impacts Common to All Alternatives

Construction of a major project such as TDLE involves intensive activities that last several years. Where the project is in close proximity to community resources and neighborhoods, construction activities could impact community activities, cohesion, and neighborhood quality. All of the alternatives in all segments would, to some extent, have temporary construction impacts. Examples of construction activity that could impact community resources and neighborhoods include:

- Property acquisition, displacement, and relocation.
- Building vacation, fencing, and demolition.
- Utility relocation.
- Vegetation removal.
- Grading.

In addition to the development of the light rail facilities themselves on individual sites, there are staging areas; temporary storage for building materials or construction debris; temporary fencing; lighting; gravel piles; large vehicles, such as cranes, dump trucks, bulldozers, or excavators; temporary roads for construction use; and/or detours of traffic lanes and sidewalks. These construction materials and activities would have varying impacts on transportation, access, air quality, noise, vibration, and visual quality.

Although construction of the entire project would take approximately 5 years, impacts on specific neighborhoods and social resources would occur over shorter durations while specific project elements are built. The construction of parking facilities at the stations in South Federal Way and Fife, which could occur up to 6 years after light rail service begins, could shift the timing of potential construction impacts related to those facilities.

Some build alternatives would require temporary construction easements, the details of which will be determined in final design, but generally temporary construction easements would allow construction crews to access areas of the property as a part of the construction process with no permanent impacts on the property.

Implementation of any of the build alternatives would temporarily affect the roadways in the study area and vicinity, resulting in short-term impacts on all public services, access to social resources, community facilities, and neighborhoods. Construction activities would result in short-term increased traffic congestion due to added construction vehicles. Lane or road closures and detours would be needed for activities such as utility relocations and guideway placement.

Federal Way Segment

No temporary construction easements would be required on any parcels identified as containing social resources within the Federal Way Segment. However, there are several areas with residential uses and social resources nearby, and in these locations, construction activities would be disruptive to social resources.

South Federal Way Segment

Overall, the SF Enchanted Parkway and SF I-5 alternative may have slightly less temporary construction impact on social resources within the South Federal Way Segment, since those alternatives would avoid the Montessori Academy at Spring Valley and have fewer temporary lane closures and access restrictions than the SF 99-West or SF 99-East alternatives.

The SF 99-West and SF 99-East alternatives would require a temporary construction easement over a portion of the property where the Montessori Academy at Spring Valley is located, whereas the SF Enchanted Parkway and SF I-5 alternatives would not require any temporary construction easements. For all alternatives, there are several areas with residential uses and social resources nearby. In these locations, construction activities would be disruptive to social resources. In addition, all of the alternatives in the South Federal Way Segment would require temporary lane closures and are anticipated to have short-term access impacts on social resources, with the impacts of the SF 99-East and SF 99-West alternatives being greater than the alternatives along I-5.

Fife Segment

Overall, the Fife Median Alternative, with or without the 54th Avenue or 54th Span Design Option, would have the greatest temporary construction impacts to social resources as it would have the most temporary construction impacts on parcels with social resources, restrictions on access through limitations on left turns from Pacific Highway, as well as the most lane closures.

The Fife Pacific Highway Alternative would require a temporary construction easement on four parcels associated with the St. Paul Hasang Church, Puyallup Tribal Integrative Medicine, a City of Fife government services building, and the Occupational Medical Clinic of Fife. The Fife 54th Avenue Design Option and Fife 54th Span Design Option would not impact any additional social resources. For all alternatives, there are several areas with residential uses and social resources nearby. In these locations, construction activities would be disruptive to social resources. These areas include Rainier View Senior Apartments, Serenity Counseling Services, and the Chateau Rainier Apartments. It is expected that these properties would experience short-term air quality, noise and vibration, and visual impacts. Noise and vibration associated with construction activities could be particularly disruptive to the St. Paul Hasang Church and Puyallup Tribal Integrative Medicine Center.

Additionally, one lane of traffic will be closed during construction on Pacific Highway, which would impact traffic patterns and business access to social resources along Pacific Highway, leading to short-term impacts on community cohesion. Access points to properties on the south side of Pacific Highway would be reconstructed where necessary, and alternate access points would be provided.

Impacts on social resources due to temporary construction easements and proximity to construction activities for the Fife Median Alternative would be the same as the Fife Pacific Highway Alternative. Additionally, three lanes of traffic, including the median turn lane, would be closed during the construction of the Fife Median Alternative. These lane closures would impact traffic patterns, and left turns would be restricted in construction zones, restricting access to properties containing social resources along Pacific Highway and reducing social cohesion.

Impacts on social resources due to temporary construction easements and proximity to construction activities for the Fife I-5 Alternative would be similar to the Fife Pacific Highway Alternative, except no temporary construction easements would be required at the City of Fife government services building and the Occupational Medical Clinic of Fife.

Tacoma Segment

All of the alternatives in the Tacoma Segment would affect social resources to similar degrees. The Preferred Tacoma 25th Street-West Alternative and Tacoma 25th Street-East Alternative would require full closure of E 25th Street, which would impact Freighthouse Square access. The Close to Sounder Alternative would avoid full closure of E 25th Street but would displace Freighthouse Square and require temporary relocation of the Tacoma Dome Station. The Tacoma 26th Street Alternative would avoid impacts to E 25th Street and Freighthouse Square but would require full closure of E 26th Street and would have temporary effects the Tacoma Dome.

Short-term disruptions to interactions between the commercial uses and patrons in the Tacoma Segment would occur under all alternatives. The businesses located in proximity to the alternatives that rely on attracting customers that are passing by while accessing the transit center, Tacoma Dome, and other attractions, would be impacted by very localized factors, such as reduced business visibility, ease of access to the specific site, parking, and pedestrian accessibility due to construction activities.

The Preferred Tacoma 25th Street-West Alternative would require the complete closure of E 25th Street from East M Street to East D Street during construction, which will limit mobility and access and could have short-term impacts on social cohesion. One social resource, Freighthouse Square, would be impacted by a temporary construction easement and would be likely to experience short-term air quality, noise and vibration, and visual impacts. In addition, access to Freighthouse Square would be limited during construction.

Similar to the Preferred Tacoma 25th Street-West Alternative, the Tacoma 25th Street-East Alternative would require the complete closure of E 25th Street from East M Street to East D Street during construction. Both the Preferred Tacoma 25th Street-West Alternative and the Tacoma 25th Street-East Alternative would disrupt operations and could require temporary closure of the T Line during construction.

The Tacoma Close to Sounder Alternative would have some impacts on access and traffic through lane closures, but no full road closures are anticipated. It is possible that the Tacoma Dome Station, which serves Amtrak and Sounder, may be temporarily closed and/or relocated, which would impact Tacoma's transportation facilities. Businesses in Freighthouse Square would be closed or relocated with this alternative.

The Tacoma 26th Street Alternative would require the complete closure of E 26th Street between East G Street and East C Street during construction, which would limit mobility and access and could have short-term impacts on social cohesion. Additionally, the Tacoma 26th Street Alternative would require a temporary construction easement on one parcel associated with the Tacoma Dome property. This temporary easement may impact transportation to and from the Tacoma Dome, and there may be impacts on social activities occurring in or around the Tacoma Dome throughout construction of TDLE.

Avoidance and Minimization of Impacts

As part of TDLE, specific design features, best management practices (BMPs), and mitigation measures would avoid or minimize impacts on social resources, community facilities, and neighborhoods during operations and construction. These project elements are described in other sections of this Draft EIS, including Chapter 3, Transportation; Section 4.1, Acquisitions, Displacements, and Relocations; Section 4.2, Land Use; Section 4.3, Economics; Section 4.5,

Visual and Aesthetic Resource; Section 4.6, Air Quality and Greenhouse Gas Emissions; Section 4.9, Noise and Vibration; and Section 4.17; Parks and Recreational Resources.

In addition, Sound Transit would work with the Puyallup Tribe of Indians and communities to minimize impacts by designing the stations to be consistent with community character. This work could occur through public workshops to discuss station design, or similar processes during advanced phases of project design.

4.4.3.4 Indirect Impacts

The TDLE build alternatives would most likely have indirect impacts on their respective study areas, notably changes in development patterns, such as transit-oriented development and infill development, especially near station areas.

The Economic Development element of the Fife Comprehensive Plan mentions the extension of the Link light rail line as an opportunity to implement TOD around station areas. The Housing Element in the City of Tacoma One Tacoma Plan and South Downtown Subarea Plan has multiple goals and policies that specifically mention the need to build “transit supportive” density and diverse housing types around major transit stations. Generally, TOD incorporates more density of housing and amenities, more diversity of land uses, more comprehensive urban design, and a short distance to transit facilities. These principles all contribute to more individual mobility for all citizens of the community, more accessibility to different community amenities, improved community cohesion, and a more livable community.

Sections 4.2 and 4.3 also identify indirect impacts from affected parcels and displacements, land use changes, economics, and development potential consistent with local and regional policies and plans.

4.4.4 Environmental Justice Summary

This Draft EIS also includes an Environmental Justice Assessment (Appendix C), as required by Executive Orders (EOs) 12898 and 14096 and Department of Transportation Order 5610.2C, which direct federal agencies to advance environmental justice to the greatest extent practicable and permitted by law by avoiding disproportionate and adverse effects on minority and low-income populations, defined below:

- Minority populations include people who are Black, Hispanic, Asian American, American Indian or Alaskan Native, or Native Hawaiian and Other Pacific Islander (United States Department of Transportation [U.S. DOT] Order 5610.2C, Appendix § 1(c)).
- Low-income populations include people whose median household income is less than or equal to two times the Federal Poverty Level — a local threshold that Sound Transit and other regional transit agencies have determined is appropriate for use in determining eligibility for reduced fare programs and reflects the increasingly high cost of living in the region.

Demographic information, including environmental populations, for the TDLE study area, surrounding jurisdictions, and Sound Transit District are included in Table 4.4-1, Study Area Demographics.

The Environmental Justice Assessment follows guidance in FTA Circular C-4703.1 Chapter II, Conducting Environmental Justice Analysis, to identify, analyze, and address whether the TDLE alternatives would result in disproportionate and adverse effects on minority and/or low-income populations. As described in Section 2, Methods and Approach, of the Environmental Justice Analysis, the analysis provides demographic data identifying where environmental justice populations are located, compares the percentage of low-income and minority populations in the

study area to the Sound Transit service district average, describes the meaningful public engagement for TDLE, and identifies potential adverse effects, offsetting benefits, and mitigation for the project. It then considers whether the project would result in a disproportionate and adverse effect to minority or low-income populations.

4.4.4.1 Project Impacts and Benefits

Project impacts with the most potential to affect environmental justice populations include the displacement of residents, businesses, and community facilities, visual impacts, and construction-related transportation impacts. Chapter 3, Transportation; Section 4.1, Acquisitions, Displacements, and Relocations; Section 4.2, Land Use; Section 4.3, Economics; and Section 4.5, Visual and Aesthetics provide additional information about potential impacts of the TDLE alternatives. See Appendix C, Environmental Justice, Assessment, for a more detailed discussion of impacts to environmental justice populations and proposed avoidance, minimization, and mitigation measures.

In the South Federal Way Segment, more businesses would be displaced by the alternatives along Pacific Highway, but the most residential displacements would occur with the SF Enchanted Parkway Alternative. The residential displacements associated with the SF 99-West Alternative (with or without the Porter Way Design Option) would be primarily in two adjacent mobile home and RV communities along the west side of Pacific Highway. In the Fife Segment, the Fife Pacific Highway Alternative would displace the most businesses. All of the build alternatives in Fife would be located close to some residences and would result in some visual change, as well as displace the priest's residence associated with St. Paul Chong Hasang Church. The Fife 54th Span Station Option would have greater construction impacts, requiring more frequent and extensive temporary closures of 54th Avenue E. In Tacoma, the Tacoma Close to Sounder Alternative would displace the most businesses, including those located within Freighthouse Square, and all of the alternatives would result in medium to high reduction in visual quality due to the introduction of the guideway and station. For all build alternatives in all segments, periodic weekend closures, nighttime closures, lane restrictions, and other changes to access would occur during construction throughout the TDLE corridor.

The introduction of light rail service from Federal Way to Tacoma offers improved access to transit and employment, transit travel time savings, and increased reliability, connectivity, and frequency. While all populations within the project's service area would realize these benefits to the same extent, they would accrue to a higher degree for minority and low-income populations (APTA 2007).

The cities of Federal Way and Fife would each benefit from a new light rail station with connections to Tacoma, Sea-Tac Airport, and Seattle. This would provide the area with a potential community hub. These improved regional connections would result in improved access to economic and employment opportunities for environmental justice communities living in the area.

The City of Tacoma would benefit from two new stations at Portland Avenue and near the Tacoma Dome. The station near the Tacoma Dome would serve as a multimodal transit hub, with transfer options to and from Sounder commuter rail service, Amtrak passenger rail service, Greyhound, T Line, and Pierce Transit and Sound Transit buses. Areas surrounding proposed stations could include increased infill development, which would be a positive impact in a community with a somewhat sprawled and disconnected development pattern. TDLE could also improve access to minority-owned businesses near these station locations.

Other social benefits resulting from TDLE include improved connectivity to social services, health services, parks, and recreation in the region. TDLE would also reduce GHG emissions, as discussed further in Section 4.6, Air and Greenhouse Gas Emissions.

Construction benefits would include new jobs to build the project and the direct purchase and sale of goods and services within the community to facilitate construction. Sound Transit has programs in place that focus on providing opportunities for minority or low-income populations, such as Project Labor Agreements and the Disadvantage Business Enterprise program. Project Labor Agreements promote a commitment to labor stability and a local workforce, apprenticeship and employment goals for people of color and women, and nondiscrimination and fairness in employment for both union and nonunion contractors and craft workers. Project Labor Agreements require that 20 percent of all hours be set aside for persons of color. The Disadvantage Business Enterprise program requires that 18.2 percent of all construction and architecture/engineering consultant dollars be set aside for small businesses that are at least 51 percent owned by individuals who are socially and economically disadvantaged. New jobs associated with TDLE itself or new development or connectivity between communities could yield a benefit to environmental justice communities.

4.4.4.2 Community Engagement

Sound Transit's community engagement procedures, EO 12898 and EO 14096, U.S. DOT Order 5610.2C, and FTA Circular C 4703.1 require Sound Transit to provide meaningful opportunities for minority, low-income, and limited English proficiency groups to engage in the planning process.

As part of its public engagement efforts, Sound Transit conducted a preliminary demographic analysis to identify low-income, minority, and limited English proficiency populations. Based on this analysis, Sound Transit used specific strategies to reach those communities during public outreach. As the project moves forward, Sound Transit will continue to engage community leaders, jurisdictions, and social service providers to seek input, assess outreach methods, and identify additional ways to reach low-income, minority, and limited-English-proficiency populations.

4.4.4.3 Preliminary Environmental Justice Determination

After consideration of the totality of circumstances, including mitigation, offsetting direct and indirect benefits, and impacts, FTA has preliminarily determined that the project would not result in disproportionate and adverse effects on environmental justice populations as defined in EO 12898, EO 14096, and U.S. DOT Order 5610.2C.

4.4.5 Potential Mitigation Measures

Mitigation measures described in Chapter 3 Transportation; Section 4.1, Acquisitions, Displacements, and Relocations; Section 4.3, Economics; Section 4.5, Visual and Aesthetics; and Section 4.7, Noise and Vibration would address potential impacts to environmental justice population, social resources, community facilities, and neighborhoods. No additional mitigation measures would be anticipated.

4.5 Visual and Aesthetic Resources

4.5.1 Introduction to Resource and Regulatory Requirements

This section analyzes the potential changes to visual quality and potential effects on views and sensitive viewers in the area surrounding TDLE. Visual and aesthetic resources can be natural features, such as hills and mountains, waterbodies, trees, or entire landscapes, such as a valley ringed by hills, but they can also include built features, such as parks, bridges, buildings, residential neighborhoods, or a city skyline.

Sound Transit adapted FHWA and WSDOT guidelines to conduct visual analysis (FHWA 1988, 2015; WSDOT 2019). The FHWA guidelines provide a generally accepted methodology for preparing visual assessments for linear transportation projects and are appropriate for use on this project to meet federal requirements. Local planning documents, ordinances, and codes were also reviewed to identify important visual resources and to determine whether local jurisdictions have established protections for visual resources, such as protected view corridors and/or viewpoints. None of the documents reviewed identified protected views from specific locations, or areas such as roadways or view corridors that would be applicable to the TDLE build alternatives. WSDOT has not designated the portions of I-5, SR 99, or SR 18 within the study area as scenic or recreational highways.

In addition, Sound Transit considered Resource Conservation Areas (formerly called "Beautification Areas") along the I-5 right-of-way. These areas were originally acquired under the Highway Beautification Act of 1965 by FHWA and WSDOT for the "restoration, preservation and enhancement of scenic beauty adjacent to the highway," and are discussed further in Section 4.5.2, Affected Environment.

The extent of potential impacts on the visual environment are evaluated according to FHWA guidelines in terms of the level of change perceived by viewers to the visual character and quality of the environment and the sensitivity of those viewers to the change. Images of some existing views and visual simulations are included in this section to illustrate the visual character being described and the impact on visual quality and character.

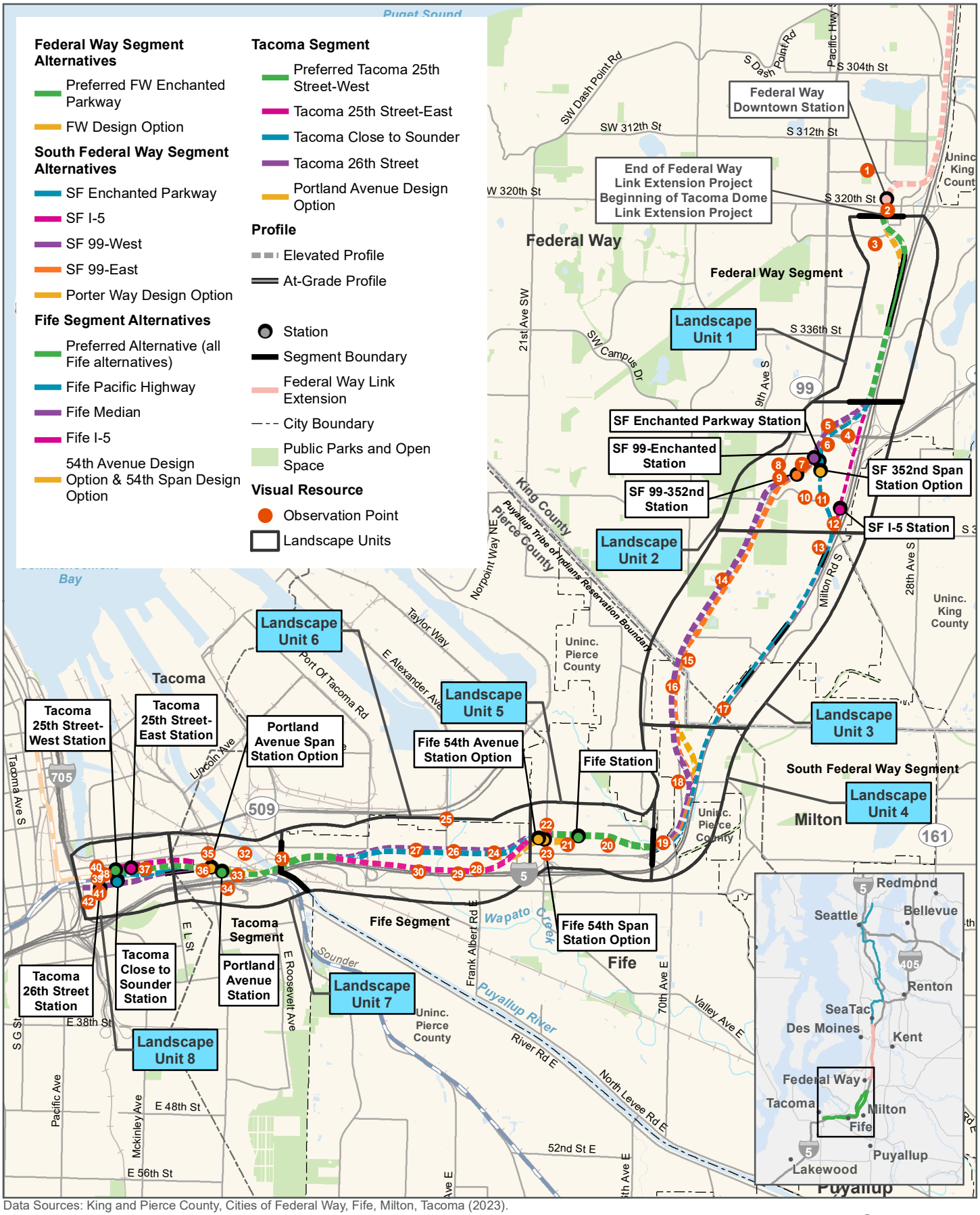
Additional information on the resources and the analysis as well as images of existing views with simulations of proposed alternatives are provided in Appendix J2, Visual Assessment Background and Simulation Analysis.

4.5.2 Affected Environment

4.5.2.1 Overview of Visual Resource Considerations

The study area for the visual and aesthetic resources analysis is defined in terms of landscape units within the TDLE corridor. The landscape units represent distinct landscapes along the project corridor and include the travel lanes of I-5. They encompass viewsheds on either side of the project corridor. The landscape units are shown on Figure 4.5-1.

A landscape unit may include several areas that are visible from a specific location and several types of landscapes, such as neighborhoods, undeveloped areas, transportation facilities or other major features. Depending on site distance allowed by topography and the layout of neighborhoods, streets, bridges, or tree cover, viewsheds are up to 2 miles long and are up to 0.5 mile from the guideway centerline of the alternatives. In densely developed areas, evaluations within viewsheds generally focus on areas that are within the foreground viewing distance (approximately 200 to 500 feet).



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

FIGURE 4.5-1
Landscape Unit Overview

N

0 1 2 Miles

Tacoma Dome Link Extension

The visual environment for each landscape unit is based on the visual character and visual quality for each landscape unit, and how typical viewers may respond to what they see around them. Specific views of the Olympic Mountains and Puget Sound, the Cascade Mountains and Mount Rainier, the Puyallup River and Thea Foss Waterway were identified as important features to the communities along the corridor, based on site visits and conversations with stakeholders and staff from affected cities.

Each landscape unit was evaluated for locations with concentrations of viewers who would be sensitive to visual changes in their surroundings and would experience impacts to visual quality from TDLE. Such concentrations were found in the South Federal Way Segment and the Fife Segment.

Visual conditions in the TDLE corridor were analyzed at select locations and primary directions from which viewers have greater potential to see changes resulting from the build alternatives. Using photos of the existing conditions taken from these selected observation point locations, visual simulations were developed to show the potential visual change to the existing visual environment.

The existing visual environment is described here in three ways:

Visual character refers to identifiable and memorable visual information, including environmental features and natural or cultural visual elements of scale, form, or material. Observations like historic, urban, rural, or agricultural are referring to visual character.

Visual quality refers to the evaluation of the visual experience to the public and is described in terms of vividness, intactness, and unity. Vividness refers to the way landscape components combine in distinctive and memorable visual patterns. Intactness refers to whether the natural and human-built visual patterns form a consistent landscape or whether highly contrasting features intrude into the view. Unity refers to the visual coherence and compositional harmony of the landscape considered as a whole. Each of the landscape units were assigned different levels of visual quality:

- High visual quality describes views with vivid, memorable, distinctive features in a landscape with compositional harmony or where elements of the landscape fit together in a visual pattern that is free from encroaching elements.
- Medium visual quality describes views with a unity or compositional harmony between elements of the landscape that produce a pleasing overall impression in which encroaching elements are minor and do not substantially alter the perception of the landscape as a unit. These views may lack vivid or memorable features.
- Low visual quality describes views that lack a dominant visual character in which there is a low level of fit between disparate elements. In some cases, these views appear disorganized with features that seem out of place or are views with some compositional harmony but include eyesore elements that can dominate one's perception. In developed areas, there is typically minimal landscaping or other aesthetic features.

Viewer response reflects viewer exposure and viewer sensitivity. Viewer exposure refers to where viewers are, how many viewers there are, and how long they are typically there. Viewer sensitivity refers to how viewers perceive the environment and what they find important. Viewer sensitivity can be affected by what the viewer is doing, the visual context, and the values, expectations, and interests of the viewer.

Viewer sensitivity has been rated as high, average, or low for the potential viewer groups within the landscape units. High sensitivity represents viewers who highly value a particular view. Low sensitivity represents viewers who do not regard the visual setting as important to their activities. For example, residential viewers are typically rated as having moderate to high sensitivity. Motorists driving for pleasure, persons biking or walking for pleasure, or tourists visiting an area to enjoy scenic features have a high awareness of features and high to moderate sensitivity. Individuals engaged in recreation activities in parks or on trails also have a high awareness and sensitivity to the surroundings. An average sensitivity rating reflects the experience of people who view the visual context as a secondary feature of other activities. For example, these could be persons at work or shopping who may value a pleasant environment but are not at a location for the specific purpose of enjoying the scenery. Motorists and vehicle occupants passing through an area are less sensitive to the visual context because they are focusing on features other than the surrounding landscape and generally have average to low sensitivity. Low viewer sensitivity generally describes the experience of persons engaged in activities that render the quality of their surroundings as irrelevant or incidental. Those with low viewer sensitivity could be nonresidents, workers traveling through or working in an area, or viewers from nearby commercial or industrial land uses.

Additionally, Resource Conservation Areas owned and maintained by WSDOT are noted in the study area characteristics and environmental impact sections below. These are specific buffer areas beyond interstate rights-of-way that are not required for operation of the interstate and that may contain mature native vegetation. Figure 4.5-1, Landscape Unit Overview, shows landscape units, where impact locations would occur for sensitive viewers, and locations of observation points.

4.5.2.2 Study Area Characteristics

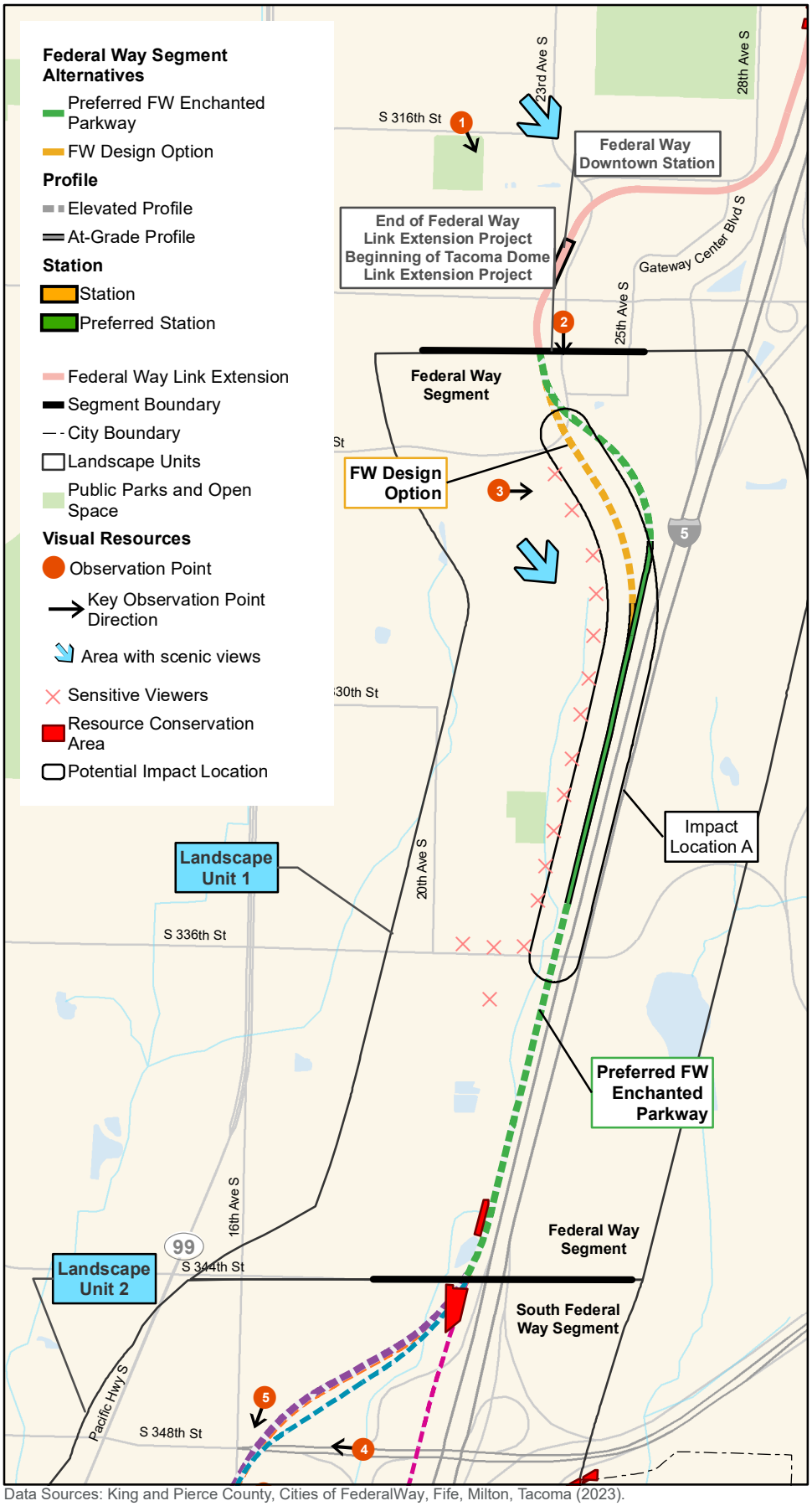
Federal Way Segment

Figure 4.5-2 shows the one landscape unit in the Federal Way Segment, the observation points, and the build alternative alignments. The landscape unit boundary is drawn to encompass the mainly residential area of Landscape Unit 1.

Landscape Unit 1, Federal Way Downtown Station to S 344th Street

The northern portion of Landscape Unit 1 extends north of the FWLE terminus and includes the Federal Way downtown area, the Federal Way Performing Arts Center, The Commons at Federal Way, the Federal Way Downtown Station, and the central business district. A visually prominent transmission line structure crosses over the landscape unit at S 324th Street. The central portion includes Belmor, a residential mobile home community that includes a nine-hole 3-par golf course and club house with community space, pool, and offices. A residential neighborhood is located west of I-5 and south of Belmor. The southernmost portion of this area is the I-5 corridor and features the Christian Faith Center campus. The I-5 viewshed is bordered by roadside forested swaths along with the open spaces of the transmission line corridor and the former Weyerhaeuser campus. Typical vegetation types in the landscape unit include mature coniferous and deciduous trees, native shrub understory, street trees and median landscaping, and other planted landscape elements. Also in the southern portion of this area is a Resource Conservation Area adjacent to I-5 just north of South 344th Street. The northern area is 0.3 acres and is covered with areas of Himalayan blackberry and native deciduous and coniferous trees. Viewers with high sensitivity are residents in Belmor and residents neighboring I-5 south to S 336th Street.

The mix of residential, commercial, and highway corridor elements gives the landscape unit area a medium visual quality.



Observation Point 1:
Looking south from the Federal Way Performing Arts and Events Center

Observation Point 3:
Looking east from a street in Belmor Park

Data Sources: King and Pierce County, Cities of FederalWay, Fife, Milton, Tacoma (2023).

N

0 0.5 1 Mile

FIGURE 4.5-2
Landscape Units and Observation Points
Federal Way Segment
Tacoma Dome Link Extension

Currently, relatively unobstructed views of Mount Rainier can be seen from the Federal Way Downtown Park and Performing Arts Center and Belmor. Other potential viewers include patrons and employees of the businesses and places of worship in the area (low to average sensitivity), pedestrians and cyclists (average to high sensitivity), and drivers on local roads and I-5 (average sensitivity, higher for sightseeing travelers). The residential areas have medium visual quality and are buffered from the freeway by mature vegetation and coniferous trees, noise walls, topography, and distance.

South Federal Way Segment

Figure 4.5-3 shows the three landscape units in the South Federal Way Segment, the observation points, and the build alternative alignments and stations. The landscape unit boundaries are drawn to distinguish between the commercial character of Landscape Unit 2, the more rural character of Landscape Unit 3, and the increasingly commercial, industrial, and transportation-oriented character of Landscape Unit 4. The South Federal Way Segment has several WSDOT Resource Conservation Areas that are near the TDLE build alternatives.

Landscape Unit 2, S 344th Street to S 360th Street

Landscape Unit 2 encompasses a portion of the I-5 corridor, including both the SR 18 interchange and the SR161/I-5 overcrossing and off-ramp as well as the area to the west of I-5 in the vicinity of Enchanted Parkway. The I-5 corridor occupies the eastern portion of the landscape unit with 10 traffic lanes and multiple flyovers and ramps. Coniferous and deciduous trees line I-5 and buffer views from neighborhoods to the east. A mix of mostly deciduous trees partially buffer views of commercial buildings to the west, except for the area in front of Jet Chevrolet. The visual character of the west side of Landscape Unit 2 is generally influenced by commercial development and urban uses with a wide variety of building sizes and character, which tends to reduce visual unity. Elements of the streetscapes with setback businesses, sidewalks with landscaping, and street trees provide some compositional harmony through a similar street-level character over most of the area. The scenic Mount Rainier can be viewed from Enchanted Parkway and other open locations. Residents in communities south of S 356th Street, west of I-5 are likely to be more sensitive to and aware of potential visual changes due to their high exposure to project alternatives. Other viewers in this landscape unit include patrons and employees of the various businesses in the area (low sensitivity); drivers on I-5 (low to average sensitivity, higher for sightseeing travelers); and drivers, pedestrians, and cyclists on Enchanted Parkway/SR 161 and local streets (average sensitivity).

Several Resource Conservation Areas exist in Landscape Unit 2: two northwest of the I-5/SR 18 interchange and a cluster southeast of the interchange. The northern area is 0.32 acres and is covered with deciduous and coniferous trees; the second area, just to the south, is 1.01 acres and is largely covered with Himalayan blackberry and just a few trees.

The diverse mix of residential, commercial, and industrial elements gives the area a medium visual quality.

South Federal Way Segment Alternatives

- SF Enchanted Parkway
- SF I-5
- SF 99-West
- SF 99-East
- Porter Way Design Option

Profile

- Elevated Profile
- At-Grade Profile

Station

- Station
- Preferred Station

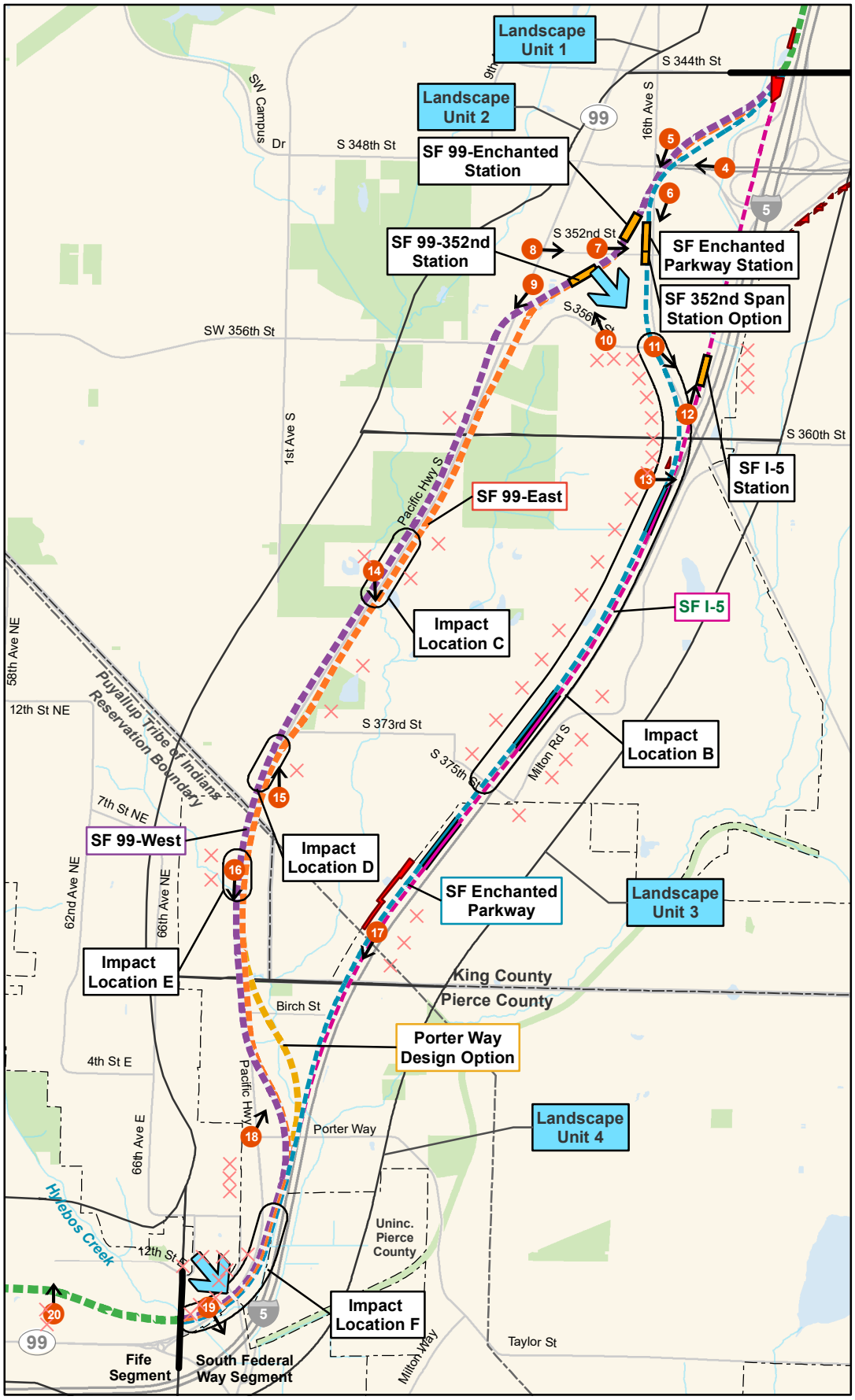
- Segment Boundary
- City Boundary
- Public Parks and Open Space
- Landscape Units

Visual Resources

- Observation Points
- Key Observation Point Direction
- Area with scenic views
- Sensitive Viewers
- Resource Conservation Area
- Potential Impact Location

Observation Point 9:
Looking south on SR 99 from mid block between S 352nd Street and S 356th Street

Observation Point 13:
Looking east from Todd Beamer High School



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

0 0.5 1 Mile

FIGURE 4.5-3
Landscape Units and Observation Points
South Federal Way Segment

Tacoma Dome Link Extension

Landscape Unit 3, S 360th Street to King/Pierce County Boundary

Landscape Unit 3 encompasses the I-5 and SR 99 corridors extending beyond the southern Federal Way city limits into Milton and Pierce County. The geography of the area consists of gently rolling hills, farm properties, and forested areas transitioning to more commercial land uses in the southwestern side of the landscape unit. Vegetation in this landscape unit consists of broad areas of mature conifer and deciduous trees, with additional trees and shrubs on the edges of agricultural areas. Built elements along the east side of I-5 include Wild Waves Theme and Water Park with associated surface parking lots and a heavily excavated commercial sand and gravel extraction site to the south. The northern portion of Landscape Unit 3, west of I-5 and including the SR 99 corridor, has generously spaced, single-family homes, the Todd Beamer High School campus, a Montessori preschool, and Gethsemane Cemetery. To the south, an auto-oriented commercial district lines both sides of SR 99.

Residents in the area with the closest proximity to the highway corridors are most likely to see changes (high sensitivity), including residents of properties west of I-5 and in the Spring Valley Mobile Home Park community adjacent SR 99. Additional potential viewers include residents of the senior living home east of I-5 on S 376th Street (average sensitivity due to less proximity), sightseeing travelers (higher sensitivity), drivers on local roads (average sensitivity), drivers on I-5 (low sensitivity), students at Todd Beamer High School and Montessori Academy at Spring Valley (average to high sensitivity), and patrons and employees at Wild Waves Theme and Water Park (low sensitivity looking across I-5). The area has medium to high visual quality due to the visual unity provided by vegetation cover along the corridors, with most views in the area either bounded by or including moderate to dense vegetation. There are two Resource Conservation Areas in Landscape Unit 3. Both areas are well covered with deciduous and coniferous trees.

Landscape Unit 4, King/Pierce County Boundary to Fife City Limit near Wapato Way East

The geography of Landscape Unit 4 consists of relatively level agricultural land east of I-5 and commercial uses immediately west of I-5, and the elevation rises towards a residential neighborhood west and northwest of I-5. The southeast slopes of the residential neighborhood along 69th Avenue E offer views of Mount Rainier. Vegetation in Landscape Unit 4 consists of suburban properties bounded by vegetated riparian corridors, deciduous trees, and by pockets of mixed native forest. Built elements consist of single- and multi-family homes, various auto-oriented commercial land uses, I-5, and SR 99. The residents directly west and northwest of the build alternatives are the most sensitive viewers due to proximity and the potential for obscured views of Mount Rainier. Other potential viewers include patrons and employees of local businesses (low to average sensitivity), sightseeing travelers (higher sensitivity), drivers on local roads (average sensitivity), and drivers on I-5 and SR 99 (low sensitivity). The area has medium visual quality because of its blend of open space and residential uses along with visual lower-quality commercial uses.

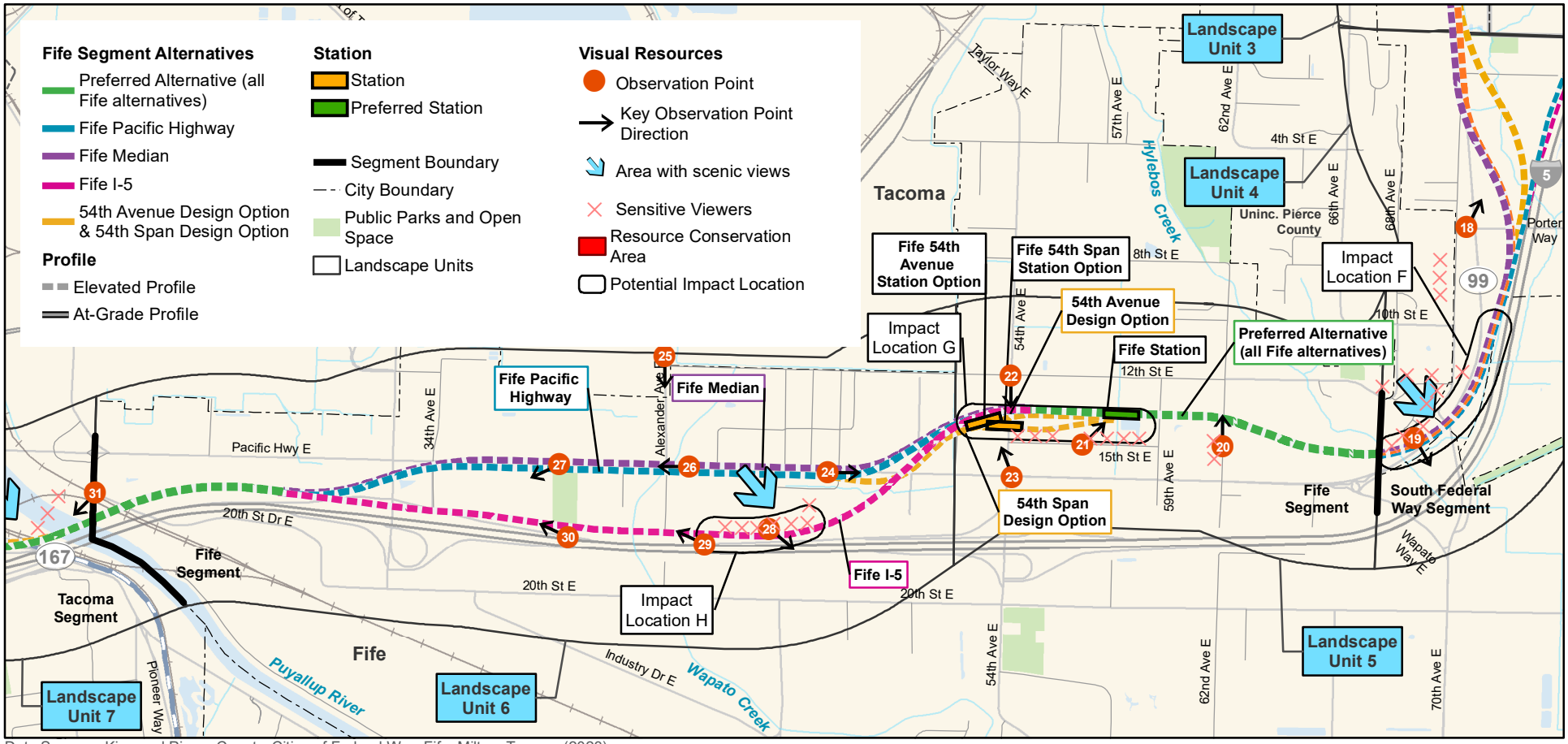
Fife Segment

Figure 4.5-4 shows the two landscape units in the Fife Segment. The landscape unit boundaries generally distinguish east and west areas of Fife. The eastern portion has more rural and residential areas, while the western portion is increasingly commercial, industrial, and transportation oriented.

Observation Point 13: Looking north on 62nd Avenue E

Observation Point 17: Looking west on Pacific Highway E

Observation Point 21: Looking west on I-5



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

0 0.5 1 Mile

FIGURE 4.5-4
Landscape Units and Observation Points
Fife Segment

Tacoma Dome Link Extension

Landscape Unit 5, Fife City Limit near Wapato Way East to 52nd Avenue East

The geography of Landscape Unit 5 is relatively level, with no prominent topographic features, and is bounded on the north and east sides by the Hylebos Creek corridor. Mount Rainier is visible from many areas in the landscape unit. The vegetation in Landscape Unit 5 consists of patches of mixed native forest, open agricultural land to the north, and planted street trees and other landscaping vegetation to the south. Built elements in the landscape unit consist of various industrial land uses north of the build alternative alignment, two small areas with single-family residences, a senior apartment building, church, and various commercial uses along I-5 and SR 99, including Emerald Queen Casino, Tahoma Market, and Tacoma RV Center. Other visible built elements include tall light posts along I-5 and SR 99 and shorter streetlamps along SR 99. The most sensitive viewers with proximity to the project alternatives are visitors to the St. Paul Chong Hasang church on 62nd Avenue E and the residents on 15th Street E. Other viewers include patrons and employees at the various businesses in the area (low to average sensitivity), sightseeing travelers (higher sensitivity), pedestrians and cyclists (average sensitivity), and freight haulers and drivers on SR 99 and I-5 (low sensitivity). The diverse mix of residential, commercial, and industrial elements gives the area a medium visual quality.

Landscape Unit 6, 52nd Avenue East to Puyallup River

The geography of Landscape Unit 6 has mostly level topography, with some variation around I-5 and near the Puyallup River. Vegetation in the landscape unit is sparse due to the heavily developed nature of the area except for native vegetation along Wapato Creek, Puyallup River, and smaller waterways. Other vegetation includes ornamental trees and shrubs lining streets, with landscaping around residential and commercial developments. The built environment features multiple land uses and building types, large surface-level parking lots, wide streets, and highways, including Pacific Highway E and I-5. This landscape unit contains many industrial manufacturing, storage, and repair businesses. Commercial development is varied and includes car dealerships and other auto-oriented businesses as well as strips of smaller retail developments, motels, and drive-through restaurants concentrated between I-5 and Pacific Highway E. The area also contains two separate single-family residential communities located north of Pacific Highway E, one near 12th Street E and Alexander Avenue E and the other between 46th Avenue E and Willows Road E. Both have limited visual exposure and views of the alternatives. Sensitive viewers with the most potential for exposure to visual change are those living in the Chateau Rainier Apartments. Other viewers include patrons and employees of businesses along Pacific Highway E (average sensitivity), pedestrians and cyclists along SR 99 (average sensitivity), users of the Puyallup River (medium to high sensitivity), and freight haulers (low sensitivity) and drivers on local roads, Pacific Highway E, and I-5 (low to average sensitivity). The overall visual quality for viewers is medium to low due to the lack of visual unity and developments with low visual interest.

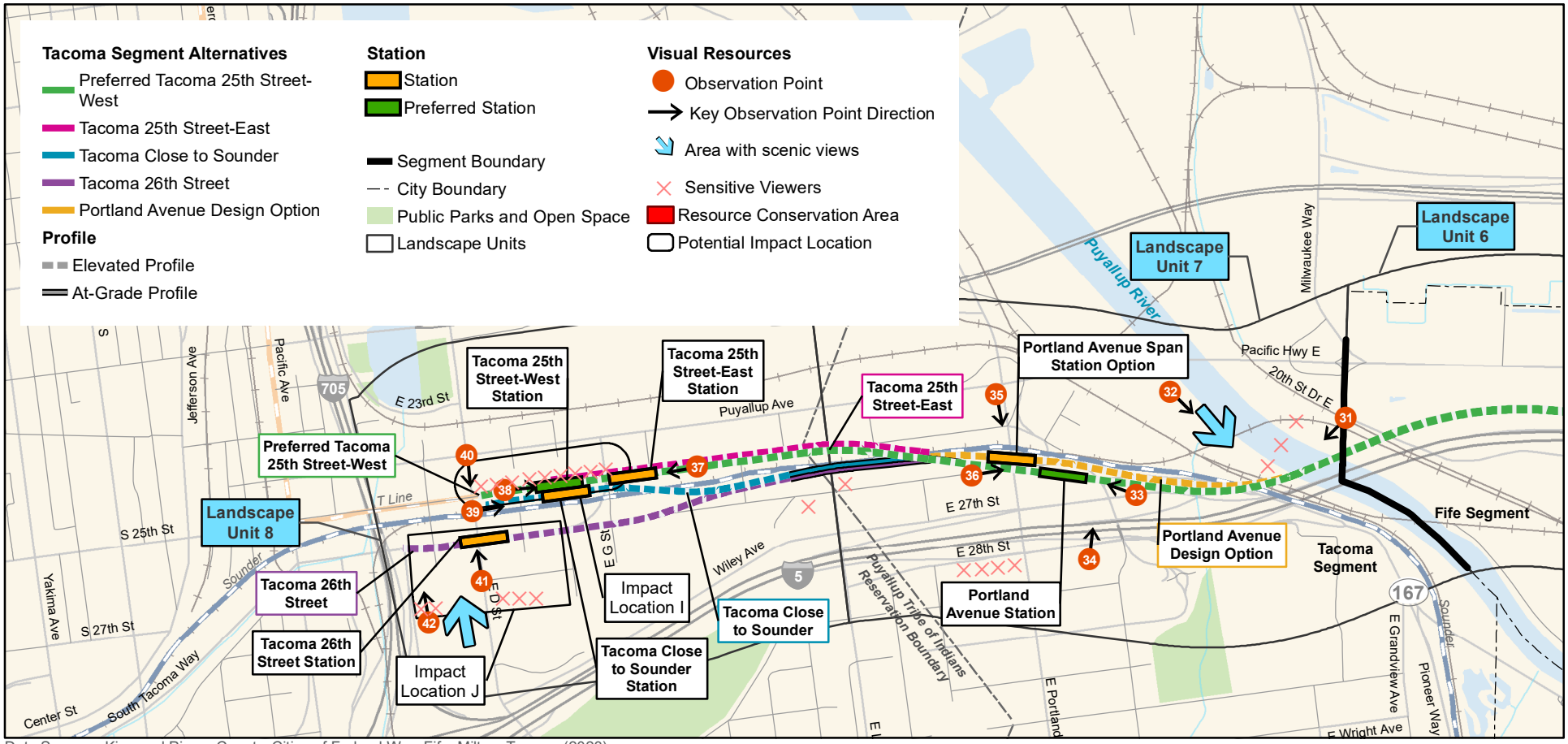
Tacoma Segment

Figure 4.5-5 shows the two landscape units for this segment, including observation points. The areas close to the river and near E Portland Avenue have an industrial character, and the area around the Tacoma Dome has more viewers as well as a mix of transit, civic, retail, and other developments. There are no Resource Conservation Areas in the Tacoma Segment landscape units.

Observation Point 34: Looking northeast from the Emerald Queen Casino Tacoma

Observation Point 39: Looking east across D Street towards Freighthouse Square

Observation Point 42: Looking north towards downtown Tacoma from LeMay Museum



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

0 0.5 1 Mile

FIGURE 4.5-5
Landscape Units and Observation Points
Tacoma Segment

Tacoma Dome Link Extension

Landscape Unit 7, Puyallup River to East L Street

Geographically, Landscape Unit 7 generally slopes down from south to north and flattens out at Puyallup Avenue. The landscape unit contains small patches of mostly deciduous trees and shrubs around the Puyallup River and other smaller waterways. Landscape Unit 7 features various land uses and building types, including single-family residences, two large casinos, and a cemetery. Large-scale industrial uses, including a large rail yard, are located north of the alternatives. Bridges in the landscape unit include nearby railroad bridges and two bridges for vehicles crossing the Puyallup River: one on I-5 and the other — the Fishing Wars Memorial Bridge — on Pacific Highway connecting to Puyallup Avenue. Other built elements include the major roadways I-5 and E Portland Avenue. The most sensitive viewers to the proposed build alternatives in the Tacoma Segment are patrons and employees of businesses near E Portland Avenue (average sensitivity viewers). Other viewers include residents south of I-5 (low exposure given their distance from the project), pedestrians, cyclists and waterway users (average sensitivity), drivers on local streets and I-5 (low sensitivity), and sightseeing travelers (higher sensitivity). The area has low visual quality due to the lack of visual harmony of the diverse variety of building styles and other built features.

Landscape Unit 8, East L Street to I-705

Landscape Unit 8 encompasses the southern terminus for all of the TDLE build alternatives. This landscape unit has a moderate topographic change from south of I-5 sloping down to the waterway, with rolling hills to the east and west, and a flatter topography along Puyallup Avenue. Vegetation is generally sparse north of I-5, with vegetated areas of deciduous and coniferous trees on the slopes south of I-5 in and around McKinley Park. Other vegetation includes streetscape trees and shrubs and ornamental landscaping associated with developed areas. There are several older buildings with character, including Freighthouse Square, as well as the monumental-scale architecture of the Tacoma Dome and LeMay America's Car Museum (LeMay Museum) and large areas dedicated to surface parking. There are locations with views of the Tacoma bridges, waterways, and city skyline. The landscape unit features a major transit hub, including a large Pierce Transit bus depot and parking garage complex at East G Street and Puyallup Avenue, a Sounder and Amtrak station between E 25th and E 26th Streets at East D Street, and a station on E 25th Street for the Tacoma Link line to downtown Tacoma. There is also a mixed-use residential development under construction on E 25th Street.

North of the build alternatives, the area is dominated by large industrial land uses, including a substantial rail yard. The streets in the Tacoma Dome area are narrower and more pedestrian oriented than in other areas of the TDLE study area. Overall, the lack of visual harmony among the multiple building and landscape forms and features contributes to a medium visual quality for this landscape unit. Pedestrians, cyclists, transit users, and local motorists would have average sensitivity to changes in this area. The most sensitive viewers would be residents and sightseeing pedestrians and drivers visiting the LeMay Museum, the Tacoma Dome, and the Freighthouse Square area (average- to high-sensitivity viewers). Other viewers include pedestrians, cyclists, employees, patrons of local businesses, transit users, local drivers (average sensitivity), and residents in areas to the south of I-5 with overlooking views (low exposure due to distance).

4.5.3 Environmental Impacts

The following three factors were used to determine impacts on visual and aesthetic resources:

- Change to the visual quality of the TDLE corridors near areas with concentrations of sensitive viewers (mostly residents).
- Potential blockage of or intrusion on scenic views.
- Impacts from light, glare, and shade related to guideways, stations, parking areas, and trains.

This section discusses the direct and indirect long-term operational and short-term construction impacts of the No-Build Alternative and build alternatives.

As part of this evaluation, computer-generated visual simulations were developed to show the potential visual impact of TDLE and illustrate the expected scale and general appearance of the alternatives and options from 42 observation points, the location of which are shown on Figure 4.5-1, as well as on Figures 4.5-2 to 4.5-5. Visual simulations for all of the observation points can be found in Appendix J2, Visual Assessment Background and Simulation Analysis. The simulations are based on preliminary design, which would be refined as the design progresses. Project features such as sound walls and landscaping are the most likely to change as design progresses, whereas the size, scale, and location of the guideway itself is less likely to change.

The focus of this evaluation is on areas where visual quality would be lowered for higher-sensitivity viewers. For this project, the most sensitive viewers are usually in residential areas, but other viewers would see visual changes from buildings, sidewalks, and roadways, including workers, customers, sightseeing travelers, and motorists.

4.5.3.1 No-Build Alternative

The No-Build Alternative includes projects, funding packages, and proposals in the central Puget Sound region that are planned to occur with or without TDLE, as described in Chapter 2 (Section 2.2). Under the No-Build Alternative, the visual quality of the landscape units would be similar to existing conditions, except for Landscape Unit 1.

In Landscape Unit 1, FWLE has constructed a new station and tail track in the Federal Way downtown area that will be an apparent addition to the urban landscape there. The Federal Way City Center Access Project could remove existing single-family residences and vegetation adjacent to and within the I-5 right-of-way. Also, the Sound Transit OMF South preferred and South 344th Street alternatives are in this area. If either of these alternatives are selected to be built, they would have impacts similar to the Preferred FW Enchanted Parkway and FW Design Option to connect the OMF site to the existing system. These projects would have the potential to change the landscape character of adjacent areas and to reduce visual quality based on a perception of intrusive or incompatible visual features by higher-sensitivity viewers.

Elsewhere, changes to the landscape would be limited to minor improvements of existing roadways and private development along the corridor, with incremental changes to the visual environment over time.

4.5.3.2 Long-Term Impacts for the Build Alternatives

To determine visual impacts, ratings for visual quality are assigned both before and after the construction of alternative options. Visual quality ratings range from 1 to 7 and are described as follows: 1) very low, 2) low, 3) medium low, 4) medium, 5) medium high, 6) high, and 7) very high. For the purpose of this analysis, a visual impact occurs when the visual quality category

would be lowered one category or more (medium high to medium or medium to medium low) in an area with a concentration of sensitive viewers.

The following criteria are used to characterize the degree of visual quality change from existing conditions in terms of changes in the elements of vividness, intactness, and unity, as well as viewer sensitivity.

- High change would remove existing features and/or introduce visually prominent features that alter the visual quality of the area. High changes include removing dense mature vegetation that contributes to high or moderately high visual quality or when vegetation provides effective screening of less attractive views. High changes may also include prominent structures that are larger in scale or higher than surrounding visual features. A high change in visual quality rating would result in a changing of the existing visual quality category rating by one or more categories; for example, a high existing rating to a medium or low rating.
- Medium change would alter visual features but not in a way that would be perceived as intrusive or incompatible by most viewers and would not substantially change the visual quality. A medium change can result from the removal of vegetation that would not affect the extent to which highway or light rail features are screened or buffered or that renders features more visible or prominent. A medium change in visual quality rating results in one category change, for example an existing rating of medium would change to a medium low rating.
- Low change generally includes relatively minor new features or relatively minor alteration of existing features, such as vegetation cover. Replacing structures such as noise walls with similarly sized structures would result in minor changes to intactness and visual unity. In some cases, physically prominent new features might result in a low change in visual quality if the existing visual context already has low visual quality. No change in visual quality rating results when a low change is determined.

Impacts Common to All Alternatives

All of the project alternatives would change visual conditions by removing existing landscape features, including trees, landscaping, and buildings, and replacing these with a primarily elevated light rail guideway, stations, and other accessory facilities. All of the alternatives would involve visual changes when overhead utilities are added, raised, or relocated, or where streets or other facilities are modified, replaced, or added. All of the alternatives have components such as retaining walls, noise walls, and sections of elevated guideway supported by columns that would be visually prominent for some adjacent residents and other viewers. Where mature vegetation framing the roadway is removed, viewers may perceive the highway corridor as wider and more prominent, and it can change the visual context of adjacent residential areas by removing the visual buffer from the transportation corridor.

Common to all the alternatives with stations, lighting at stations and parking facilities could create light impacts with glare, an increase in the level of ambient light nearby, and increased skyglow, which can impact nighttime views of the sky. These impacts would be similar for either type of parking facility, structured or surface. Future light rail passengers are likely to experience scenic views from the elevated TDLE station platforms and along the elevated guideway.

If TDLE is constructed in phases, the M.O.S. to the station in South Federal Way and, to a lesser degree, the M.O.S. to the station in Fife would have the same type of visual impacts, just in a smaller geographic area, until the remaining phases were completed.

Federal Way Segment

Overall, the build alternatives would have a medium change to visual quality in Landscape Unit 1 of the Federal Way Segment. Some residents in the Belmor community and along I-5 in the Federal Way Segment would experience visual impacts with views of the elevated guideway structures. The Federal Way Design Option alignment would be closer to and would have higher impact for some residents in the Belmor community (Figure 4.5-6). See Impact Location A on Figure 4.5-2 for the location where one or more alternatives would impact visual quality near areas with concentrations of sensitive viewers (residents) and Appendix J2 for more information on impacts in Landscape Unit 1.

Additionally, an existing cell tower near I-5 and Oakland Hills Boulevard would likely be relocated to available open property in the vicinity rather than adjacent to the interstate. The location of the relocated tower would be determined during further design and may be visible in private views.

The Resource Conservation Area that is adjacent to the guideway could be affected by the Preferred FW Enchanted Parkway Alternative. This area would be protected from impacts, except where tree removal would be required because their height and proximity would interfere with guideway operations.

Table 4.5-1 summarizes the potential visual impacts near concentrations of sensitive viewers in the Federal Way Segment.

Table 4.5-1 Federal Way Segment Visual Impacts near Concentrations of Sensitive Viewers

Impact Location and Alternative	Existing Visual Quality Rating	Rating of Visual Quality Change[1]	Visual Quality Rating with Build Alternative	Impacted Viewers
Landscape Unit 1				
Impact Location A • Preferred FW Enchanted Parkway	Medium	Medium	Medium low	Residents in Belmor and residents along the west side of I-5

Note:
(1) Impacts are determined as lowering of visual quality ratings of combined averages of ratings for vividness, intactness, and unity. Appendix J2, Visual and Aesthetic Resources Background Report and Simulation Analysis includes numeric ratings. These numeric ratings range from 1 to 7 and are described as follows: 1 – very low; 2 – low; 3 – medium low; 4 – medium; 5 – medium high; 6 – high; 7 – very high.

Existing View

Simulation: Preferred FW Enchanted Parkway

Simulation: Preferred FW Enchanted Parkway with FW Design Option

Figure 4.5-6 Seminole Lane, Belmor Mobile Home Park, looking east (Observation Point 3)

South Federal Way Segment

Overall, the build alternatives in this segment would result in a medium to low change to visual quality in Landscape Units 2, 3 and 4. The visual change surrounding the station area would be the same regardless of the type of parking facility, structured or surface.

Some residents in South Federal Way would experience visual impacts. Figure 4.5-3 shows the following potential Impact Locations:

- Impact Location B, along the west side of I-5 from S 356th Street and continuing south, where some residents in the area and Todd Beamer High School would experience visual impacts from tree removal and proximity to the build alternatives.
- Impact Locations C, D and E, where the alternative alignment would be visible for sensitive viewers at the Spring Valley Montessori school campus, Gethsemane Cemetery (shown in Figure 4.5-8), and Spring Valley Mobile Home Park.
- Impact Location F, where the build alternatives would result in medium to low changes to visual quality in Landscape Unit 4 and some residents with direct views would experience visual quality impacts near 69th Avenue E.

Table 4.5-2 summarizes the potential visual impacts near concentrations of sensitive viewers in the South Federal Way Segment. Additionally, in the South Federal Way Segment, there are several Resource Conservation Areas, totaling approximately 3 acres of land. The Resource Conservation Areas that are adjacent to the guideway could be affected by the SF I-5 and SF Enchanted Parkway alternatives, where tree removal would be required because their height and proximity would interfere with guideway operations. Though not considered a visual impact to sensitive viewers, TDLE would impact about 1 acre of one of the Resource Conservation Areas northwest of the I-5/SR 18 interchange in Landscape Unit 2.

Table 4.5-2 South Federal Way Segment Visual Impacts near Concentrations of Sensitive Viewers

Impact Location and Alternative	Existing Visual Quality Rating	Rating of Visual Quality Change [1]	Visual Quality Rating with Build Alternative	Impacted Viewers
Landscape Unit 2				
Impact Location B • SF Enchanted Parkway	Medium	Medium	Medium low	Residents south of S 356th Street, adjacent to Enchanted Parkway and I-5
Impact Location B • SF I-5	Medium	Medium	Medium low	Residents south of S 356th Street, adjacent to Enchanted Parkway and I-5
Landscape Unit 3				
Impact Location B • SF Enchanted Parkway	Medium	Medium	Medium low	Residents south of S 356th Street, adjacent to Enchanted Parkway and I-5 and Students at High School
Impact Location B • SF I-5	Medium	Medium	Medium low	Residents south of S 356th Street, close to Enchanted Parkway and I-5 and Todd Beamer High School students and staff
Impact Location C • SR 99-East	Medium high	Medium	Medium	Montessori students and staff

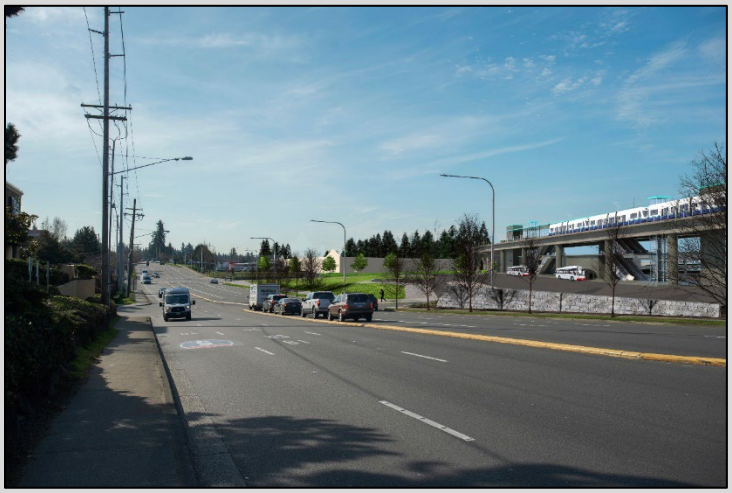
Table 4.5-2 South Federal Way Segment Visual Impacts near Concentrations of Sensitive Viewers (continued)

Impact Location and Alternative	Existing Visual Quality Rating	Rating of Visual Quality Change [1]	Visual Quality Rating with Build Alternative	Impacted Viewers
Impact Location C • SR 99-West	Medium high	Medium to high	Medium low	Montessori students and staff
Impact Location D • SR 99-East	Medium high	Medium	Medium	Gethsemane Cemetery visitors
Impact Location D • SR 99-West	Medium high	Medium	Medium	Gethsemane Cemetery visitors
Impact Location E • SR 99-East	Medium low	Medium	Low	Spring Valley Mobile Home Park residents
Impact Location E • SR 99-West	Medium low	Medium	Low	Spring Valley Mobile Home Park residents
Landscape Unit 4				
Impact Location F • All South Federal Way Alternatives	Medium	High	Low	Residents in the area near 69th Avenue E

Note:
(1) Impacts are determined as lowering of visual quality ratings of combined averages of ratings for vividness, intactness, and unity. Appendix J2, Visual and Aesthetic Resources Background Report and Simulation Analysis includes numeric ratings. These numeric ratings range from 1 to 7 and are described as follows: 1 – very low; 2 – low; 3 – medium low; 4 – medium; 5 – medium high; 6 – high; 7 – very high.

Existing view

Simulation: SF Enchanted Parkway Station



Simulation: SF 99-West and SF 99- East Alternatives

Figure 4.5-7 Enchanted Parkway South of S 348th Street, looking southwest (Observation Point 6)

Existing view

Simulation: SF 99-West Alternative

Simulation: SF 99-East Alternative

Figure 4.5-8 SR 99 at Gethsemane Cemetery, looking north (Observation Point 15)

Fife Segment

In the Fife Segment, all of the alternatives would have the same visual quality impacts. The visual change surrounding the station area would be the same regardless of the type of parking facility, structured or surface.

In Landscape Unit 5, the proposed elevated guideway structure would be about 500 feet away and partially visible to some residents on the north side of the Rainier View Senior Apartments. As the guideway would be at a distance and partially screened by vegetation and existing structures, the changes to the view at this location would not be considered to be a visual impact. For residents on 15th Street E at Impact Location G, shown on Figure 4.5-9, the 54th Span Design Option would have a higher visual change.

In Landscape Unit 6, the build alternatives would have moderate to low impact to visual quality. The elevated guideway of the Fife I-5 Alternative would appear more similar in scale with other structures seen on I-5 as compared with the Fife Pacific Highway and Fife Median Alternatives, where the large scale of the elevated guideway would visually contrast more with the smaller visual scale elements visible along Pacific Highway. The Fife Pacific Highway and Fife Median alternatives would be more central to the community (Figure 4.5-9) and would affect different viewer groups than the Fife I-5 Alternative along the freeway, which would impact views of Mount Rainier from Chateau Rainier (Figure 4.5-10) and would obscure views of auto dealerships and business signs seen from the interstate (Figure 4.5-11). See Impact Locations G and H on Figure 4.5-4, which identify locations where one or more alternative would impact visual quality near areas with concentrations of sensitive viewers (residents), and Table 4.5-3, which summarizes visual impacts near concentrations of sensitive viewers in the Fife Segment.

Table 4.5-3 Fife Segment near Concentrations of Sensitive Viewers

Impact Location and Alternative	Existing Visual Quality Rating	Rating of Visual Change [1]	Visual Quality Rating with Build Alternative	Impacted Viewers
Landscape Unit 5				
Impact Location G • All Fife Alternatives	Medium	Medium	Medium low	Church visitors on 62nd Avenue E and residents on 15th Street E
Impact Location G • 54th Span Design Option	Medium	High	Low	Church visitors on 62nd Avenue E and greater impact for residents on 15th Street E
Landscape Unit 6				
Impact Location H • Fife I-5 Alternative	Medium low	Medium	Low	Residents of the Chateau Rainier apartment complex with direct views. Scale of elevated guideway less visually contrasting in context of I-5

Note:
(1) Impacts are determined as lowering of visual quality ratings of combined averages of ratings for vividness, intactness, and unity. Appendix J2, Visual and Aesthetic Resources Background Report and Simulation Analysis includes numeric ratings. These numeric ratings range from 1 to 7 and are described as follows: 1 – very low; 2 – low; 3 – medium low; 4 – medium; 5 – medium high; 6 –high; 7 – very high.

Existing view

Simulation: Fife Pacific Highway Alternative

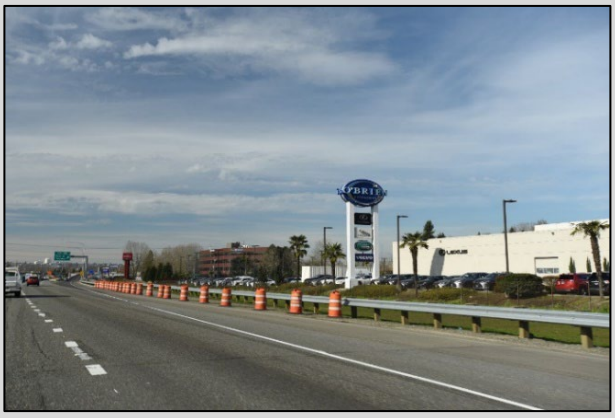
Simulation: Fife Median Alternative

Figure 4.5-9 Pacific Highway E at 40th Avenue E, looking west (Observation Point 26)

Existing View

Simulation: Fife I-5 Alternative

Figure 4.5-10 Chateau Rainier Apartments, looking southeast (Observation Point 28)



Existing View

Simulation: Fife I-5 Alternative

Figure 4.5-11 I-5, looking northwest (Observation Point 30)

Tacoma Segment

To cross the Puyallup River, both a long-span bridge and a pier-supported bridge are being considered. Both would involve construction of major structures around and over the river. Viewers near the river would be sensitive to visual change with either option. The new bridge would be viewed in front of or with the I-5 bridge structures. Therefore, the river crossing would constitute a low visual change to the general public. However, the visual change would have the potential to impact views of the landscape that are important to the Tribal community.

West of the river, the guideway would pass through an area with industrial uses and a mix of visual forms with low visual unity to E Portland Avenue and either the Portland Avenue Station or the Portland Avenue Span Station Option. The new station and resulting development would improve visual unity and cohesiveness and add an element of vividness in the area. An optional Portland Avenue bike and pedestrian bridge is also being considered to connect the station to the neighborhoods and Puyallup Tribe of Indians facilities on the south side of I-5. Overall, viewer sensitivity is low in this area. The build alternatives would result in a low change to visual quality, while for all alternatives, the addition of the distinctive visual patterns of the elevated guideway structure in this area could improve visual quality.

West of E Portland Avenue on E 25th Street, the Preferred Tacoma 25th Street-West and Tacoma 25th Street-East alternatives would both create a tunnel effect and alter views of existing built elements for street-level viewers. This visually dominant tunnel effect is greater for the Tacoma 25th Street-West Alternative because it extends further west along E 25th Street to East D Street in the Freighthouse Square area (Figures 4.5-12 and 4.5-13). Visual impacts would occur in this area, which has higher pedestrian traffic and viewer sensitivity (Impact area I). The guideway and station, particularly for the Preferred Tacoma 25th Street-West Alternative, would also be potentially prominent in views for some residential units on E 25th Street that are planned or are currently under construction.

The Tacoma 26th Street and Tacoma Close to Sounder alternatives both would pass through a less densely developed area west of East E Street and south of the Sounder tracks. The Tacoma Close to Sounder Alternative would change views for Sounder commuters but would result in less dramatic visual changes than would the Tacoma 25th Street-West for those visiting local businesses at Freighthouse Square and for some residential units (currently under construction on E 25th Street). The introduction of the new vertical elements to the streetscape of an elevated guideway and station of the Tacoma 26th Street Alternative would be visually prominent overhead for patrons and employees at businesses along E 26th Street looking north on East D Street, as seen from the Tacoma Dome area and from the LeMay Museum (Figure 4.5-14). Partial obstruction of water and city views, including views of the prominent cable-stayed East 21st Street Bridge would result in visual impact from the Tacoma 26th Street Alternative. See Impact Locations I and J on Figure 4.5-5, which identifies locations where one or more alternative would impact visual quality near areas with concentrations of sensitive viewers. Table 4.5-4 summarizes visual impacts near concentrations of sensitive viewers.

Table 4.5-4 Tacoma Segment near Concentrations of Sensitive Viewers

Impact Location and Alternative	Existing Visual Quality Rating	Rating of Visual Quality Change [1]	Visual Quality Rating with Build Alternative	Areas with Sensitive Viewers Where Visual Quality Would Be Impacted
Landscape Unit 8				
Impact Location I • Preferred Tacoma 25th Street-West Alternative	Medium high	Medium to high	Medium low	E 25th Street in the Freighthouse Square block
Impact Location I • Tacoma 25th Street-East Alternative	Medium high	Medium to high	Medium low	E 25th Street in the Freighthouse Square block
Impact Location J • Tacoma 26th Street Alternative	Medium	Medium	Medium low	Museum and Tacoma Dome vicinities

Note:
(1) Impacts are determined as lowering of visual quality ratings of combined averages of ratings for vividness, intactness, and unity. Appendix J2, Visual and Aesthetic Resources Background Report and Simulation Analysis includes numeric ratings. These numeric ratings range from 1 to 7 and are described as follows: 1 – very low; 2 – low; 3 – medium low; 4 – medium; 5 – medium high; 6 –high; 7 – very high.

Existing view

Simulation: Preferred Tacoma 25th Street-West Alternative

Simulation: Tacoma 25th Street-East Alternative

Figure 4.5-12 E 25th Street West of East J Street, looking west (Observation Point 37)

Existing View

Simulation: Tacoma 25th Street-East Alternative

Simulation: Preferred Tacoma 25th Street-West Alternative

Simulation: Tacoma Close to Sounder Alternative
(optional pedestrian bridge to parking garage)

Figure 4.5-13 E 25th Street from Link Station, looking east (Observation Point 38)

Figure 4.5-14 LeMay Museum Balcony, Looking North (Observation Point 42)

4.5.3.3 Avoidance and Minimization of Impacts

When developing TDLE alternatives during conceptual design, Sound Transit considered minimizing the elevation or height of structures to avoid and minimize potential visual impacts. This includes incorporating at-grade profiles to reduce visual and aesthetic impacts where practicable. Early conceptual design also considered where alignments could avoid or reduce acquisitions and clearing of right-of-way where the project would be near or in existing arterial and highway right-of-way or utility corridors.

Measures that would be developed and refined during final design, where practicable, and with input from the affected communities and cities, include:

- Preserving existing vegetation when possible.
- Designing grades of sloped areas, together with retaining walls and noise walls where practicable, to reduce visual impact on adjacent viewers. Designing exterior lighting at stations and park-and-ride lots to minimize height and using source shielding to avoid light that would be directly visible from residential areas, streets, and highways. Shielding would also limit spillover light and glare in residential areas.
- Implementing a consistent architectural theme for elevated elements and stations, with consistent signage and a systemwide art program to improve visual continuity of project elements in the corridor. Design criteria for these project elements would be consistent with local design requirements and redevelopment plans to the extent practicable.
- Adhering to local jurisdiction and WSDOT development standards, design standards, guidelines, and design review, as applicable and practicable, to promote visual unity in station areas.
- Complying with local ordinances and WSDOT regulations regarding tree replacement ratios within state right-of-way or on off-site mitigation site(s).
- Providing visually interesting elements that incorporate design textures, patterns, or colors on walls, constructed in areas near sensitive viewers, such as residences, where there may not be enough room for landscaping that would grow large enough to screen TDLE and where sound walls may be required pursuant to the noise analysis.

- Planting appropriate vegetation within and adjoining the project right-of-way to replace existing street trees and other visually important vegetation that may be removed for the project and/or to provide screening for sensitive visual environments and/or sensitive viewers. Tree replacement is discussed below in Section 4.5.4, Potential Mitigation Measures.

4.5.3.4 Construction Impacts

Impacts Common to All Alternatives

Visual impacts due to construction would be visible but temporary. Existing visual characteristics would undergo fairly rapid localized changes as features are removed and new structures are developed, followed by a longer period of stability as finish work and testing occurs and stations are developed. Construction would last for multiple years, depending on the build alternative chosen and the details of the final design. The existing visual character and form of the build alignment corridor would be altered as existing features are removed and cleared spaces and dirt are revealed. Over time, the construction zone would include staging areas; reserves of building materials; fencing; lighting; gravel piles; large vehicles or pieces of equipment, such as cranes, dump trucks, scaffolding, bulldozers, or excavators; and detours or temporary roads. Other large vehicles may move to and from the site location.

If TDLE parking facilities at both the South Federal Way and Fife stations are constructed 3 years after initial service opens, the same construction-related effects on visual quality and ways to minimize impacts and best management practices would also apply at these two station locations at the time the parking facilities are constructed.

Avoidance and Minimization of Construction Impacts

Throughout the final design phase of TDLE, Sound Transit would consider ways to minimize construction and staging area footprints and minimize clearing to reduce visual impacts.

During construction, Sound Transit would reduce lighting impacts by shielding light sources used in nighttime construction. Where practicable, construction screens or barriers would be placed to limit the visibility of work areas that would intrude on adjacent activities, such as public open space, community facilities, and recreational areas and trails. Sound Transit would incorporate these measures into construction plans and specifications.

4.5.3.5 Indirect Impacts

Extending light rail from Federal Way to Tacoma could support changes to nearby land uses, as allowed by the local jurisdictions in accordance with their adopted plans and zoning. If development and increases in density occur, this could result in changes to the visual setting as well as the number and types of viewers.

4.5.4 Potential Mitigation Measures

In addition to the avoidance and minimization measures considered during the development of the design and in place during construction, mitigation measures would be implemented where practicable to reduce visual impacts in areas near residences and other areas with sensitive viewers to reduce impacts, where appropriate. Sound Transit would refine the mitigation measures as the project design is further developed and feedback from reviewing agencies and the public is received. Most of the potential mitigation measures for visual impacts are related to the use of landscaping or other features to help screen views of the TDLE guideway, stations, or

other project components. Mitigation measures would need to be compatible with Sound Transit's maintenance and operations requirements, which include long-term maintenance, safety, and security considerations.

Visual impacts from removing mature vegetation, including forested areas adjacent to the guideway, would occur for all alternatives. This would result in long-term visual impacts that would not immediately be mitigated by replacement vegetation or landscaping. There may be locations, such as the areas identified for mitigation measures in Figures 4.5-2 to 4.5-5, along the elevated guideway where direct view impacts of the project on adjacent sensitive viewers cannot be mitigated or screened and may result in unavoidable adverse impacts. The locations would be further analyzed as design progresses for the Preferred Alternative in the Final EIS.

In locations where the construction of elevated guideways would remove existing landscaped areas and medians, Sound Transit could replace landscaping, as appropriate, adjacent to the guideway where there is available space. However, in some locations, the area available for re-vegetations would be limited and may not be possible. In these instances, impacts of the project on adjacent sensitive viewers would not be mitigated.

Tree removal within the I-5 corridor would be mitigated according to the WSDOT Roadside Policy Manual. Sound Transit would prepare a roadside master plan in accordance with WSDOT guidelines for the portion of the build alternatives along the I-5 right-of-way. This plan would show proposed construction, landscape treatments, and function of these areas to aid coordination between Sound Transit and WSDOT for advancing common goals for corridor aesthetics and sustainability. Sound Transit would mitigate the conversion of the Resource Conservation Area in the South Federal Way Segment that is just north of the SR 18 interchange along the west side of the I-5 the right-of-way by providing replacement property. Sound Transit would consult with WSDOT staff to develop appropriate site-specific measures and offsite mitigation, as agreed to by WSDOT and FHWA, that would meet the intended function of the original Resource Conservation Areas.

Impact Locations where mitigation measures would be appropriate are shown in Figures 4.5-2 to 4.5-5. TDLE would have potential impacts to sensitive viewers and visual quality would be lowered at these locations. Mitigation measures would be refined in consultation with WSDOT, Tribes, and local jurisdictions during final design.

Impact Location A: Adjacent to residences between S 324th Street and S 336th Street.

Applies to all alternatives in the Federal Way Segment, including the design option.

- Sound Transit would mitigate locations with high visual impacts to sensitive viewers where possible using:
    1. Vegetative screening, or
    2. Architectural treatments to project components such as noise walls and ancillary facilities.

These measures would help soften views of the guideway and add visual interest, as practicable, based on available land, safety, and maintenance and operational needs. Landscaping and architectural treatment would be designed to add human-scale elements.

Impact Location B: Adjacent to residences between S 356th Street and S 375th Street.

Applies to the SF I-5 and SF Enchanted Parkway alternatives in the South Federal Way Segment, including design and station options.

- Sound Transit would mitigate locations with high visual impacts to sensitive viewers where possible using:
    1. Vegetative screening, or
    2. Architectural treatments to project components such as noise walls and ancillary facilities.

These measures would help soften views of the guideway and add visual interest, as practicable, based on available land, safety, and maintenance and operational needs. Landscaping and architectural treatment would be designed to add human-scale elements.

Impact Location C: Adjacent to Montessori Academy at Spring Valley campus area on SR 99.

Applies to the SF 99-West and SF 99-East alternatives in the South Federal Way Segment.

- Sound Transit would mitigate locations with high visual impacts using vegetative screening, as practicable, based on available land, safety, and maintenance and operational needs. Landscaping would be designed to add human-scale elements. For the SF 99-West Alternative, the area for vegetative screening may be limited and would require property owner agreement.

Impact Location D: Adjacent to the area near Gethsemane Cemetery on SR 99.

Applies to the SF 99-West and SF 99-East alternatives in the South Federal Way Segment.

- Sound Transit would mitigate locations with high visual impacts using vegetative screening, as practicable, based on available land, safety, and maintenance and operational needs. Landscaping would be designed to add human-scale elements. The area for vegetative screening may be limited and would require property owner agreement.

Impact Location E: Adjacent to residences in the Spring Valley area of SR 99.

Applies to the SF 99-West and SF 99-East alternatives in the South Federal Way Segment.

- Sound Transit would mitigate locations with high visual impacts using vegetative screening, as practicable, based on available land, safety, and maintenance and operational needs. Landscaping would be designed to add human-scale elements. In this location limited space may only allow limited screening planting, however potential planting of small trees, narrow evergreens and lower height planting landscape treatments could all help to enhance the view and partially reduce the visual impact.

Impact Location F: Adjacent to residences in the area of 69th Avenue E.

Applies to all the alternatives in the South Federal Way Segment.

- Sound Transit would mitigate locations with high visual impacts using vegetative screening, as practicable, based on available land, safety, and maintenance and operational needs. Landscaping would be designed to add human-scale elements. Mitigation would require property owner agreement to provide vegetative screening mitigation on adjacent property.

Impact Location G: South of the preferred Fife Station and elevated guideway, near residences on 15th Street E.

Applies to all alternatives in the Fife Segment.

- Sound Transit would mitigate locations with high visual impacts, using vegetative screening, as practicable, based on available land, safety, and maintenance and operational needs. Landscaping would be designed to add human-scale elements.

Impact Location H: Adjacent to Chateau Rainier residences.

Applies to the Fife I-5 Alternative.

- Sound Transit would mitigate locations with high visual impacts to sensitive viewers where possible using:
    1. Vegetative screening, or
    2. Architectural treatments to project components such as fencing.

These measures would help soften views of the guideway and add visual interest, using vegetative screening, as practicable, based on available land, safety, and maintenance and operational needs. Landscaping would be designed to add human-scale elements. In this location limited space may only allow limited screening planting in parking lot landscape areas.

Impact Location I: E 25th Street between East G Street and East D Street.

Applies to the Preferred Tacoma 25th Street-West Alternative, the Tacoma 25th Street-East Alternative, and the Tacoma Close to Sounder Alternative.

- Viewers in this area would be, primarily, pedestrians directly adjacent to or crossing under the structures. Because the visual impact is largely due to the dominant visual scale and tunnel effect of the structures, Sound Transit would use human-scale elements, such as street furniture, pedestrian scale street lighting fixtures, signage, landscaping, and architectural design, in the vicinity to focus viewer attention and to distract attention from the large scale of the structures.

Impact Location J: E 26th Street, west of East D Street.

Applies to the Tacoma 26th Street Alternative.

- Sound Transit would mitigate locations with high visual impacts using vegetation to soften and screen views of the guideway structure, as practicable, based on available land, safety, and maintenance and operational needs. Landscaping would be designed to add human-scale elements.

4.6 Air Quality and Greenhouse Gas Emissions

4.6.1 Introduction to Resource and Regulatory Requirements

This section discusses the potential long-term as well as short-term air quality impacts of TDLE. The analysis evaluates the impacts of criteria pollutants, mobile source air toxics, and GHGs during project construction and operation.

The Puget Sound Clean Air Agency (PSCAA), United States Environmental Protection Agency (EPA), and Washington State Department of Ecology (Ecology) work together in regulating air quality in the TDLE corridor. Supporting information, including an introduction and list of federal, state, and local laws, regulations, guidance, and policies, and modeling results for air quality are included in Appendix H4, Air Quality Supporting Information.

4.6.2 Affected Environment

Regional impacts to air quality were analyzed by calculating criteria air pollutants that would be emitted directly or indirectly as a result of the proposed project. “Criteria air pollutants” are six common air pollutants that can harm health and the environment, cause property damage, and are subject to certain federal air quality standards.

The study area for this analysis is the same as the study area for the regional transportation analysis, which is the Puget Sound Regional Council four-county region including King, Pierce, Snohomish, and Kitsap counties.

4.6.2.1 Regional Topography and Climate

The project is located in King and Pierce counties, within the Puget Sound Lowlands Region. The climate of Puget Sound is a product of the interaction between large-scale wind and weather patterns and the complex topography of the region. Seasonal changes in the movement of moisture-laden air that collides with the sudden barrier of the Olympic and Cascade mountains bring Puget Sound high levels of precipitation. West of the Cascade Mountains, the low-lying valleys have a maritime climate with typically abundant winter rains, infrequent snow, dry summers, and mild temperatures year-round. The Pacific climate variation depends on the annual and decadal changes in the strength and location of the Aleutian Low pressure pattern, which is influenced by the El Nino-Southern Oscillation and Pacific Decadal Oscillation. An intense Aleutian Low brings relatively warm and dry winters to Puget Sound while a weak Aleutian Low favors a cooler and wetter winter (Puget Sound Institute 2024). Winter temperatures generally range from 28 degrees Fahrenheit to 45 degrees Fahrenheit, and summer temperatures generally range from 50 degrees Fahrenheit to 78 degrees Fahrenheit (Western Regional Climate Center 2024). Air pollution is usually most noticeable in the late fall and winter season, under conditions of clear skies, light wind, and a sharp temperature inversion. These conditions may prevail a few days before a weather system moves through that removes the pollution by wind and rain.

4.6.2.2 Criteria Pollutants

Criteria Pollutants

Six criteria air pollutants have been recognized by EPA as potentially harmful, and National Ambient Air Quality Standards have been established to protect the public health and welfare. These pollutants are carbon monoxide, ozone, lead, nitrogen dioxide, particulate matter, and sulfur dioxide.

Criteria pollutants include carbon monoxide; ozone; lead; nitrogen dioxide; particulate matter, which is broken down for regulatory purposes into particulate matter with aerodynamic diameter equate to or smaller than 10 micrometers (PM_{10}) and 2.5 micrometers ($PM_{2.5}$); and sulfur dioxide. Nitrogen oxides and volatile organic compounds are

considered precursors to ozone. Sulfur dioxide and lead are not pollutants of concern associated with light rail operation, light rail construction, or automobile emissions and therefore are not discussed further in this analysis. Although not criteria pollutants, additional pollutants of concern for transportation projects are mobile source air toxics and GHGs.

4.6.2.3 Mobile Source Air Toxics

Mobile source air toxics (MSATs) are hazardous air pollutants emitted from on-road vehicles that can cause cancer and noncancer health risks. The nine priority mobile source air toxics include acetaldehyde, acrolein, benzene, 1,3-butadiene, diesel particulate matter, formaldehyde, ethylbenzene, naphthalene, and polycyclic organic matter (FHWA 2023). Transportation projects may affect the regional or local air toxic concentrations due to the mobile source air toxics emissions from vehicles. Nationwide mobile source air toxics emissions are expected to be lower than present levels in future years as a result of EPA's national emissions control programs and fuel economy standards. Estimated emissions using the EPA Motor Vehicle Emission Simulator, MOVES4, model indicate that even if VMT increases by 31 percent from 2020 to 2060 as forecast, a combined reduction of 76 percent in the total annual emissions for the priority mobile source air toxics is projected for the same time period. Diesel particulate matter is the dominant component of mobile source air toxics emissions, making up 36 to 56 percent of all priority mobile source air toxics pollutants by mass, depending on calendar year (FHWA 2023).

4.6.2.4 Greenhouse Gases

GHGs include both naturally occurring and human-made gases that trap heat in the Earth's atmosphere. These gases include carbon dioxide, methane, nitrous oxide, fluorinated gases, and water vapor, among others. A growing body of research attributes long-term changes in temperature, precipitation, and other elements of Earth's climate to large increases in GHG emissions since the mid-19th century, particularly from human activity related to fossil fuel combustion. GHG emissions of particular interest include carbon dioxide, methane, nitrous oxide, and fluorinated gases (hydrochlorofluorocarbons, perfluorocarbons, and sulfur hexafluoride).

GHGs differ in how much heat each type of gas traps in the atmosphere and thus affect the global warming potential differently. Carbon dioxide is the primary GHG emitted through human activities, so amounts of other gases are expressed relative to carbon dioxide, using a metric called "carbon dioxide equivalent" (CO_2e). The Global Warming Potential was developed to allow comparisons of the global warming impacts of different gases. Specifically, it is a measure of how much energy the emissions of 1 ton of a gas will absorb over a given period of time, typically a 100-year time horizon, relative to the emissions of 1 ton of carbon dioxide. Gases with a higher Global Warming Potential absorb more energy per ton emitted than gases with lower Global Warming Potential and thus contribute more to warming Earth (EPA 2023a). Generally, estimates of all GHGs are summed to obtain total emissions for a project or given time period, usually expressed in metric tons or million metric tons.

In the United States, the main source of GHG emissions is electricity generation, followed by transportation. Carbon dioxide is the most abundant GHG, both naturally occurring and human-generated, mostly from fossil fuel combustion. In the Puget Sound region, the main source of GHG emissions is from transportation sources.

4.6.2.5 Existing Air Quality

PSCAA and Ecology monitor criteria air pollutant concentrations at several locations in the project area. The monitoring stations closest to the project corridor that monitor the criteria pollutants are located at 1802 S 36th Street in Tacoma and 15th Avenue S and S Charlestown Street (Beacon Hill) in Seattle. Table 4.6-1 shows the criteria air pollutant concentrations monitored at these stations by their appropriate averaging period between 2018 and 2023 (PSCAA 2018, 2019, 2020, and 2022). Data from 2020 (PSCAA 2021) are not listed because air toxics sampling was not conducted between mid-March and July due to the COVID-19 pandemic. As shown, none of the criteria air pollutant concentrations monitored at these stations exceeded a National Ambient Air Quality Standards (NAAQS) during this time period, excluding wildfire smoke-impacted days, and pollutant concentrations are generally trending downward. Diesel particulate emissions have been trending downward compared to 2018, but have remained similar in recent years (2022–2023). According to the PSCAA 2022 Air Quality Data Summary (PSCAA 2023), wildfire smoke-impacted air quality on 26 days in September and October 2022. EPA allows data from such events to be excluded from regulatory calculations. When days impacted by wildfire smoke are excluded, the background air quality is below the NAAQS, and monitors in PSCAA's four-county region fell below the federal standard for $PM_{2.5}$ of 35 micrograms per cubic meter. While none of the pollutants exceeded NAAQS, the southern half of the project lies within a $PM_{2.5}$ maintenance area, which extends south from the King-Pierce county line through Puyallup, Tacoma, and Lakewood (shown in Appendix H4, Air Quality Supporting Materials). Per 23 CFR 450.104 definitions, a maintenance area is a geographic region that the EPA previously designated as a nonattainment area pursuant to the Clean Air Act Amendments of 1990 and subsequently redesignated as an attainment area subject to the requirement to develop a maintenance plan under Clean Air Act Section 175A. The project corridor is also within former carbon monoxide and PM_{10} maintenance areas.

Table 4.6-1 Monitored Criteria Pollutant Concentration

Pollutant	National Ambient Air Quality Standard	Monitored Concentration*				
		2018	2019	2021	2022	2023
1-hour carbon monoxide (ppm)	35 ppm	1.0	1.2	NA	NA	NA
8-hour carbon monoxide (ppm)	9 ppm	0.9	0.8	NA	NA	NA
8-hour ozone (ppm)	0.070 ppm	0.062	0.050	0.052	0.047	0.049
98th percentile 1-hour nitrogen dioxide (ppm)	0.100 ppm	0.046	0.040	0.040	0.037	0.038
Annual nitrogen dioxide (ppm)	0.053 ppm	0.027	0.024	NA	NA	NA
24-hour PM_{10} ($\mu g/m^3$)	150 $\mu g/m^3$	104	26	25	17	23
98th percentile 24-hour $PM_{2.5}$ ($\mu g/m^3$)	35 $\mu g/m^3$	29.4	19.5	19.1	19.5	19.5
Annual $PM_{2.5}$ ($\mu g/m^3$)	12 $\mu g/m^3$	8.0	7.3	7.7	7.7	7.7
1-hour sulfur dioxide (ppm)	0.075 ppm	0.011	0.006	0.005	0.004	0.003

Notes:$\mu g/m^3$ = micrograms per cubic meter; NA = not available; $PM_{2.5}$ = particles of 2.5 micrometers and smaller; PM_{10} = particles of 10 micrometers and smaller; ppm = parts per million; $PM_{2.5}$ data has wildfire impacted days removed.

*Sources: PSCAA 2019, 2020, 2022, 2023, and 2024. Data from two monitoring stations (S 36th Street in Tacoma and Beacon Hill in Seattle) were reviewed as not all pollutants are monitored at each station. 24-hour PM_{10} data from EPA 2024.

4.6.2.6 Sensitive Receptors

Sensitive populations, also referred to as sensitive receptors, are more susceptible to the effects of air pollution than the general population. Sensitive populations (sensitive receptors) that are in proximity to localized sources of toxics, particulate matter, and carbon monoxide are of particular concern. Land uses considered sensitive receptors include residences, schools, playgrounds, childcare centers, athletic facilities, long-term health care facilities, rehabilitation centers, convalescent centers, and retirement homes. Table 4.6-1 is representative of the air quality conditions experienced by sensitive receptors located near the proposed project. The majority of the sensitive receptors within or adjacent to the project study area are residential uses and are between S 324th Street in Federal Way and 54th Avenue E in Fife. Several churches and schools are throughout the corridor. In addition to residences, churches, and hotels, the majority of the land uses along the project corridor west of the proposed Fife Station are commercial and industrial.

4.6.3 Environmental Impacts

4.6.3.1 No-Build Alternative

The No-Build Alternative includes projects, funding packages, and proposals in the central Puget Sound region that are planned to occur with or without TDLE, as described in Chapter 2 (Section 2.2).

Under the No-Build Alternative, regional VMT would increase by about 9 percent over 2016 existing conditions as a result of projected regional growth (Table 4.6-2). However, pollutant emissions for all criteria pollutants would be lower than existing levels because of improvements to future vehicle emissions. No construction-related air quality impacts or GHG emissions from TDLE would occur because the project would not be built.

4.6.3.2 Long-Term Impacts for the Build Alternatives

Impacts Common to All Alternatives

Because all build alternatives would be of similar length and ridership, direct impacts would be similar. If TDLE is constructed in phases, the minimum operable segment (M.O.S.) to the station in South Federal Way and the M.O.S. to the station in Fife would result in long-term reduction in pollutants and GHGs, as described above, because VMT would be reduced as people switch from personal vehicles to light rail. However, since there would be fewer stations with either M.O.S. than with the full build alternatives, there would be less of a reduction in VMT and, consequently, less of a reduction of pollutant and GHG emissions during operation. Because the M.O.S. would be shorter than the full build alternatives, it would also have fewer air quality impacts during construction.

Regional Emissions

For transit improvement projects, regional emissions are a function of regional VMT, which includes passenger vehicles, transit, and small and heavy-duty trucks. For additional information, see Appendix H4, Air Quality Supporting Information, and Chapter 3, Transportation. As such, the operational emissions analysis takes into account long-term changes in VMT expected to occur under the build alternatives when compared with the No-Build Alternative. As shown in Table 4.6-2, with the extension of light rail south to Tacoma, regional VMT is expected to decrease by approximately 228,000 miles on a typical weekday compared to the No-Build Alternative because some regional passenger vehicle trips and transit

bus trips are expected to shift to light rail with TDLE. VMT for heavy-duty trucks would not change. The regional VMT data for the existing, No-Build, and build alternatives, along with the estimated emissions rates from the EPA MOVES4 model, were used to calculate the criteria air pollutants, including volatile organic compounds, carbon monoxide, nitrogen oxides, sulfur oxides, PM_{10}, and $PM_{2.5}$ emissions for the existing year (2016) and transportation forecast year (2042) conditions. Existing conditions in 2016 for VMT, VHT, and VHD are as estimated by the regional travel demand model (PSRC 2016). Between 2016 and 2020, Sound Transit ridership increased, while other agencies experienced little to no change. A sudden and dramatic decline in transit ridership across all modes and agencies occurred in 2020 due to the COVID-19 pandemic. Since 2020, transit ridership on Sound Transit, King County Metro, and Piece Transit services has gradually recovered, but remains lower than pre-pandemic 2019 ridership for all three agencies. For additional information on traffic trends, see Appendix J1, Transportation Technical Report.

The EPA MOVES model is a state-of-the-science emissions modeling system that estimates air pollution emissions for criteria air pollutants, GHGs, and air toxics for both on-road vehicles and non-road equipment sources (EPA 2023b). Vehicle emissions in the region for the build alternatives would decrease when the region's VMT decreases compared to the No-Build Alternative. The results of the modeling are summarized in Table 4.6-3. When compared to the existing conditions, the regional criteria pollutant emissions are substantially lower for both the 2042 No-Build Alternative and 2042 build alternatives, even though VMT is higher because of improvements to fuel economy standards and the expected transition to electric vehicles. These trends for stricter vehicle emissions standards and increased market penetration for electric vehicles would continue to lower tailpipe emissions in the revised transportation forecast year of 2045, assuming a later opening year in 2035. While resuspended road dust would increase directly proportional to VMT, this increase in PM_{10} emissions would be outweighed by the decrease in tailpipe PM_{10} emissions. The detailed results of the modeling are shown in Appendix H4.3, Air Quality Modeling Results.

Table 4.6-2 Weekday Daily Vehicle Miles of Travel, Vehicle Hours of Travel, and Vehicle Hours of Delay

Alternative	VMT	VHT	VHD
Existing[1]	88,718,000	3,075,000	818,000
2042 No-Build Alternative	97,078,000	3,416,000	924,000
2042 Build Alternatives	96,850,000	3,401,000	914,000
Change Between 2042 No-Build and Build Alternatives	*-228,000*	*-15,000*	*-10,000*

Source: PSRC Travel Demand Model 2016, modified by Fehr & Peers April 2020.

Notes: VHD = vehicle hours of delay; VHT = vehicle hours of travel; VMT = vehicle miles traveled.

(1) Existing conditions in 2016 for VMT, VHT, and VHD are as estimated by the regional travel demand model. The Sound Transit incremental ridership model was calibrated from 2016 regional transit ridership data, and estimates of regional travel demand are shown in the same 2016 base year for consistency in regional and screenline estimates.

Table 4.6-3 Regional Criteria Pollutant Emissions

Pollutant	Daily Emissions (pounds per day)				
	Existing[1]	2042 No-Build	2042 Build	Change Between 2042 No-Build and Build Alternatives	Percent Change Between 2042 No-Build and Build Alternatives
Volatile organic compound	23,291.87	12,041.49	12,007.07	-34.42	-0.29%
Nitrogen oxide	52,984.36	2,272.59	2,255.41	-17.18	-0.76%
Carbon monoxide	633,056.35	194,690.41	194,057.53	-632.88	-0.33%
Sulfur dioxide	333.52	279.49	278.66	-0.83	-0.30%
PM_{10}	8,986.68	8,901.36	8,873.48	-27.88	-0.31%
$PM_{2.5}$	2,886.49	2,400.04	2,392.56	-7.48	-0.31%

Notes: $PM_{2.5}$ = particles of 2.5 micrometers and smaller; PM_{10} = particles of 10 micrometers and smaller; SO_2 = sulfur dioxide; VOC = volatile organic compound.

(1) Calculated as 2020 Emission Factors with 2019 Existing VMT.

Transportation Conformity

Transportation Conformity is a process required by the Clean Air Act Section 176(c), which prohibits the federal agencies from funding, authorizing, or approving transportation plans, programs, or projects that do not conform to the State Implementation Plan for attaining the NAAQS.

Regional Conformity. TDLE is included in the 2022–2050 Regional Transportation Plan (project number 5685). TDLE is also included in the 2023–2026 Regional Transportation Improvement Program, approved July 13, 2023. The project is currently listed in the Transportation Improvement Program under project number RTA-98. Inclusion of the project in both the 2022–2050 Regional Transportation Plan and 2023–2026 Regional Transportation Improvement Program demonstrates that the build alternatives are consistent with the regional Transportation Improvement Program and in conformance with the State Implementation Plan.

Project Level Conformity. The proposed project is within a maintenance area for the federal $PM_{2.5}$ standards. Therefore, per 40 CFR Part 93, analyses for $PM_{2.5}$ are required for conformity purposes. However, the EPA does not require hot-spot analyses (an estimation of likely future localized carbon monoxide, PM_{10}, and/or $PM_{2.5}$ pollutant concentrations and a comparison of those concentrations to the NAAQS), qualitative or quantitative, for projects that are not listed in Section 93.123(b)(1) as an air quality concern. Projects of air quality concern typically involve a substantial number or increase in diesel vehicles and may affect intersections operating at level of service D, E, or F. TDLE does not qualify as a Project of Air Quality Concern as documented in Appendix H4, Air Quality Supporting Information, because the project would improve traffic by reducing regional VMT and encouraging modal shift to light rail. Furthermore, as shown in Table 4.6-1, the measured $PM_{2.5}$ concentrations are below the NAAQS for both the 98th percentile 24-hour $PM_{2.5}$ standard and the annual $PM_{2.5}$ standard in years 2018, 2019, 2021, 2022, and 2023. Therefore, the proposed project would meet the Clean Air Act requirements and 40 CFR 93.116 without any explicit hot-spot analysis. Therefore, the project would not likely worsen existing conditions or create any new violations of the air quality standard for $PM_{2.5}$.

The Puget Sound region has reached the end of the 20-year maintenance period for carbon monoxide and PM_{10} as of 2016 and 2021, respectively; therefore, transportation conformity is no longer required for carbon monoxide and PM_{10} in the region.

FHWA released updated guidance in January 2023 for determining when and how to address mobile source air toxics impacts in the NEPA process for transportation projects as documented in Appendix H4, Air Quality Supporting Information. Based on the *Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA* [National Environmental Policy Act] *Documents* (FHWA 2023), this project is considered to have low potential mobile source air toxics effects because it would serve to improve transit operations without adding substantial new capacity and without creating a facility that is likely to meaningfully increase MSAT emissions. Therefore, a quantitative analysis of mobile source air toxics emissions is not required. However, as part of the regional emissions analysis, the project's effects on MSAT emissions were calculated. As shown in Appendix H4, the 2042 MSAT emissions associated with both the No-Build and the build alternatives are substantially lower than the emissions generated under the existing conditions. When compared with the 2042 No-Build Alternative, the build alternatives would result in a small decrease in MSAT emissions.

Climate Change

The construction, maintenance, and operational GHG emissions were calculated using FTA's Transit Greenhouse Gas Emissions Estimator v3.0 (Estimator) (April 2022). The Estimator is a Microsoft Excel based spreadsheet tool that allows users to quantify lifecycle GHG emissions and associated energy use during the construction, operation, and maintenance phases of a project across select transit modes. Users input general project information, and the Estimator calculates annual GHG emissions by project phase. The Estimator includes embodied emissions from the production and transport of fuel and materials. Information entered into the model consists of length of track and stations by profile type (at-grade, tunnel, or elevated) and station profile type and size.

Each phase of construction and operation was considered separately and in detail (tables provided in Appendix H4 Air Quality Supporting Information), including both upstream and downstream sources of emissions. In total, construction of the project would generate 245 $MTCO_2e$ per year. This total is after the construction emissions were amortized over a 50-year period, which corresponds to the minimum useful lifespan of facilities.[1] In the construction phase of a transit project, upstream emissions are the emissions associated with the extraction, transport, and production of the materials used in the construction of the facilities (e.g., asphalt, concrete, base stone, and steel). Downstream construction emissions are tailpipe emissions resulting from the operation of construction vehicles and equipment.

Sound Transit is committed to following best practices to lower the embodied carbon impact of the project. The technology and regional market opportunities of lower-carbon materials and construction practices continues to advance. Lower-carbon concrete options for guideway construction, steel, rebar, and other materials will be considered and included, where practicable. Sound Transit will also implement BMPs, such as using energy-efficient construction equipment and limiting the equipment and vehicle idling time during construction, which would reduce GHG emissions from construction activities.

[1] FTA Report No. 0263. Greenhouse Gas Emissions from Transit Projects: Programmatic Assessment. April 2024. https://www.transit.dot.gov/about/research-innovation

Operation and maintenance of the vehicles and facilities would generate 2,653 $MTCO_2e$ per year. For TDLE, these emissions are associated with the natural gas required to heat the stations and equipment required for maintenance of track-miles and transit vehicles. Sound Transit and Puget Sound Energy (PSE), which provides power in the city of Federal Way, have entered into an agreement that all electricity accounts related to the operations of Link light rail be sourced solely from renewable wind power via PSE's Green Direct program. Therefore, there would be no upstream emissions associated with the project's electricity use in Federal Way. In the remainder of the TDLE corridor, little to no upstream vehicle emissions associated with the project's electricity use are anticipated because the sources in the project area have very low or zero GHG emissions. As demonstrated through the 2019 Sustainability Plan and, most recently, the 2024 Environmental and Sustainability Targets, Sound Transit is committed to reducing GHG emissions, expanding the use of renewable energy, and making all electricity used for operations carbon free by 2030, and all energy used for operations carbon free by 2050.

With the extension of light rail south to Tacoma, regional VMT is expected to decrease by approximately 73,552,500 miles annually compared to the No-Build Alternative because some regional vehicle trips are expected to shift to light rail with the TDLE. The shift from passenger vehicles to light rail is projected to reduce the regional GHG emissions by approximately 30,009 $MTCO_2e$ per year following the start of revenue service. These emission reductions from displaced vehicles would outweigh the cumulative emissions generated during construction, operation, and maintenance of the project. TDLE would support the four primary strategies listed in Appendix H4, Air Quality Supporting Materials (Section H4.1.4), for reducing GHG emissions from transportation sources.

Table 4.6-4 summarizes the project's annual GHG emissions.

Table 4.6-4 Annual Greenhouse Gas Emissions from Project Construction and Operation

Emission Source	Annual GHG Emissions ($MTCO_2e$ per year)
Construction	
Construction – Upstream Materials and Transport	2,644
Construction – Downstream	194
Operation	
Transitway Maintenance – Upstream	0
Transitway Maintenance – Downstream	44
Facility Operations – Upstream Materials and Transport	0
Facility Operations – Downstream	633
Vehicle Operations – Upstream Materials and Transport	1,965
Vehicle Operations – Downstream	0
Transitway and Vehicle Maintenance – Upstream	0
Transitway and Vehicle Maintenance – Downstream	11
Displaced Emissions – VMT	-30,009
Total Annual GHG Emissions	**-24,519**

Source: FTA Transit Greenhouse Gas Emissions Estimator, 2023.
Notes:
Upstream construction emissions are associated with the extraction, transport, and production of materials used in the construction of the facilities (e.g., asphalt, concrete, and steel).
Downstream construction emissions are tailpipe emissions resulting from the operation of construction vehicles and equipment.

Social Cost of GHGs

The analysis of the social cost of GHGs estimates the monetary value of the net harm to society associated with emission of carbon dioxide, methane, nitrous oxide, or other GHGs that contribute to climate change (Interagency Working Group 2021). Following guidance on analyzing GHGs under NEPA (CEQ 2023), the social cost is estimated based on the total $MTCO_2e$ emissions from the construction and operation of the build alternatives (−27,113 $MTCO_2e$) multiplied by the average cost per $MTCO_2e$ determined by EPA. The estimated 2040 average cost is quantified at $270 per $MTCO_2e$ (using the projected 2.0 percent near-term rate) (EPA 2023c). The 2040 average cost (in 2020 dollars) is used because it is the closest year to the TDLE design year of 2042. This results in an approximately $7.3 million beneficial social cost of GHGs with TDLE.

Potential Benefits

A key purpose of this project is to combat climate change by reducing GHG emissions. This would be accomplished by reducing VMT. TDLE would reduce the region's GHG emissions by approximately 24,519 $MTCO_2e$ per year. This is roughly equivalent to the emissions of 6,000 gas-powered passenger vehicles for 1 year (EPA 2023d).

4.6.3.3 Construction Impacts for the Build Alternatives

Impacts Common to All Alternatives

Because all build alternatives would be of similar length and design and include similar construction techniques, construction impacts would be similar.

During construction, short-term degradation of air quality may occur due to the release of particulate emissions generated by excavation, grading, hauling, and other activities. Exhaust emissions from fuel combustion in motor vehicles and construction equipment are also anticipated and would include carbon monoxide, nitrogen oxides, sulfur dioxide, volatile organic compounds, and directly emitted particulate matter ($PM_{2.5}$ and PM_{10}). Construction vehicle activity and disruption of normal traffic flow may result in increased motor vehicle emissions within certain areas. Potential air quality impacts would be short-term, occurring only while construction work is in progress. A qualitative description of the construction activity is provided below. Quantitative construction emission estimates are not available because those calculations would require greater detail in the construction schedule, phasing, haul trips, and equipment use that has not yet been defined at this stage of the project.

Site preparation and project construction would involve clearing, cut-and-fill activities, grading, and building activities. Construction-related effects on air quality from the proposed project would be greatest during the site preparation phase because most engine emissions are associated with the excavation, handling, and transport of soil on the site. Sources of fugitive dust would include disturbed soil at the construction sites and trucks carrying loads of soil. Unless properly controlled, vehicles leaving the site would deposit dirt and mud on local streets, which could be an additional source of airborne dust after it dries. PM_{10} emissions would vary from day to day, depending on the nature and magnitude of construction activity and local weather conditions. PM_{10} emissions would depend on soil moisture, silt content of soil, wind speed, and the amount of operating equipment. Larger dust particles would settle near the source, while fine particles would be dispersed over greater distances from the construction sites.

Water or other soil stabilizers can be used to control dust, resulting in emission reductions of 50 percent or more. With the implementation of standard construction measures, such as frequent watering (e.g., two times per day at a minimum), fugitive dust emissions from construction activities would not result in adverse air quality impacts.

In addition to dust-related PM_{10} emissions, heavy trucks and construction equipment powered by gasoline and diesel engines would generate carbon monoxide, sulfur dioxide, nitrogen oxides, volatile organic compounds, and some soot particulate ($PM_{2.5}$ and PM_{10}) in exhaust emissions. If construction activities were to increase traffic congestion in the area, carbon monoxide and other emissions from traffic would increase slightly while those vehicles are delayed. These emissions would be temporary and limited to the immediate area surrounding the construction sites.

Construction-related impacts could affect air quality within localized areas of construction activity (including traffic congestion). Implementation of the controls required for the various aspects of construction activities and consistent use of BMPs, as described in the following section, Avoidance and Minimization of Impacts, would avoid and/or reduce on-site emissions. Construction of the proposed project would not be expected to substantially affect air quality. In addition, Sound Transit has a robust community outreach program to keep the public informed of the project and address any community concerns and questions throughout construction.

If construction of TDLE parking facilities at the stations in South Federal Way and Fife is deferred up to 3 years after initial service opens, the same construction-related effects on air quality and implementation of controls and best management practices would also apply at these two station locations at the time the parking facilities are constructed.

Avoidance and Minimization of Impacts

Sound Transit would implement construction BMPs to minimize the impact on existing residential and recreational uses from construction-related emissions and fugitive dust, including the development of a fugitive dust control plan that would be prepared during final design. Such plans typically include the following:

- Identification of all fugitive dust sources.
- A source-specific description of the proposed dust control method(s).
- A prescribed method to identify how often, how much, or when the control method is to be used.
- Provisions for monitoring and recordkeeping.
- A backup plan in case the first control plan is not successful.
- The contact information for the person responsible for making sure the plan is implemented and who can be contacted for dust complaints (Ecology 2016).

In addition to complying with Washington Administrative Code (WAC) 173-400-040 (general standards for maximum emissions), BMPs to reduce construction impacts would be incorporated into construction plans and specifications and could include the following:

- Complying with applicable dust control policies and plans.
- Spraying dry soil with water to reduce dust.
- Using temporary ground covers.
- Minimizing idling of equipment when not in use.

- Planning construction areas to minimize soil exposure for extended periods.
- Covering dirt and gravel piles.
- Establishing wheel wash stations at exits from spoils handling and truck-loading sites.
- Sweeping paved roadways to reduce mud and dust.
- Replanting exposed areas as soon as practical after construction.
- Potentially using renewable diesel, which can reduce emissions by approximately one-third compared to fossil diesel (Ecology 2023a and 2023b).

4.6.3.4 Indirect Impacts

Indirect impacts are potential effects related to the project but not part of it that may occur separated by distance or time but are still reasonably foreseeable. The air quality analysis was performed using projected traffic volumes for future years. In addition to a reduction in automobile VMT related emissions, there would be beneficial indirect impacts from changes in land use. TDLE would indirectly encourage more efficient and denser land use patterns around station areas. This would support non-automobile trips that could further reduce GHG emissions (FTA 2023). These land use benefits may occur over a long period of time.

4.6.4 Potential Mitigation Measures

No mitigation beyond the avoidance and minimization measures described above would be anticipated.

4.7 Noise and Vibration

4.7.1 Introduction to Resource and Regulatory Requirements

This section contains the noise and vibration impact assessment for TDLE, which follows FTA and Sound Transit policies and practices in evaluating impacts and potential mitigation measures. Sound Transit evaluates light rail noise and vibration impacts for transit projects according to the FTA Transit Noise and Vibration Impact Assessment Manual (FTA 2018), Sound Transit policies and guidance, and local ordinances, where applicable. For more information regarding the noise and vibration assessment, refer to Appendix J3, Noise and Vibration Technical Report.

4.7.1.1 Background Information on Noise and Vibration Analysis

Noise

Noise is considered to be unwanted sound. The three parameters that define noise include:

- **Level:** The level of sound is the magnitude of air pressure change above and below atmospheric pressure and is expressed in decibels (dB). Typical sounds fall within a range between 0 dB (the approximate lower limit of human hearing) and 120 dB (the highest sound level generally experienced in the environment).
- **Frequency:** The frequency (pitch or tone) of sound is the rate of air pressure change and is expressed in cycles per second, or hertz (Hz). Human ears can detect a wide range of frequencies from around 20 to 20,000 Hz. The A-weighting system, which reduces the sound levels of higher- and lower-frequency sounds, is used to provide a measure (A-weighted decibels, or dBA) that correlates with human response to noise.
- **Time Pattern:** Because environmental noise is constantly changing, it is common to condense all this information into a single number, called the “equivalent” sound level (Leq). The Leq represents the changing sound level over a period of time, typically 1 hour or 24 hours in transit noise assessments. For assessing the noise impact of rail projects at residences, hotels, and other land uses with sleeping quarters, the day-night sound level (Ldn) is used. The Ldn is a 24-hour cumulative noise exposure metric that accounts for increased noise sensitivity at night. Typical Ldn noise levels and what types of land uses are compatible land uses are shown on Table 4.7-1.

Table 4.7-1 Typical Day-Night (Ldn) Noise Exposure Levels

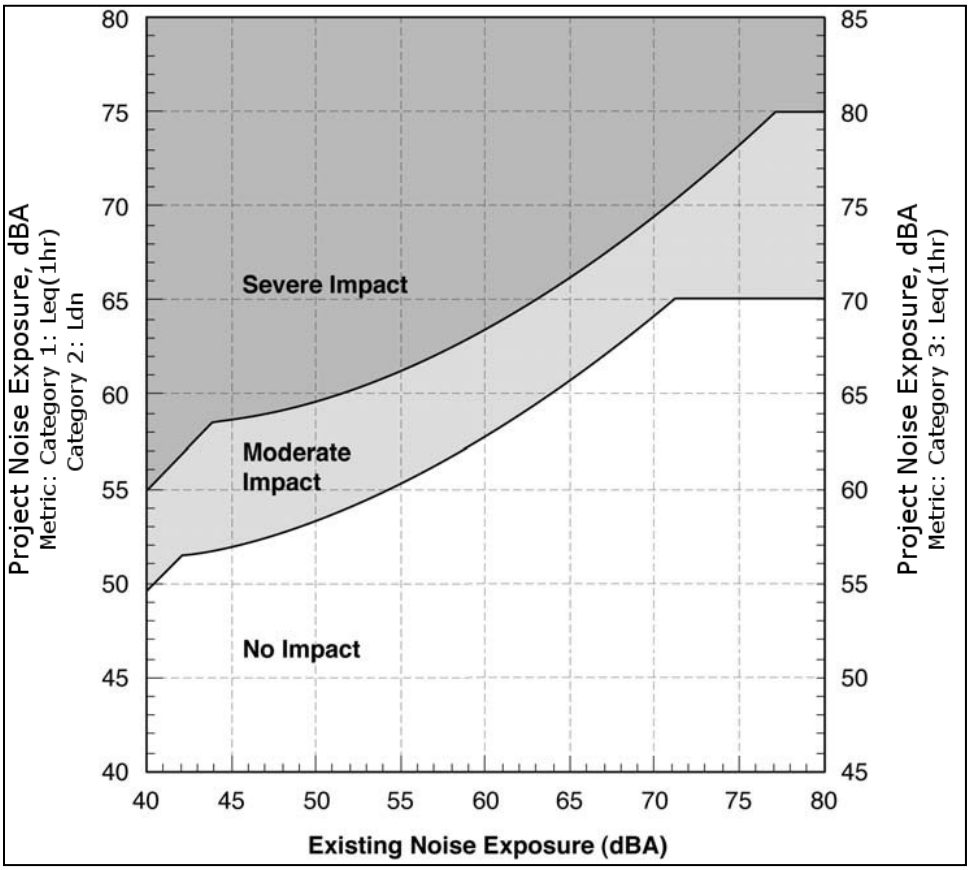
Day-Night equivalent sound level in A-weighted Decibels	Description of Typical Background Noise
Ldn of 50 to 55 dBA	Noise level in a typical quiet suburban residential neighborhood that is not close to major roadways.
Ldn of 55 to 60 dBA	Noise level in a typical suburban residential area with minor arterials and some urban residential areas.
Ldn of 60 to 65 dBA	Noise level in a residential area near a major road.
Ldn of 65 to 70 dBA	Noise levels in this range are typical of a noisy residential area close to major freeways.
Ldn of 70 to 75 dBA	Noise levels in this range are typical for areas directly adjacent to a major freeway and are not normally acceptable for residential use without noise mitigation measures.
Ldn greater than 75 dBA	Noise levels above75 dBA Ldn are typical near the end of airport runways and adjacent to major highways and are not acceptable for residential use.

Source: Adapted from FTA 2018.

The noise assessment uses FTA operational noise impact criteria, which are based on both the existing level of noise and the change in noise exposure due to a project, FTA construction impact criteria, and WAC criteria for park-and-ride facilities. The noise criteria depend on the land use category of the sensitive receptor, which is a land use that is considered sensitive to noise impacts, such as schools, residences, libraries, hospitals, and other care facilities. The FTA operational noise impact criteria are shown in Figure 4.7-1 and the land use category descriptions are shown in Table 4.7-2.

The FTA noise criteria are based on the land use category of the sensitive receptor. The descriptors and criteria for assessing noise impacts vary according to land use categories adjacent to TDLE. For Category 2, land uses where people live and sleep (e.g., residential neighborhoods, hospitals, and hotels), the Ldn is the assessment parameter. For other land use types (Category 1 or 3) where there are noise-sensitive uses (e.g., outdoor concert areas, schools, and libraries), the Leq for the loudest hour of train activity during hours of noise sensitivity is the assessment parameter.

The FTA does not specify standardized criteria for construction noise impact but provides noise impact guidelines for sensitive land uses that describe levels that may result in an adverse community reaction.



Source: FTA 2018.

Figure 4.7-1 FTA Noise Impact Criteria

Table 4.7-2 Land Use Categories and Metrics for Transit Noise Impact Criteria

Land Use Category	Land Use Type	Noise Metric (dBA)	Description of Land Use Category
1	High Sensitivity	Outdoor Leq(h)[1]	Land where quiet is an essential element of its intended purpose. Example land uses include land preserved for serenity and quiet, outdoor amphitheaters and concert pavilions, and National Historic Landmarks with considerable outdoor use. Recording studios and concert halls are also included in this category.
2	Residential	Outdoor Ldn	This category is applicable to all residential land uses and buildings where people normally sleep, such as hotels and hospitals.
3	Institutional	Outdoor Leq(h)[1]	This category is applicable to institutional land uses with primarily daytime and evening use. Example land uses include schools, libraries, theaters, and churches, where it is important to avoid interference with such activities as speech, meditation, and concentration on reading material. Places for meditation or study associated with cemeteries, monuments, museums, campgrounds, and recreational facilities are also included in this category.

Note:
(1) Leq (h) for the loudest hour of project-related activity during hours of noise sensitivity.

Traffic Noise Criteria

Sound Transit also analyzed the potential increased traffic noise for noise-sensitive land uses. Traffic noise impacts could result from the development of new or extended roadways in station areas, or from the removal of buildings, walls, or berms that shield traffic noise. FTA criteria and methods were used for non-federal-aid highways (e.g., new or modified local roadways) and FHWA methods and criteria for federal-aid highways (e.g., I-5). WSDOT's traffic noise impact threshold for residential land use is an hourly Leq of 66 dBA. See Attachment G of Appendix J3, Noise and Vibration Technical Report for additional details regarding the traffic noise criteria.

Vibration

For the purposes of the vibration analysis of light rail, the potential ground-borne vibration from trains refers to the fluctuating or oscillatory motion experienced by persons on the ground and in buildings near the tracks. The response of humans, buildings, and equipment to vibration is most accurately described using velocity or acceleration.

Typical vibration levels from light rail operations can range from below 50 vibration decibels (VdB) to 100 VdB. The human threshold of perception is approximately 65 VdB. People do not generally find vibration from light rail operations disruptive until the vibration levels exceed 70 to 75 VdB. Vibration levels between 70 and 80 VdB typically occur near light rail crossovers within 50 feet of the source, this is comparable to a bus going over a pothole. Vibration levels can exceed 80 VdB when bulldozers or other heavy vehicles or freight trains pass within 50 feet (adapted from FTA 2018).

The land use categories for vibration are similar to those for noise. The assessment of vibration is based on the land use, number of operations, and frequency content of the vibration. More information regarding vibration can be found in Appendix J3, Noise and Vibration Technical Report.

Washington State and Local Noise Ordinances

The Washington State Noise Control Ordinance (WAC 173-60), together with local noise regulations apply to general construction activities and park-and-rides. The Washington State Noise Control Ordinance does not contain a section specific to highway or light rail noise. State law exempts mobile noise sources, including freight rail, aircraft in flight, and vehicles traveling in public right-of-way, as well as safety warning devices (e.g., bells). For stationary land use with noises originating from outside public roadways and rights-of-way, the Washington State Noise Control Ordinance defines three classes of property usage and the maximum noise levels allowable for each.

Contractors would be required to meet the criteria of the noise ordinance for the city within which they are working. Construction outside normal weekday hours (e.g., 7 a.m. to 10 p.m. for locations governed by the WAC) may require a noise variance from the city or county where the work is being performed. Because TDLE travels across ancestral and reservation lands of the Puyallup Tribe of Indians, as well as the cities of Federal Way, Fife, Milton, and Tacoma and unincorporated Pierce County, several additional local noise ordinances are applicable to construction activities, park-and-rides, and other ancillary project-related facilities. Most of the jurisdictions in the corridor have adopted noise control ordinances similar to WAC 173-60. However, local ordinances can include different provisions from the state law. Federal Way adopts WAC by reference for maximum environmental noise levels. Milton, Fife, Tacoma, and Pierce County do not adopt the WAC by reference but have adopted similar noise ordinances; the only difference is the definitions of daytime and nighttime. Refer to Section 4.6 of Appendix J3, Noise and Vibration Technical Report, for additional details on local noise ordinances.

4.7.2 Affected Environment

This section summarizes the noise- and vibration-sensitive land uses adjacent to TDLE and the existing noise and vibration conditions in the study area. The study area is based on the maximum distance from the alternatives, where the potential for noise or vibration impacts exists based on a review of the proposed operational schedule, land use, and existing noise levels. The noise and vibration assessments used the FTA guidance manual screening distance of 350 feet from the project centerline for light rail transit projects. Sensitive receptors (as defined in Section 4.7.1.1) located near the proposed alternatives include single-family and multi-family residences, hotels, and places of worship. The survey of sensitive receptors also considers Puyallup Tribal Integrative Medicine (including the Salish Cancer Center), which has specialized equipment that is sensitive to vibration.

4.7.2.1 Noise- and Vibration-Sensitive Land Use

Additional details about noise- and vibration-sensitive land uses are included in Appendix J3, Noise and Vibration Technical Report.

The Federal Way and Tacoma segments have Category 2 sensitive land uses, which include single- and multi-family homes and hotels. There are no institutional or highly sensitive noise- or vibration-sensitive land uses adjacent to the alternatives in the Federal Way Segment and one medical building in the Tacoma Segment.

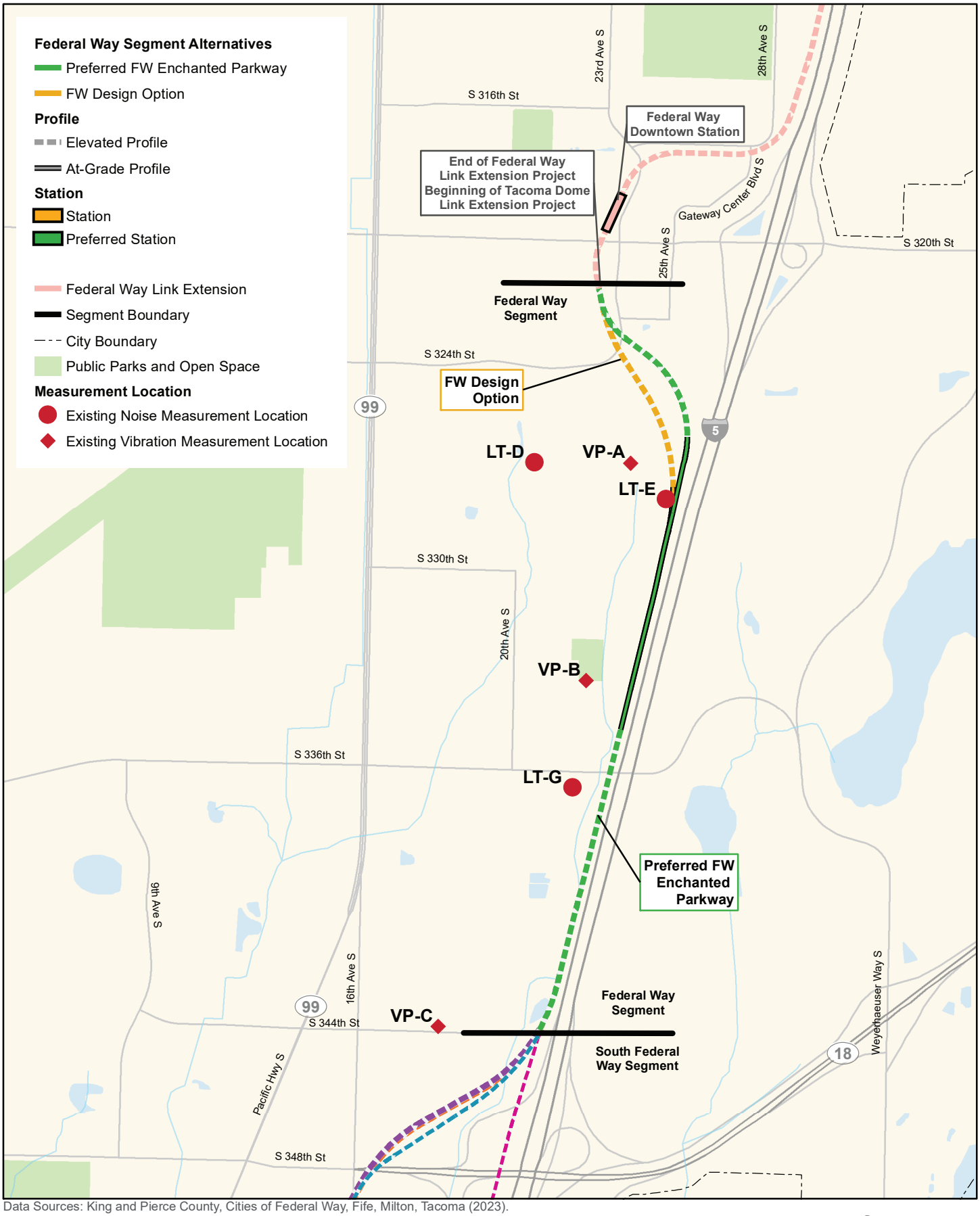
In the South Federal Way and Fife segments, there are Category 2 and 3 land uses that are a mixture of institutional and residential properties, including churches, cemeteries, and a medical building.

4.7.2.2 Existing Noise Conditions

Existing noise sources in the project area include traffic on I-5, local roadway traffic, aircraft overflights, heavy rail (passenger and freight), and local community activities. The existing ambient sound levels vary by location, depending on the proximity to I-5 and other major roadways, and are generally typical of a suburban environment near a busy interstate highway. Existing ambient noise levels were characterized through direct measurements at selected sites near the TDLE build alternatives during November 2019, March 2020, and June 2023. The results of the existing noise measurements are shown in Table 4.7-3 and the locations of the measurements are shown in Figures 4.7-2 through 4.7-5.

Table 4.7-3 Summary of Existing Ambient Noise Measurement Results

Site No.	Measurement Location Description	Start Date	Start Time	Meas. Duration (hours)	Noise Exposure (dBA) Ldn	Noise Exposure (dBA) 1 Hour Leq
LT-D	11 The Dunes Court, Federal Way	11/19/2019	12:00	24	65	59
LT-E	326 Oakland Hills Boulevard, Federal Way	11/19/2019	12:00	24	70	65
LT-I	35810 16th Avenue S, Federal Way	3/16/2020	11:00	24	73	69
LT-J	Abandoned Weigh Station, I-5 (MM 141), Federal Way	3/17/2020	19:00	24	81	77
LT-S	Brooklake Church, Federal Way	6/12/2023	16:00	24	59	54
LT-T	7808 Pacific Highway E, Milton	6/12/2023	15:00	24	68	65
LT-K	1413 69th Avenue E, Fife	3/17/2020	16:00	24	73	69
LT-L	Restaurant Depot, 6130 12th Street E, Fife	3/16/2020	11:00	24	64	56
LT-M	Chateau Rainier Apartments North, 4600 16th Street E, Fife	3/16/2020	12:00	24	65	61
LT-N	Chateau Rainier Apartments South, 4600 16th Street E, Fife	3/16/2020	12:00	24	77	67
LT-O	3812 Pacific Highway E, Fife	3/16/2020	13:00	24	69	65
LT-P	Poulsbo RV, 2950 Pacific Highway E, Fife	3/17/2020	15:00	24	76	72
ST-A	3700 Pacific Highway E, Fife	3/17/2020	17:12	1	–	64
LT-Q	1121 26th Street E, Tacoma	3/17/2020	15:00	24	64	61
LT-R	2611 East E Street, Tacoma	3/17/2020	15:00	24	67	63



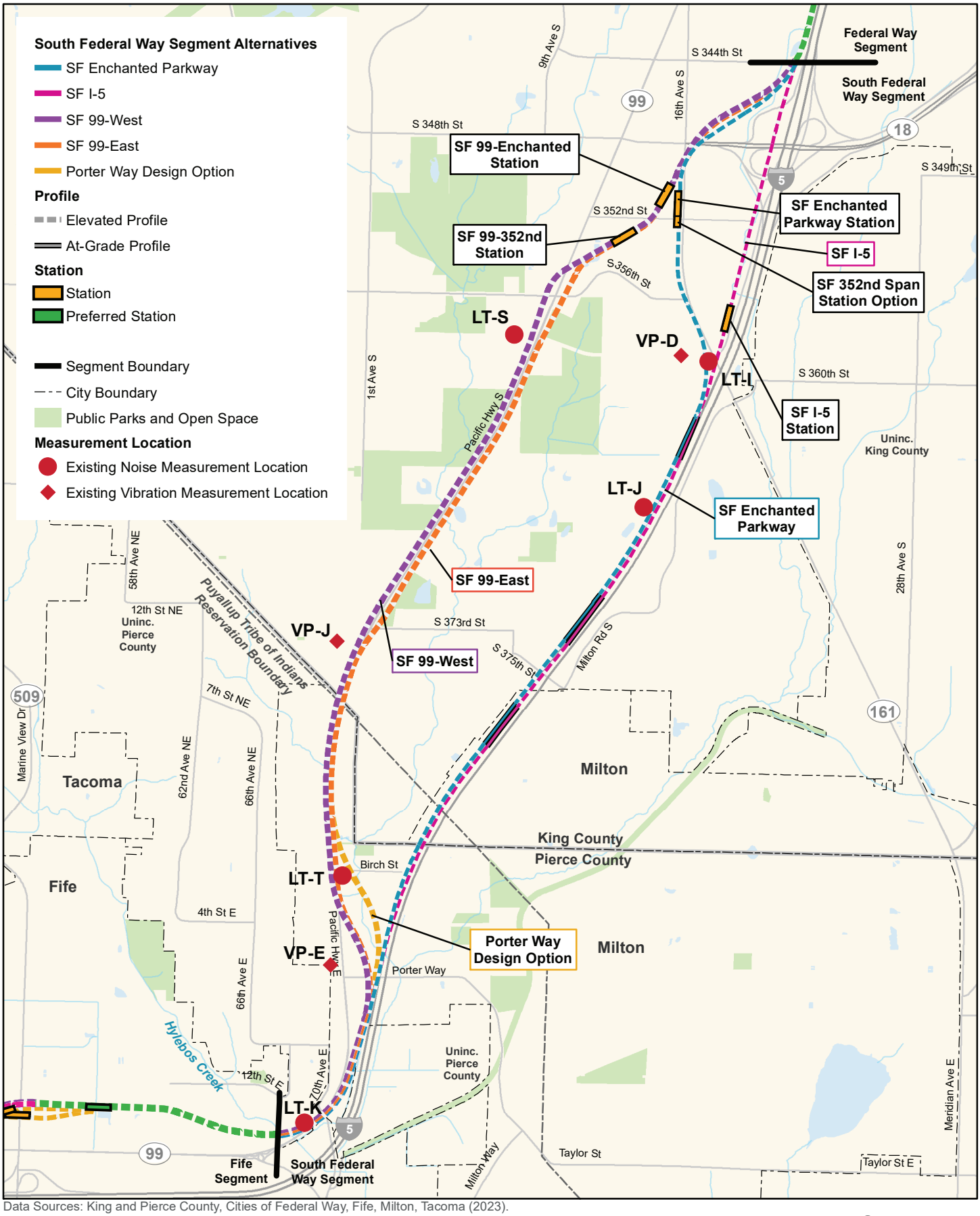
Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

FIGURE 4.7-2
Existing Noise and Vibration Measurement Locations
Federal Way Segment

Tacoma Dome Link Extension

N

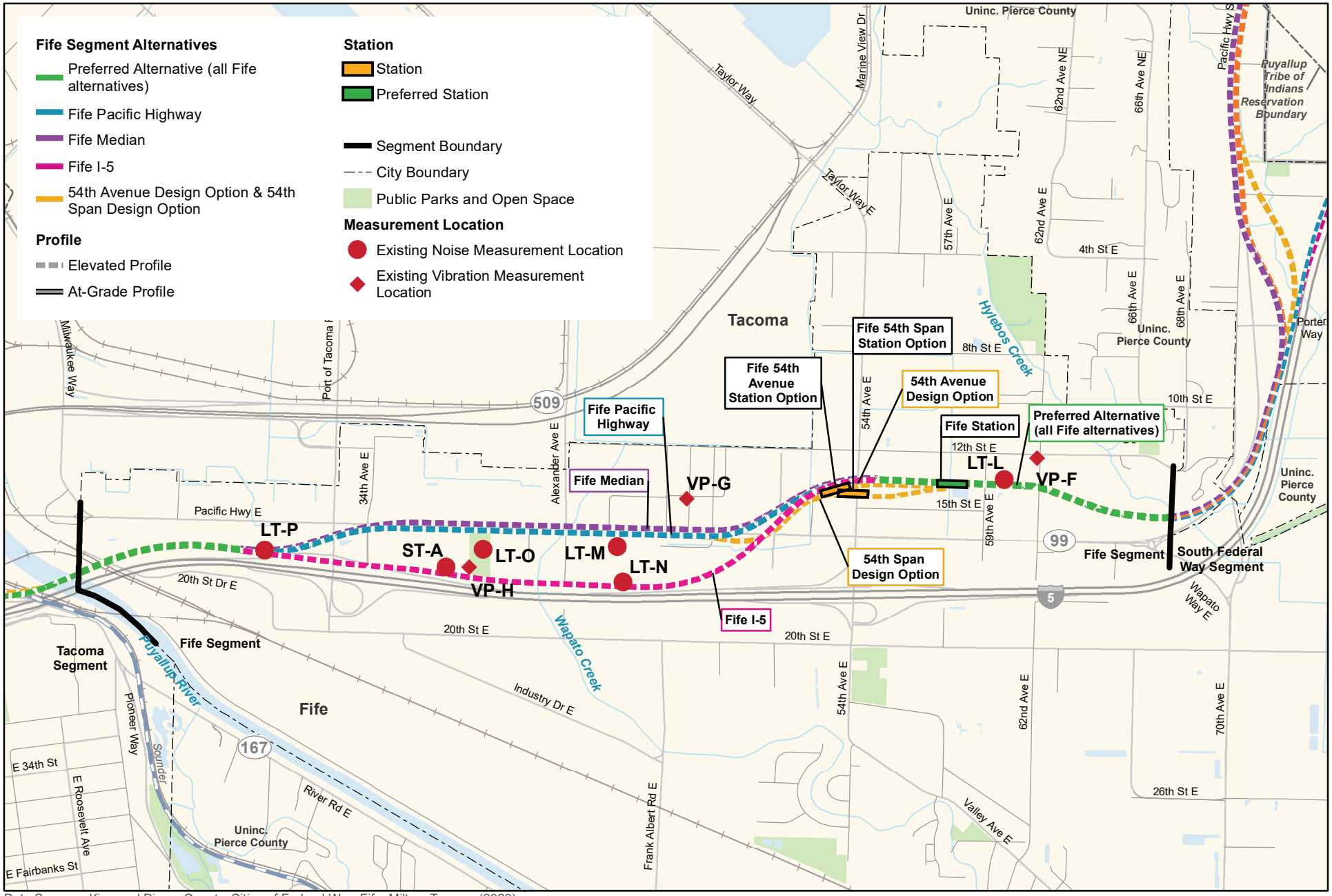
0 0.5 1 Mile



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

FIGURE 4.7-3
Existing Noise and Vibration Measurement Locations
South Federal Way Segment

Tacoma Dome Link Extension



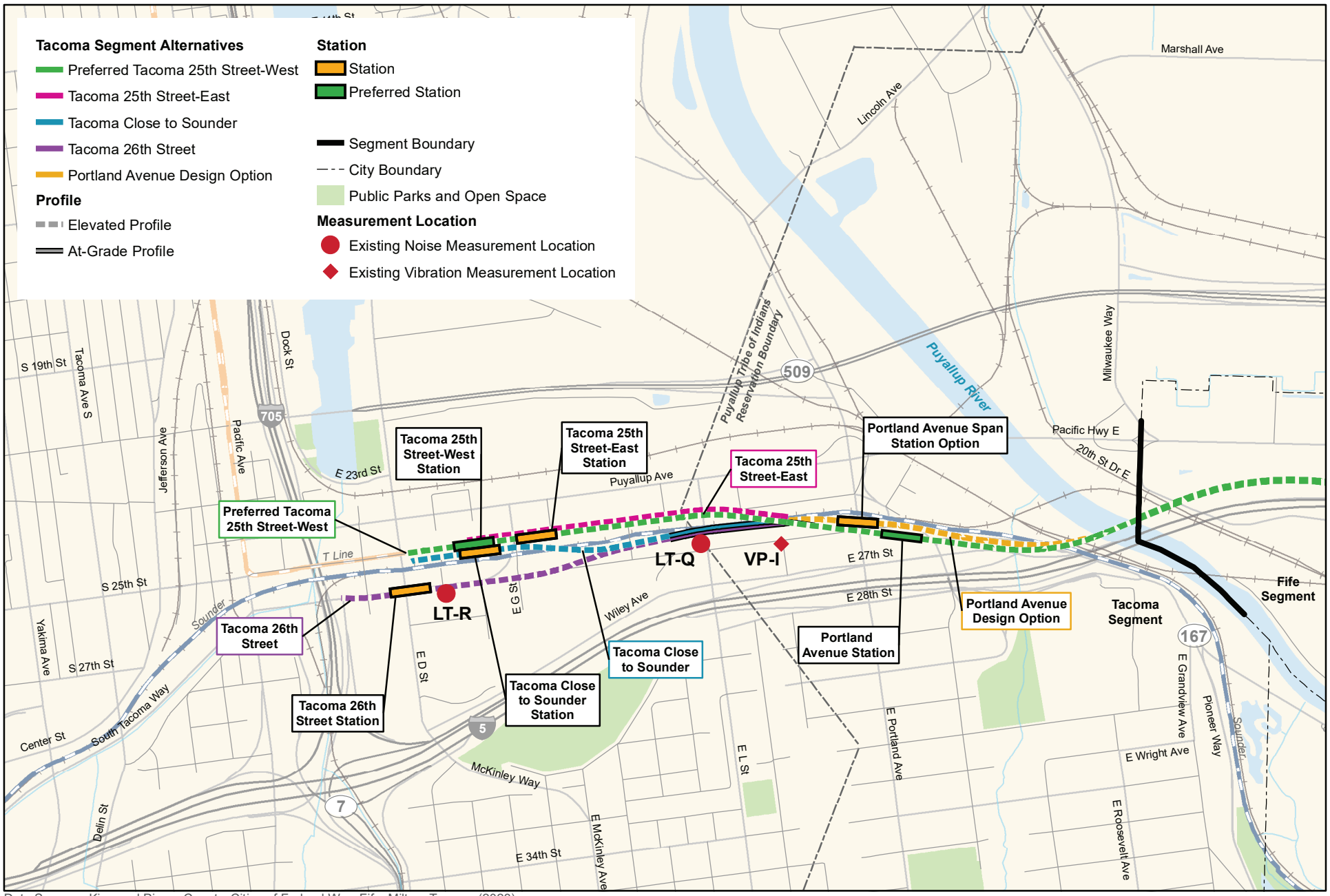
Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

0 0.5 1 Mile

FIGURE 4.7-4
Existing Noise and Vibration Measurement Locations
Fife Segment

Tacoma Dome Link Extension



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

0 0.5 1 Mile

FIGURE 4.7-5
Existing Noise and Vibration Measurement Locations
Tacoma Segment
Tacoma Dome Link Extension

4.7.2.3 Existing Vibration Conditions

Vibration-sensitive land use for the project build alternatives is generally similar to the noise-sensitive land use described above, focusing on where people live and sleep, places of worship, and schools or where highly sensitive technical equipment is operated. Existing vibration sources along the project alignments include auto, bus, and truck traffic on local streets, as well as some locations (primarily Tacoma) with heavy rail, commuter rail and T Line operations. Vibration from street traffic is not generally perceptible at receivers in the study area unless streets have substantial bumps, potholes, or other uneven surfaces. Still, the FTA vibration impact criteria feature impact thresholds rather than comparing the change to existing conditions, as the noise criteria does. The vibration analysis considers soil conditions along the TDLE build alternatives and assesses how soil affects the way vibration from light rail is transmitted, or "propagated" to nearby buildings. Ten vibration propagation test sites were selected for the November 2019, March 2020, and June 2023 measurements. The locations of the sites are shown on Figures 4.7-2 through 4.7-5, with more detail in Section 5.3 of Appendix J3, Noise and Vibration Technical Report.

4.7.3 Environmental Impacts

Noise and vibration from light rail operations were modeled using the methods described in the FTA guidance manual (FTA 2018). Noise-generating activities include light rail operations on the TDLE guideway, crossovers, wheel squeal on tight radius curves, warning bells at stations, parking facilities, and traction power substations (TPSS). The only activity that would generate material vibration would be light rail operations on the TDLE guideway. Additionally, there would be noise and vibration generated by construction activities for the guideway, stations, and parking facilities, including demolition and clearing and activities related to constructing the project.

4.7.3.1 No-Build Alternative

The No-Build Alternative includes projects, funding packages, and proposals in the central Puget Sound region that are planned to occur with or without TDLE, as described in Chapter 2 (Section 2.2).

The No-Build Alternative would not result in any noise or vibration impacts. There would likely be increases in highway and local roadway noise due to increased traffic volumes. The OMF South project would increase noise levels at a few receivers near the S 336th Street. There would also be a few noise impacts in Belmor due to the OMF South mainline track. Those impacts, which are a subset of the noise impacts identified for TDLE build alternatives, occur along the guideway south of the Federal Way Downtown Station that would connect to the planned OMF South site.

4.7.3.2 Long-Term Impacts for the Build Alternatives

The noise and vibration impacts for the TDLE build alternatives are summarized in Table 4.7-4 and shown in Figures 4.7-6 through 4.7-24. Appendix J3, Noise and Vibration Technical Report, includes detailed figures for each of the alternative showing the locations of noise and vibration impacts.

There would be no impacts associated with stations or TPSS. Additionally, there are no FTA traffic noise impacts and no FTA or WAC impacts related to the parking facilities. The volumes of traffic are low enough that the noise levels are 15 to 20 dB below the impact thresholds.

If TDLE is constructed in phases, the M.O.S. to the station in South Federal Way and, to a lesser degree, the M.O.S. to the station in Fife would have the same type of noise and vibration impacts, but in a smaller geographic area. For example, the M.O.S. to the station in South Federal Way

would avoid or delay all of the potential noise or vibration impacts identified in Table 4.7-4 for the Fife and Tacoma Segments as well as the impacts identified south of the proposed station location. Similarly, the M.O.S. to the station in Fife would avoid or delay all of the potential noise or vibration impacts for Tacoma and many of the potential impacts in the Fife Segment. At each of the M.O.S. stations, functions associated with being the terminus station, such as differences in parking and feeder bus operations, could have a minor increase in noise impacts near those stations until the rest of TDLE was constructed.

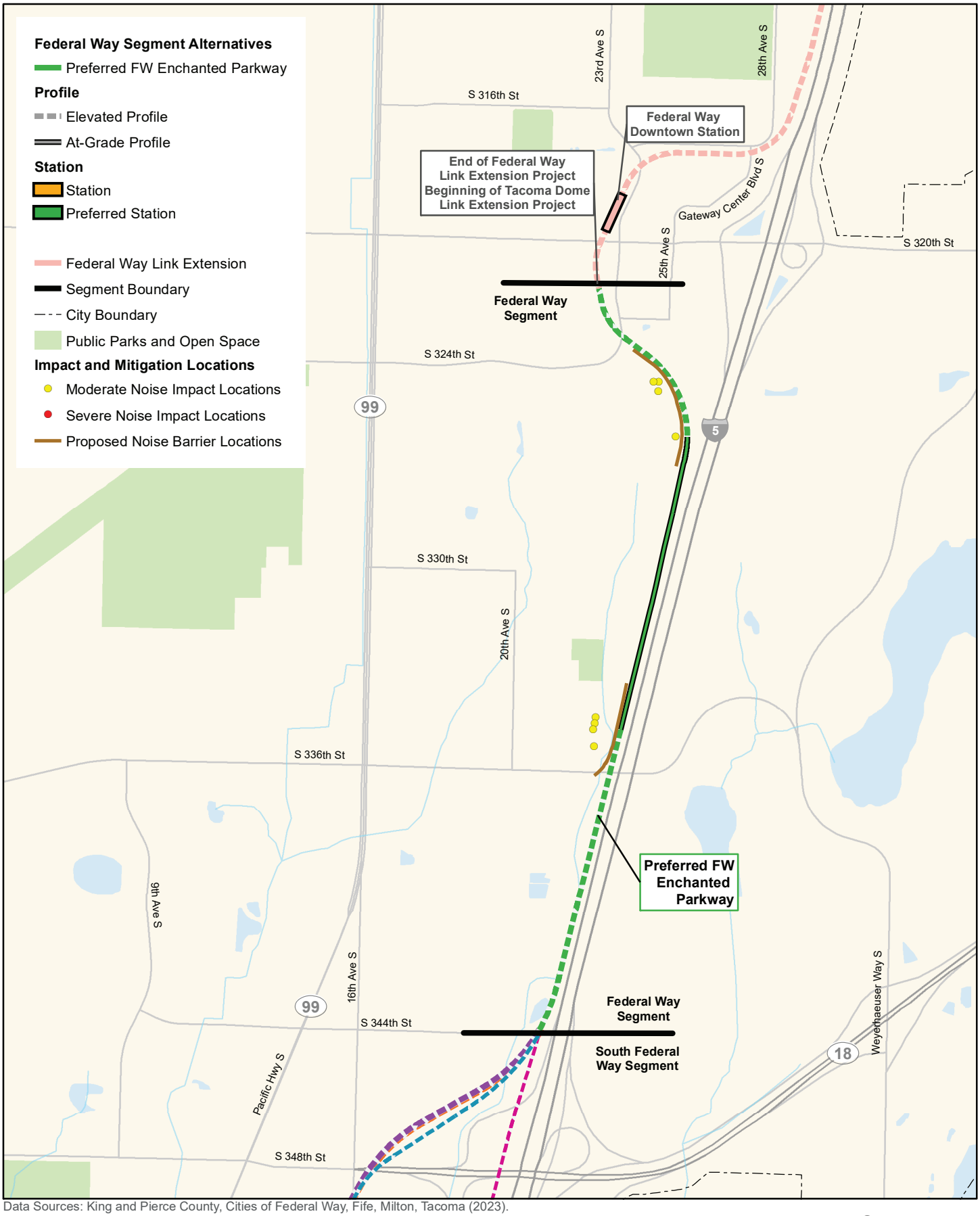
Table 4.7-4 Summary of Potential Noise and Vibration Impacts for the TDLE Alternatives

Alternative	Number of Moderate Noise Impacts[1]	Number of Severe Noise Impacts[1]	Number of Vibration Impacts[1]
Federal Way Segment			
Preferred FW Enchanted Parkway[2]	25	0	0
FW Enchanted Parkway with Design Option	40	2	0
South Federal Way Segment			
SF Enchanted Parkway	74	76	0
SF I-5	9	0	0
SF 99-West	22	5	0
SF 99-West with Porter Way Design Option	20	4	0
SF 99-East	23	3	0
SF 99-East with Porter Way Design Option	20	3	0
Fife Segment			
Fife Pacific Highway	178	3	2
Fife Pacific Highway with 54th Avenue Design Option	176	3	2
Fife Pacific Highway with 54th Span Design Option	182	4	2
Fife Median	178	3	1
Fife Median with 54th Avenue Design Option	176	3	1
Fife Median with 54th Span Design Option	182	4	1
Fife I-5	89	2	1
Fife I-5 with 54th Avenue Design Option	88	2	1
Fife I-5 with 54th Span Design Option	94	3	1
Tacoma Segment			
Preferred Tacoma 25th Street-West	1	2	0
Tacoma 25th Street-East	1	2	0
Tacoma Close to Sounder	1	1	0
Tacoma 26th Street	1	2	0

Notes:

(1) The number of impacts counts the individual residential units with projected noise or vibration impacts. Uses such as multi-family residential have multiple individual residential units on a parcel. Hotels and motels are treated as one impact in the noise impact counts.

(2) In addition, one highway noise impact and eight combined highway and light rail noise impacts would affect the Belmor community due to the changes to the barriers and berm that parallel I-5.



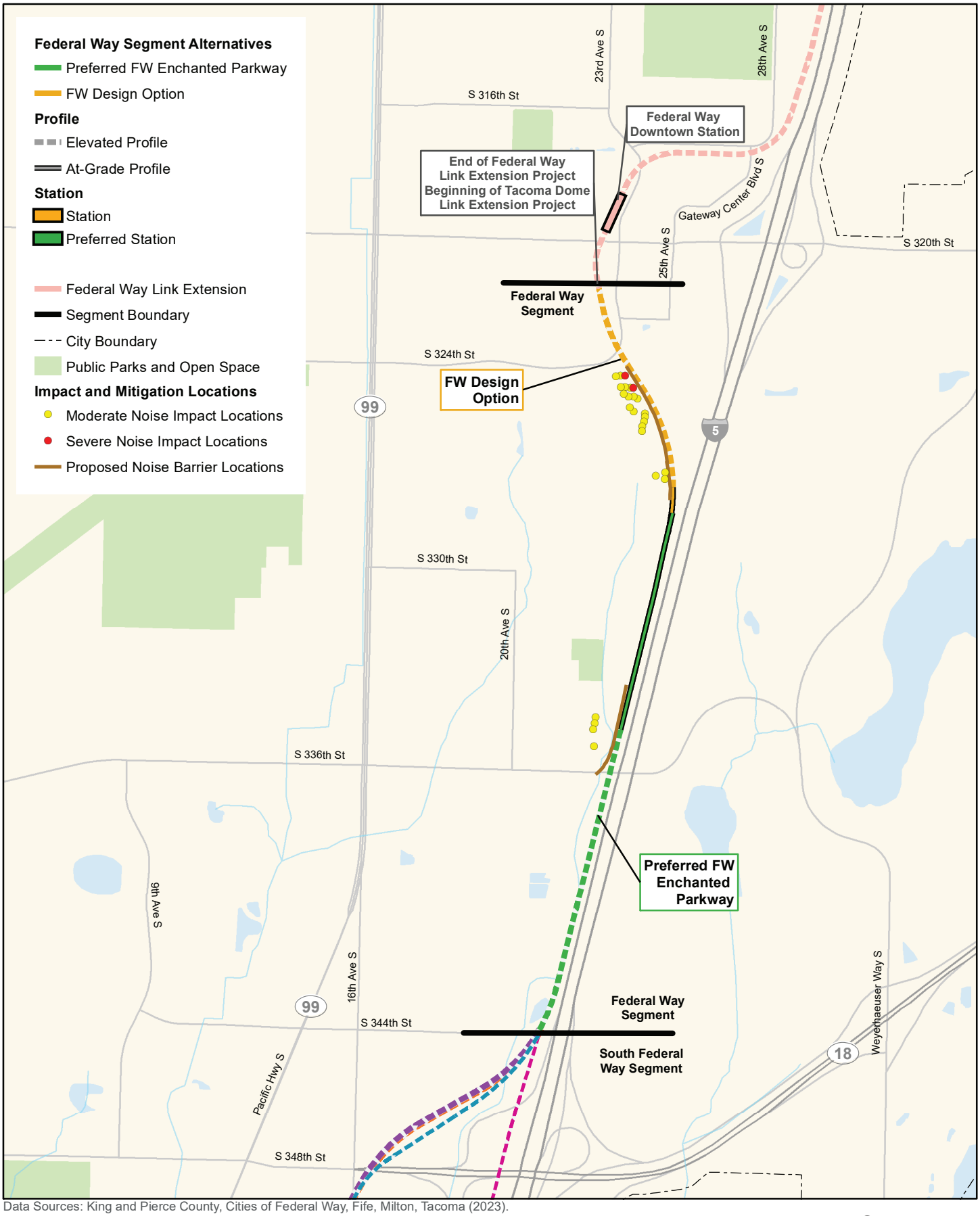
Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

FIGURE 4.7-6
Noise and Vibration Impact Locations and Mitigation Measures
Preferred Alternative
Federal Way Segment

N

0 0.5 1 Mile

Tacoma Dome Link Extension



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

FIGURE 4.7-7
Noise and Vibration Impact Locations and Mitigation Measures
FW Design Option
Federal Way Segment

N

0 0.5 1 Mile

Tacoma Dome Link Extension

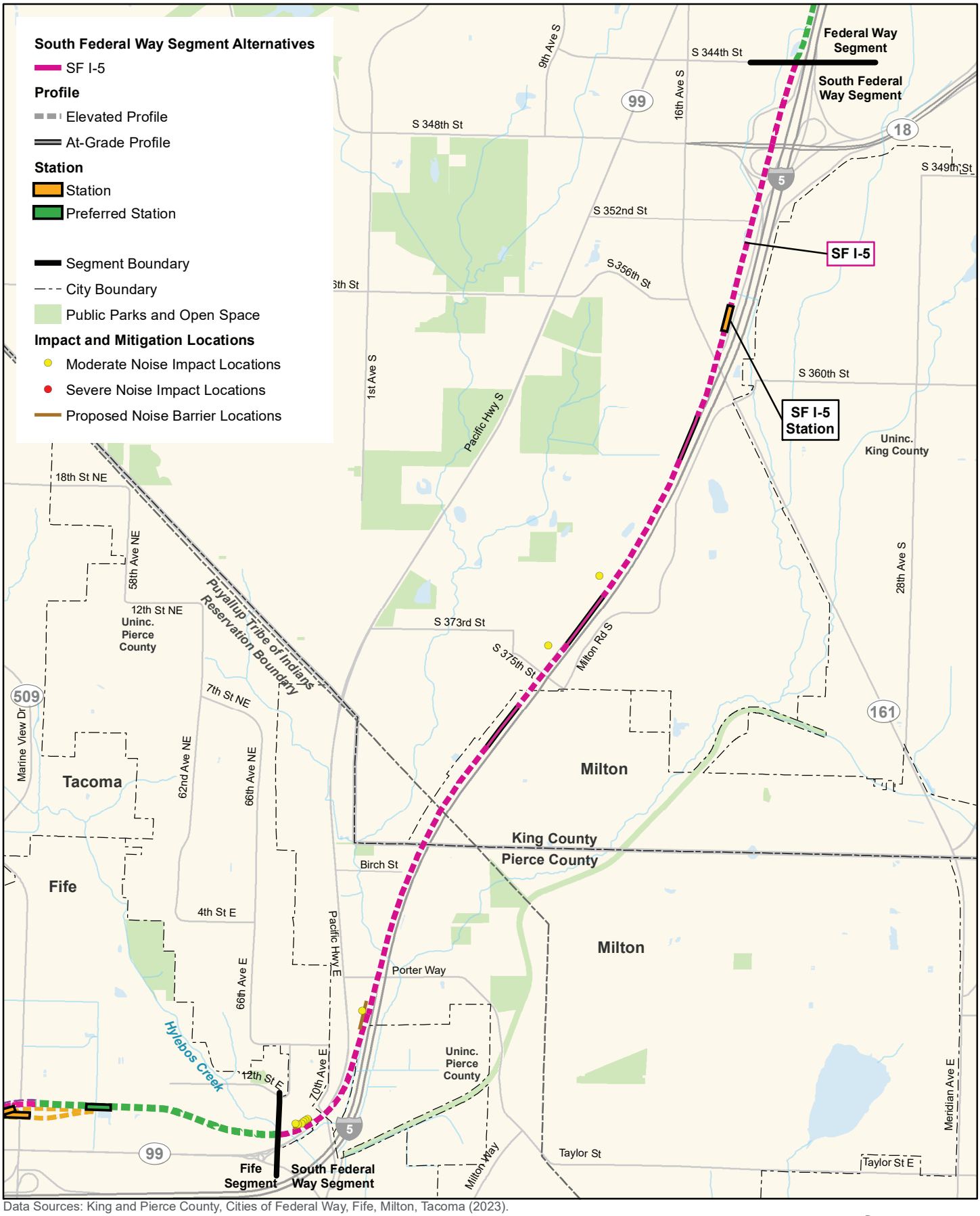
Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

FIGURE 4.7-8
Noise and Vibration Impact Locations and Mitigation Measures
SF Enchanted Parkway Alternative
South Federal Way Segment

Tacoma Dome Link Extension

N

0 0.5 1 Mile



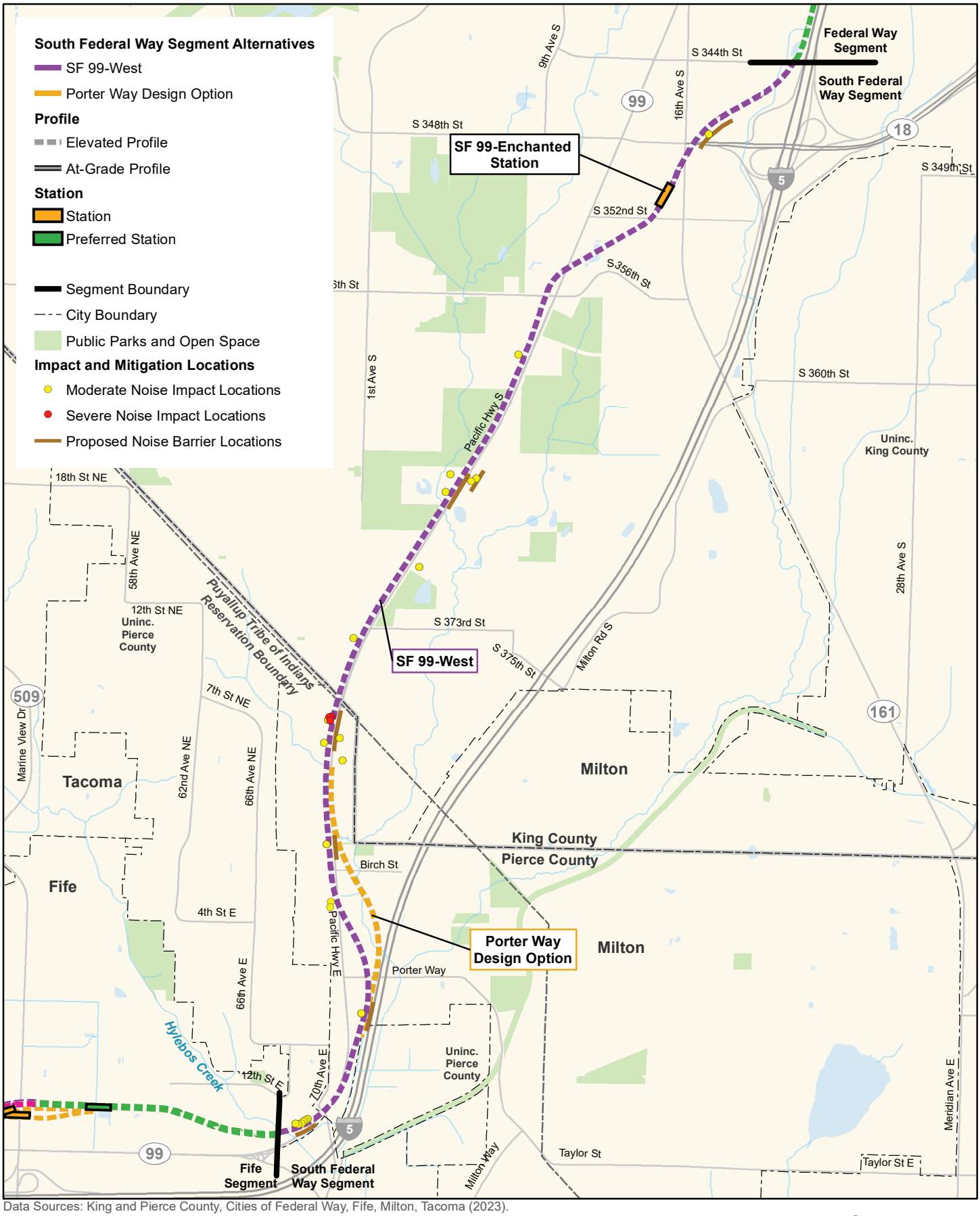
Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

FIGURE 4.7-9
Noise and Vibration Impact Locations and Mitigation Measures
SF I-5 Alternative
South Federal Way Segment

Tacoma Dome Link Extension

N

0 0.5 1 Mile



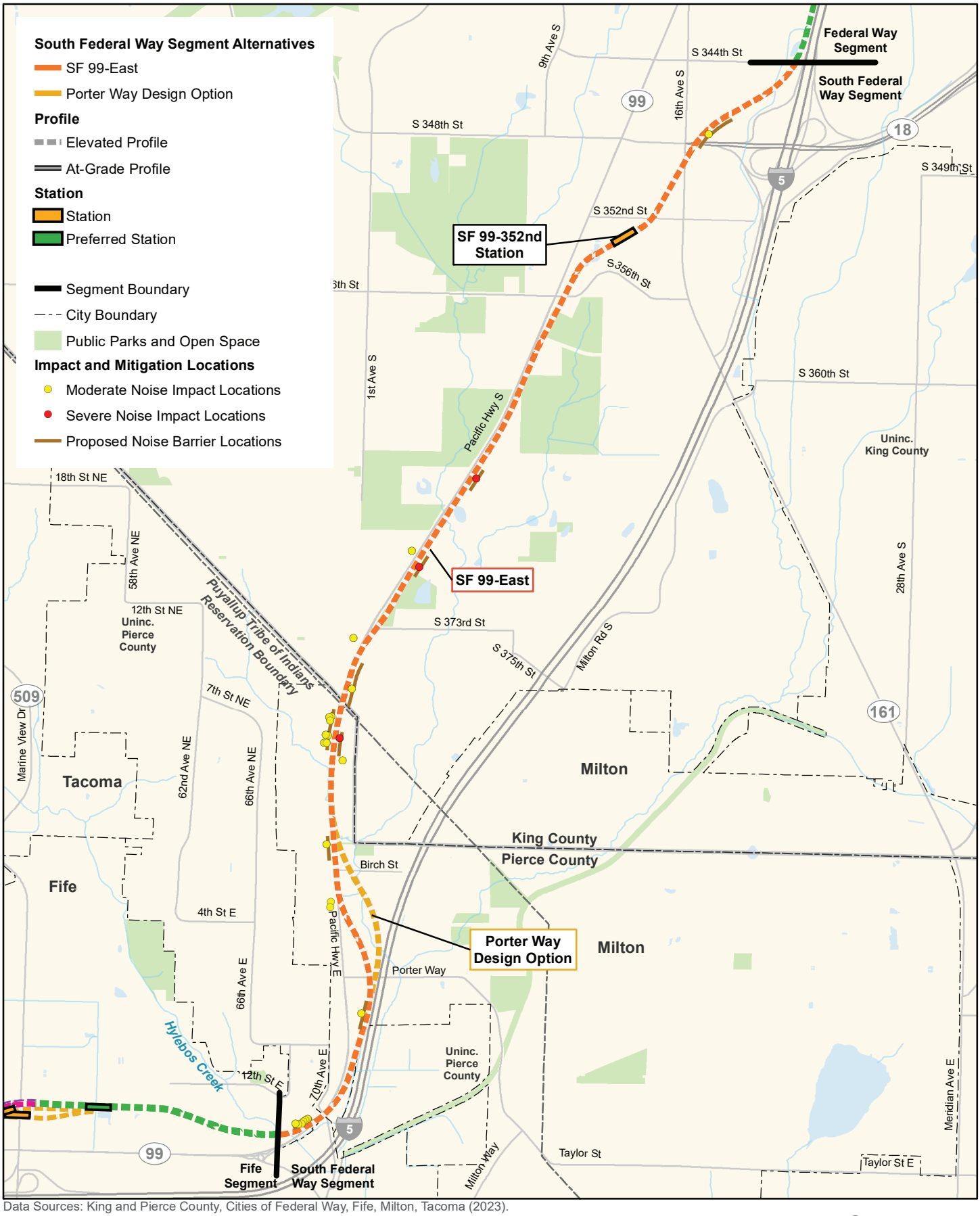
Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

0 0.5 1 Mile

FIGURE 4.7-10
Noise and Vibration Impact Locations and Mitigation Measures
SF 99-West Alternative
South Federal Way Segment

Tacoma Dome Link Extension



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

0 0.5 1 Mile

FIGURE 4.7-11
Noise and Vibration Impact Locations and Mitigation Measures
SF 99-East Alternative
South Federal Way Segment

Tacoma Dome Link Extension

Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

0 0.5 1 Mile

FIGURE 4.7-12
Noise and Vibration Impact Locations and Mitigation Measures
Fife Pacific Highway Alternative
Fife Segment

Tacoma Dome Link Extension

Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

0 0.5 1 Mile

FIGURE 4.7-13
Noise and Vibration Impact Locations and Mitigation Measures
Fife Pacific Highway with 54th Avenue Design Option
Fife Segment

Tacoma Dome Link Extension

Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

0 0.5 1 Mile

FIGURE 4.7-14
Noise and Vibration Impact Locations and Mitigation Measures
Fife Pacific Highway with 54th Span Design Option
Fife Segment

Tacoma Dome Link Extension

Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

0 0.5 1 Mile

FIGURE 4.7-15
Noise and Vibration Impact Locations and Mitigation Measures
Fife Median Alternative
Fife Segment

Tacoma Dome Link Extension

Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

0 0.5 1 Mile

FIGURE 4.7-16
Noise and Vibration Impact Locations and Mitigation Measures
Fife Median with 54th Avenue Design Option
Fife Segment

Tacoma Dome Link Extension

Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

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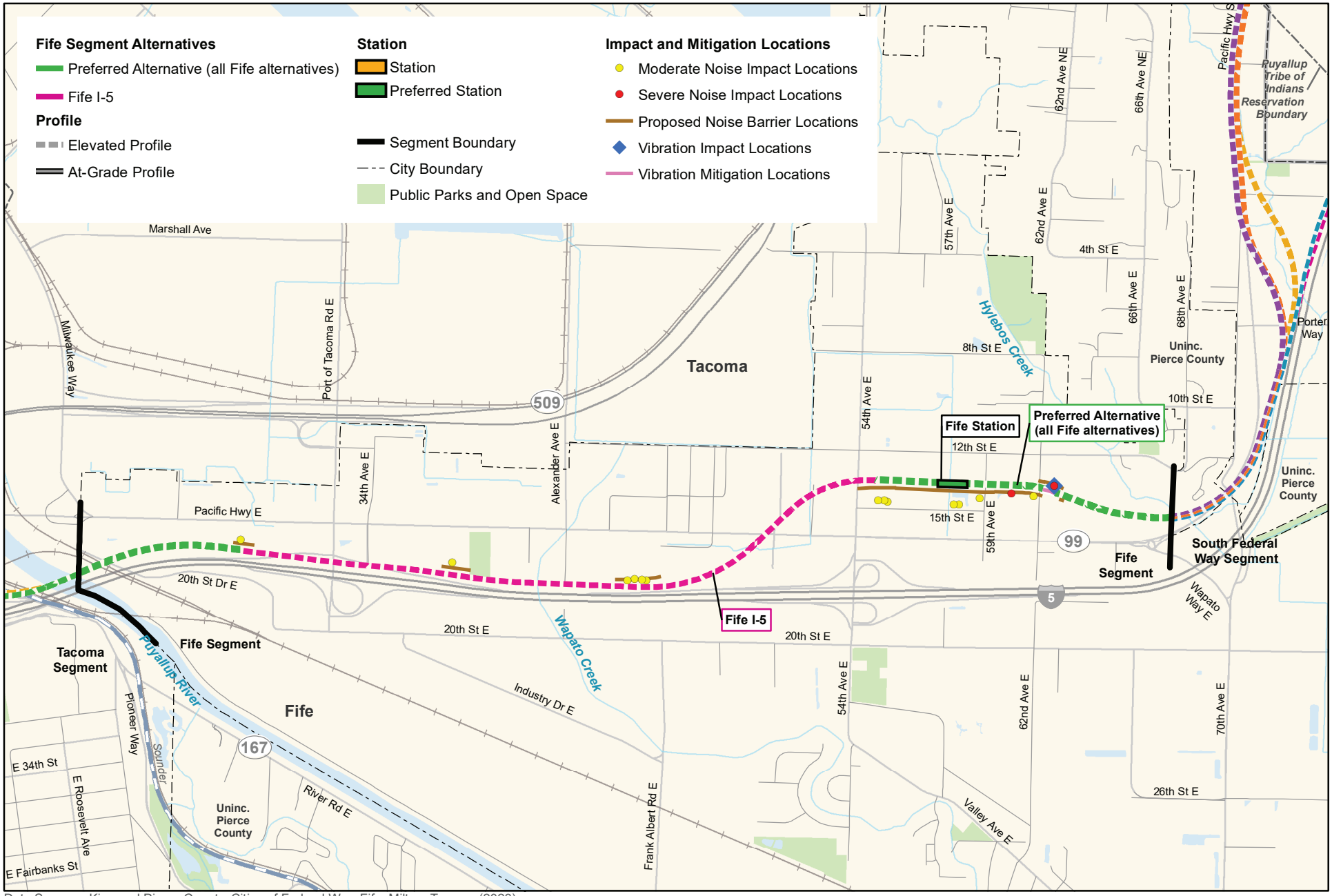
FIGURE 4.7-17
Noise and Vibration Impact Locations and Mitigation Measures
Fife Median with 54th Span Design Option
Fife Segment

Tacoma Dome Link Extension



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

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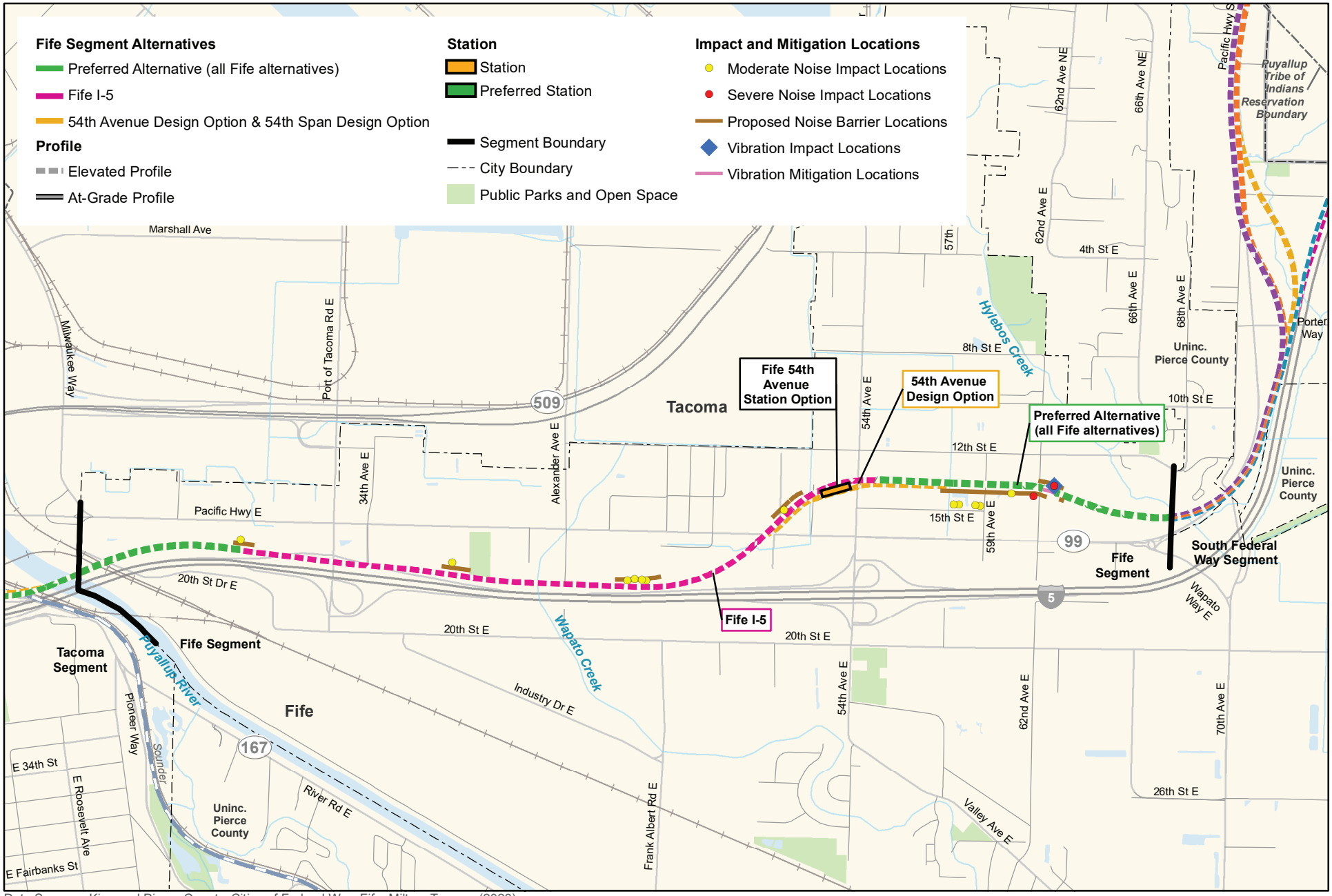
FIGURE 4.7-18
Noise and Vibration Impact Locations and Mitigation Measures
Fife I-5 Alternative
Fife Segment

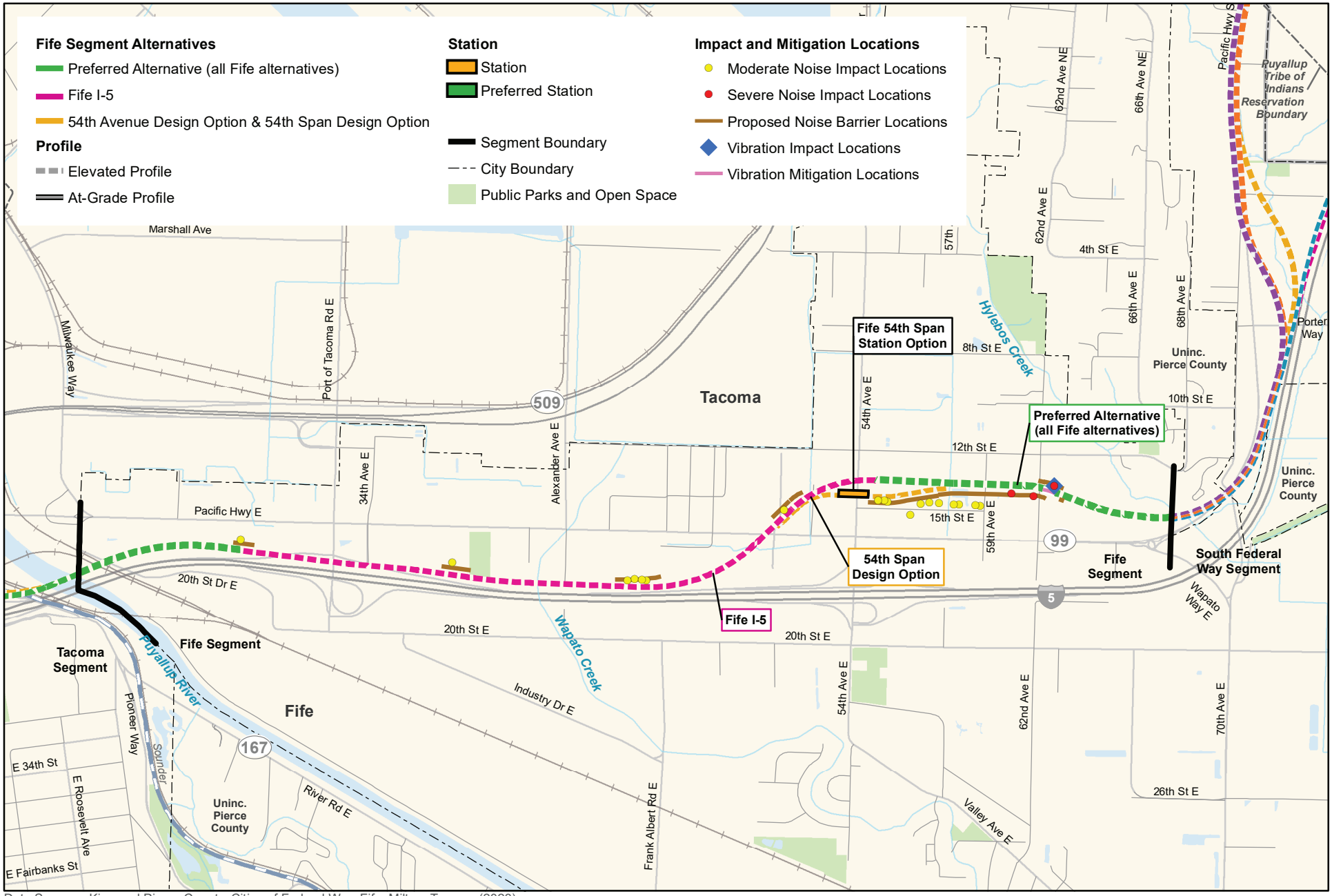
Tacoma Dome Link Extension



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

FIGURE 4.7-19
Noise and Vibration Impact Locations and Mitigation Measures
Fife I-5 with 54th Avenue Design Option
Fife Segment

Tacoma Dome Link Extension



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

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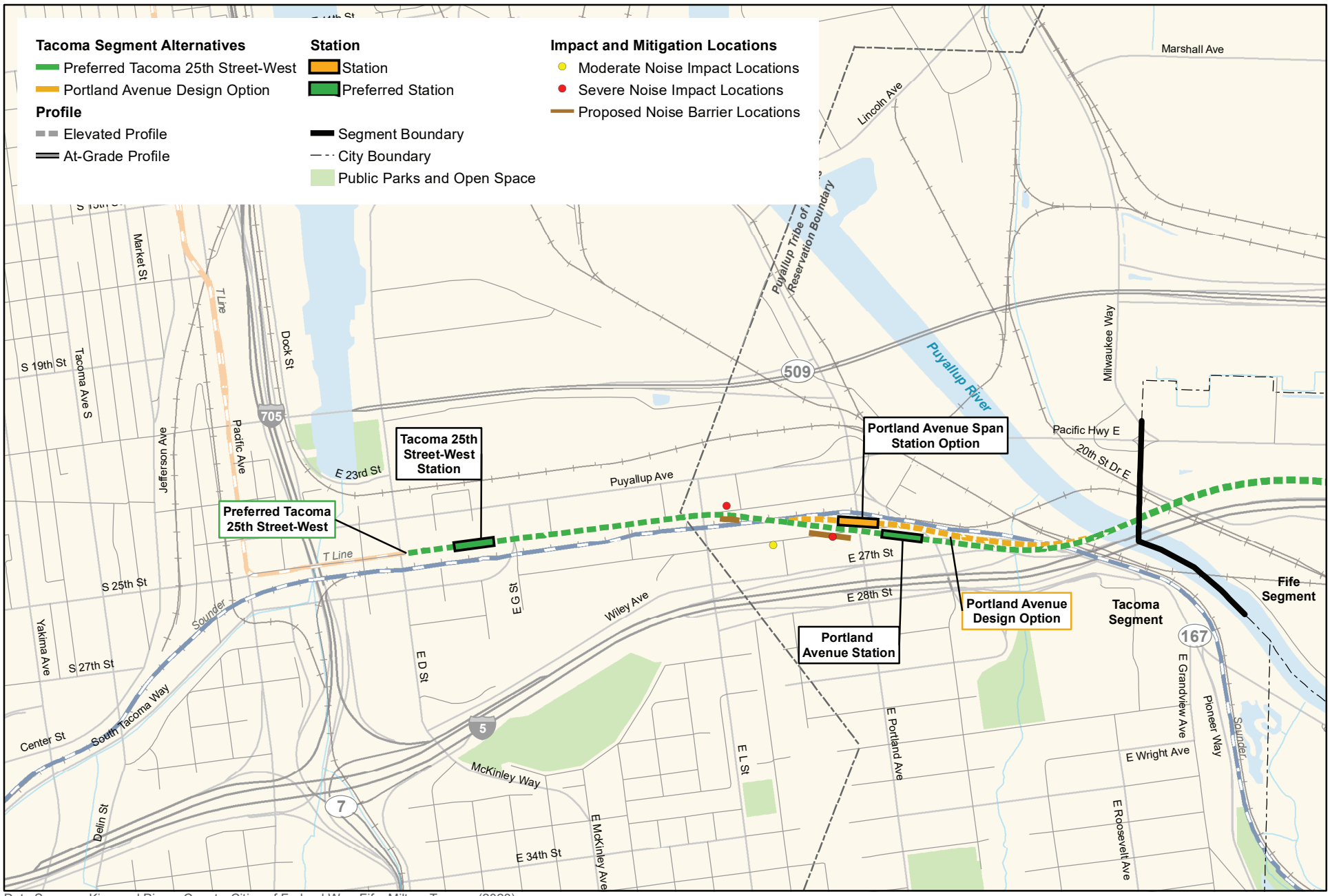
FIGURE 4.7-20
Noise and Vibration Impact Locations and Mitigation Measures
Fife I-5 with 54th Span Design Option
Fife Segment

Tacoma Dome Link Extension



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

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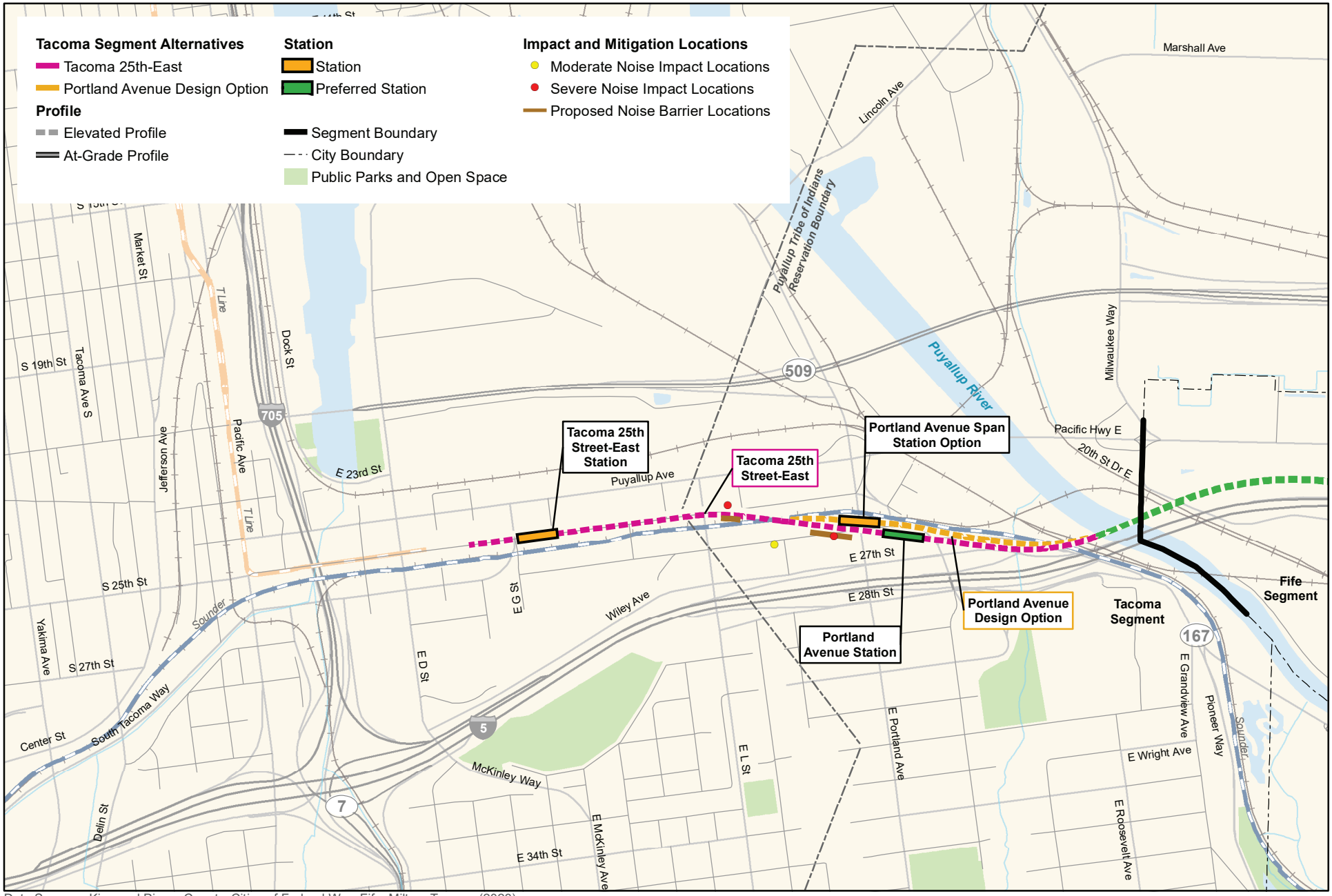
FIGURE 4.7-21
Noise and Vibration Impact Locations and Mitigation Measures
Preferred Tacoma 25th Street-West Alternative
Tacoma Segment



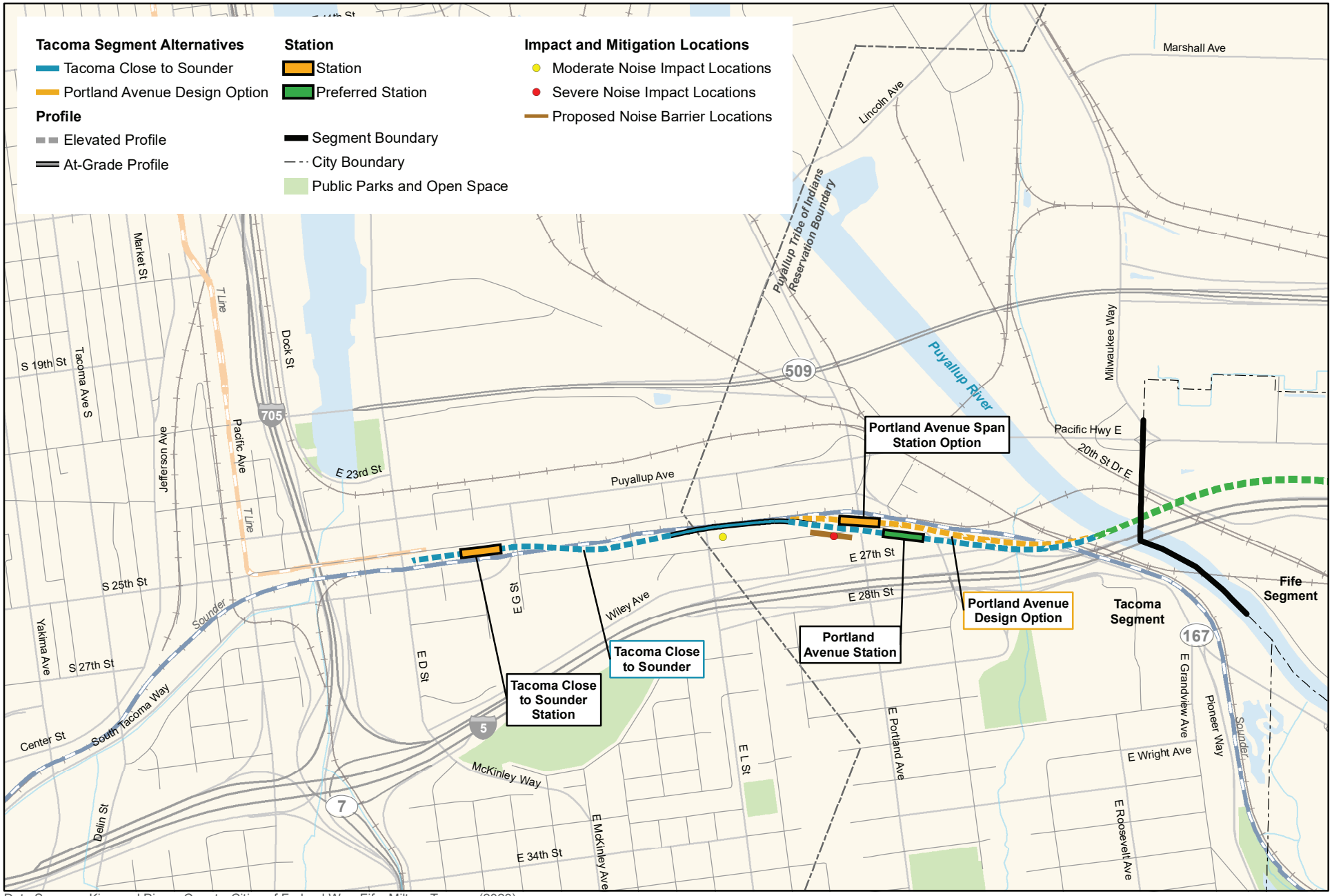
Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

0 0.5 1 Mile

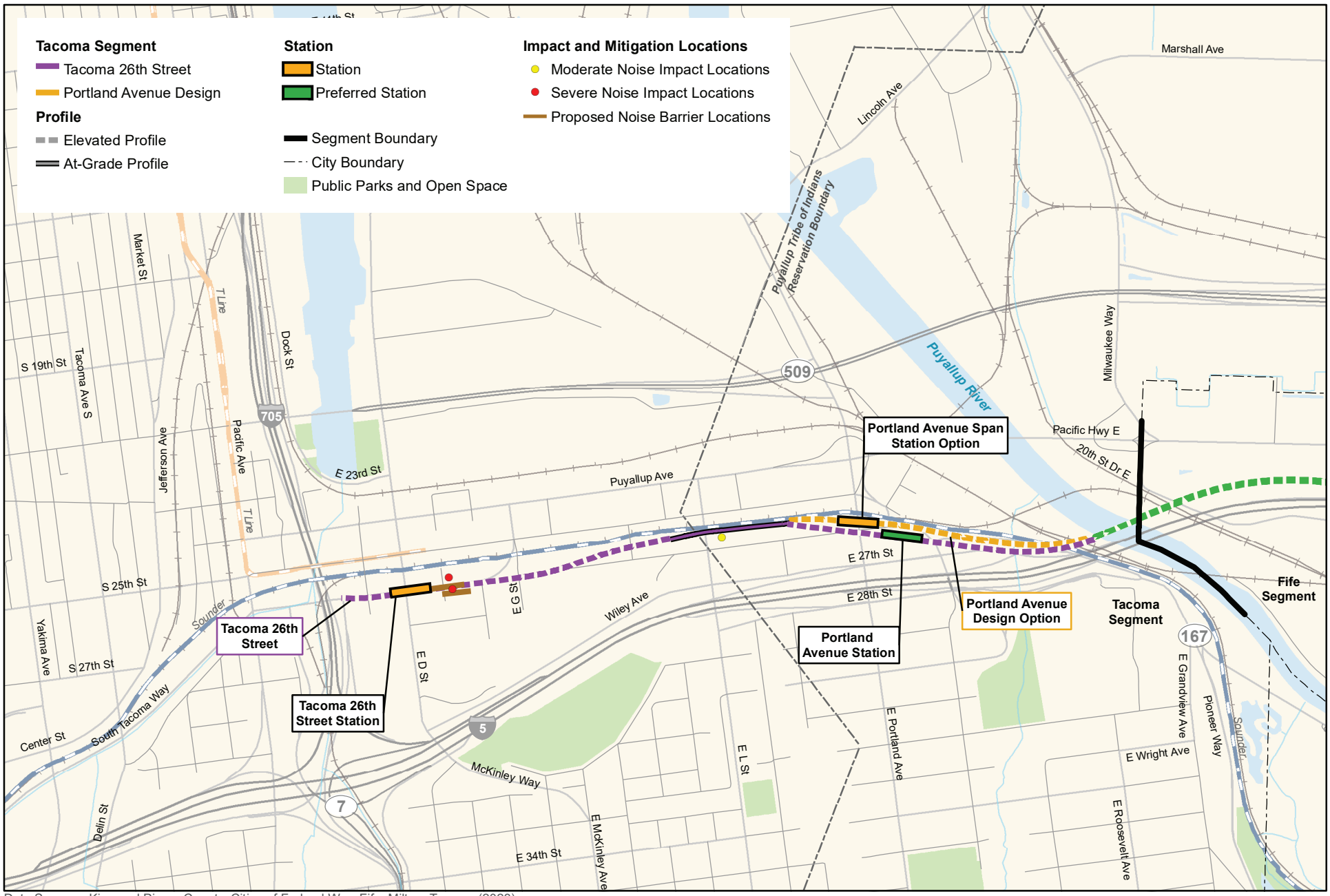
FIGURE 4.7-22
Noise and Vibration Impact Locations and Mitigation Measures
Tacoma 25th Street-East Alternative
Tacoma Segment

Tacoma Dome Link Extension



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

FIGURE 4.7-23
Noise and Vibration Impact Locations and Mitigation Measures
Tacoma Close to Sounder Alternative
Tacoma Segment



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

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FIGURE 4.7-24
Noise and Vibration Impact Locations and Mitigation Measures
Tacoma 26th Street Alternative
Tacoma Segment

Tacoma Dome Link Extension

Information regarding the number and severity of the noise and vibration impacts by alternative for each segment is shown in Table 4.7-4, and detailed information on the impacts is contained in Appendix J3, Noise and Vibration Technical Report (Attachment G), Chapter 6.

Federal Way Segment

For the Preferred FW Enchanted Parkway Alternative, the analysis identified 25 moderate noise impacts in the Belmor community. The FW Design Option would increase the noise impacts at this location with additional 15 moderate noise impacts and two new severe noise impacts. The curves north of S 324th Street and from S 324th Street to Oakland Hills Boulevard for both the Preferred FW Enchanted Parkway Alternative and the FW Design Option would have a radius between 600 and 1,000 feet and would be prepared for wayside lubricators. In addition, there would be one highway noise impact in the Belmor community due to the changes to the barriers and berm that parallel I-5 and an additional eight impacts due to the combination of I-5 and light rail noise. See Appendix J3, Noise and Vibration Technical Report (Attachment G) for details regarding the traffic noise assessment.

There are no vibration impacts projected in the Federal Way Segment.

South Federal Way Segment

The SF Enchanted Parkway Alternative would have 74 moderate and 76 severe noise impacts, which would be located primarily between S 356th Street and I-5 and due to the crossover associated with the pocket track and the proximity of the alignment to the CrossPoint Apartments. Additionally, the curve across S 348th Street would have a radius between 600 and 1,000 feet and would be prepared for wayside lubricators. The SF I-5 Alternative would have nine moderate and no severe noise impacts; six of these impacts are single-family homes in unincorporated Pierce County just south of the City of Milton and are impacted by all alternatives.

The SF 99-West Alternative would have 22 moderate and five severe noise impacts. The SF 99-West Alternative with the Porter Way Design Option would have two fewer moderate and one fewer severe noise impacts near where the design option would cross Pacific Highway. Both would have a moderate noise impact at the Montessori Academy at Spring Valley. The SF 99-East Alternative would have 23 moderate and three severe noise impacts. The SF 99-East Alternative with the Porter Way Design Option would have three fewer moderate noise impacts due to the proximity of tracks on either side of SR 99. Both would result in a moderate noise impact at the Gethsemane Cemetery.

All alternatives would result in a moderate noise impact at the Telecare Pierce County Evaluation and Treatment Center.

There are no vibration impacts projected for any of the alternatives in the South Federal Way Segment.

Fife Segment

The noise and vibration impacts for the Fife Pacific Highway and Fife Median alternatives with all three Fife station locations (preferred Fife Station, Fife 54th Avenue Station Option, and Fife 54th Span Station Option) involve single- and multi-family residences, as well as several hotels and the St. Paul Chong Hasang Korean Catholic Community Church. The impacts of these two alternatives vary based on the specific location of the station, the proposed tracks, or special trackwork/switches near the individual properties. The noise impacts at the St. Paul Chong Hasang Korean Catholic Community Church are not related to noise from the station for any of the station locations but are related to the proximity of the crossover and location of the track

relative to the church. Both alternatives would have 176 to 182 moderate and three to four severe noise impacts depending on the station location, as shown in Table 4.7-4.

The Fife I-5 Alternative with all three station locations would have the fewest number of impacts (89 to 94 moderate and two to three severe noise impacts depending on the station location). This alternative affects several of the same properties as the Fife Pacific Highway and the Fife Median alternatives, including single- and multi-family residences, a hotel, and the St. Paul Chong Hasang Korean Catholic Community Church. The Fife I-5 Alternative would impact fewer hotels than the other two alternatives, but it would have a moderate noise impact to the Puyallup Tribe Integrative Medicine. The majority of the noise impacts for all the alternatives would be at the Chateau Rainier Apartments. The curve from the Kings Motor Inn to Pacific Highway on the Fife Pacific Highway Alternative would have a radius between 600 and 1,000 feet and would be prepared for wayside lubricators.

All Fife Segment alternatives would have a vibration impact at a single-family residence on 62nd Avenue E, east of the Fife Station, where the vibration level just exceeds the impact threshold. The Fife Pacific Highway Alternative would also have a vibration impact at the Travelodge due to the very close proximity of the tracks to the building.

Tacoma Segment

The noise impacts for the Tacoma Segment alternatives would each affect two to three properties. The Preferred Tacoma 25th Street-West Alternative and the Tacoma 25th Street-East alternative both have severe noise impacts at two hotels and a moderate noise impact at a single-family home. The Tacoma Close to Sounder Alternative and the Tacoma 26th Street Alternative have a severe noise impact at a hotel and a moderate noise impact at a single-family residence. The Tacoma 26th Street Alternative would have a severe noise impact to the Cedar Wellness Center. The impacts are due to a combination of crossovers and the proximity of the tracks to receptors. The curve by the Tacoma Soccer Center on the Tacoma 25th Street-East Alternative, the curve east of East G Street on the Tacoma Close to Sounder Alternative, and the curve across East G Street on the Tacoma 26th Street Alternative would have a radius between 600 and 1,000 feet and would be prepared for wayside lubricators.

There are no vibration impacts projected for any of the alternatives in the Tacoma Segment.

4.7.3.3 Avoidance and Minimization of Impacts

Wheel squeal is possible on curves with a radius of less than 600 to 1,000 feet, depending on the speed and type of trackway. Wheel squeal is not included in the noise model because Sound Transit has committed to reducing potential wheel squeal during system operations by installing wayside lubricators on all curves with a radius of less than 600 feet in noise-sensitive areas and by preparing all curves with a radius of between 600 and 1,000 feet for wayside lubricators. There are no curves with a radius of less than 600 feet. Curves with a radius between 600 and 1,000 feet are discussed in Appendix J3, Noise and Vibration Technical Report (Section 6).

Wayside lubricators

Wayside lubricators reduce the friction between the wheels and track, significantly reducing or eliminating the squeal noise on curves.

4.7.3.4 Construction Impacts for the Build Alternatives

Noise

Elevated noise levels from construction activities are, to a degree, unavoidable for this type of project and would be similar under all of the TDLE build alternatives. For most construction equipment, diesel engines are typically the dominant noise source. For other activities, such as clearing and demolition, impact pile driving and jackhammering, noise generated by the actual process dominates, but can vary in intensity and duration depending on the localized work being done. Construction noise can be particularly intrusive to residents near construction sites. Most construction noise levels are projected to be between 85 and 90 dBA (hourly Leq) at a distance of 50 feet. Louder sources of noise during construction, including with elevated structures, involve cranes, excavators, concrete pumps, and pneumatic tools. At some locations, more extensive work would occur, such as pile driving for elevated structures or buildings, which can exceed 100 dBA at 50 feet. While many construction activities would primarily occur during weekday daytime hours, nighttime or weekend work may be required in some locations or for specific activities. City noise ordinance procedures would be followed, and waivers or noise variances would be obtained as required.

Construction noise predictions at noise-sensitive locations depend on the amount of noise during each construction phase, the duration of the noise, and the distance from the construction activities to the sensitive receptor. Table 4.7-5 provides an example of a construction noise projection for typical at-grade track construction. Construction for other project features, such as stations and elevated guideway, would have similar results. Specific construction scenarios would be developed during the preparation of the construction noise and vibration plan, when more information on methods, equipment, and durations is available. Using these assumptions, an 8-hour Leq of 88 dBA would be projected at a distance of 50 feet from the construction site.

Table 4.7-5 Typical Construction Scenario, At-Grade Track

Equipment Type	Typical Noise Level at 50 Feet (dBA)	Equipment Utilization Factor (%)	Leq (dBA)
Grader	85	50	82
Backhoe	80	40	76
Compactor	82	20	75
Loader	85	20	78
Roller	74	20	67
Truck	88	40	84
Crane, mobile	83	20	76
Total 8-hour workday Leq at 50 feet:			**88**

Using the FTA noise impact guidelines for construction in residential areas (see Appendix J3, Noise and Vibration Technical Report), the potential for short-term at-grade track construction noise impacts could extend to approximately 120 feet away from the corridor; however, if nighttime construction is conducted (when sensitivity to noise is higher and the criteria for impact are lower), the potential for short-term noise impacts from at-grade construction could extend to approximately 380 feet from the corridor. For elevated structure construction, the distance for noise impacts during the daytime could be up to 250 feet for impact pile driving, assuming it occurs during 20 percent of the day. If alternative methods of piling are used, such

as vibratory, the distance to an impact would be less. Based on the distances above, there would be approximately 500 receivers within the daytime distance and approximately 1,500 receivers within the nighttime distance for all TDLE build alternatives.

As part of the project, construction activities will be carried out in compliance with Sound Transit specifications and all applicable local noise regulations. Construction noise is exempt from the WAC noise limits, except at residential land uses during nighttime hours (10 p.m. to 7 a.m.). If construction is performed during nighttime hours, the contractor must meet the WAC noise level requirements or obtain a noise variance from the governing jurisdiction. Federal Way, Milton, and Tacoma have each adopted their own construction-related noise ordinances, which have only slight differences in the definitions of daytime and nighttime.

Vibration

Unlike typical light rail operations, there is the potential for damage to nearby structures at close distances due to construction vibration from activities, such as pile driving, hoe rams, vibratory compaction, and loaded trucks. Most limits on construction vibration are based on reducing the potential for damage to nearby structures. Although construction vibrations are only temporary, it is still reasonable to assess the potential for human annoyance.

As a conservative approach, the potential for construction vibration damage impacts has been assessed based on the vibration damage criteria for the non-engineered timber and masonry building category (Category 3) in the FTA guidance manual. A vibration criterion of 94 VdB has been used to assess potential damage impact, and the operational vibration criterion of 72 VdB has been used to assess potential vibration annoyance from construction activities. With the exception of impact pile driving, the potential for vibration damage is limited to within 25 feet of construction activities. For impact pile driving, the screening distance for potential vibration damage is 55 feet. There are sensitive receptors within 25 feet of the project alternatives in the Federal Way and South Federal Way segments, and there are several others within 55 feet at other locations as well. However, any potential for impacts would depend on the piling method chosen as part of final design. The potential impacts would be similar under all of the TDLE build alternatives.

Because the exact location of construction equipment is important in projecting vibration levels, a more detailed assessment of potential vibration damage would be performed during final design for buildings that are within 25 feet of large construction equipment and within 55 feet of impact pile driving when more accurate equipment locations are known.

4.7.3.5 Indirect Impacts

Indirect noise and vibration impacts, including increased noise and/or vibration levels near the TDLE build alternatives, could be associated with new developments near the project. This could involve developments on land that becomes available along the alignment after project construction, or due to transit oriented developments near station areas. Long term noise increases associated with future development could increase noise in the project area, but any increase would likely be minimal, particularly because transit-oriented developments typical involve non-manufacturing activities like residential or commercial uses. During construction as well as long term, any new developments would be required to meet local noise regulations. Most vehicle traffic and other sources of environmental vibration they could create are below the levels of human perception and would not cause an indirect impact.

4.7.4 Potential Mitigation Measures

4.7.4.1 Noise

Sound Transit is committed to minimizing noise levels at their source for all of its light rail corridors (Figure 4.7-25). When noise impacts still occur, Sound Transit provides noise mitigation measures for existing uses when determined to be reasonable and feasible, consistent with its Link Light Rail Noise and Vibration Policy (Resolution No. R2023-15). This policy sets source mitigation as the preferred method of mitigation, followed by path mitigation, such as noise barriers, and then receiver mitigation, which would include sound insulation of properties (Sound Transit 2023). The most effective type of mitigation at most locations would be noise barriers (sound walls) because they reduce noise near the source. The height of the barriers would be determined during final design. However, typical noise barriers are 8 to 10 feet high for at-grade operations and 4 to 6 feet in height on elevated structures. The figures in Section 4.7-3 show the locations of potential noise barriers for each alternative. Additionally, Chapter 8 of Appendix J3, Noise and Vibration Technical Report, includes tables identifying potential locations and lengths of noise barriers, as well as figures showing the potential noise barriers locations for each alternative.

Sound Transit would mitigate the majority of noise impacts with noise barriers along the guideway or with special trackwork, such as movable point or spring rail frogs to eliminate the gap that causes noise and vibration at track crossover locations. For impacts that cannot be fully mitigated with sound walls or special trackwork or are at locations that have impacts to single isolated residences, the most effective mitigation measure would be building sound insulation. With the recommended noise mitigation, including potential additional sound insulation at barrier locations, there would be no residual impacts at noise barrier locations and all noise impacts would be at a level below the FTA threshold for moderate noise impacts.

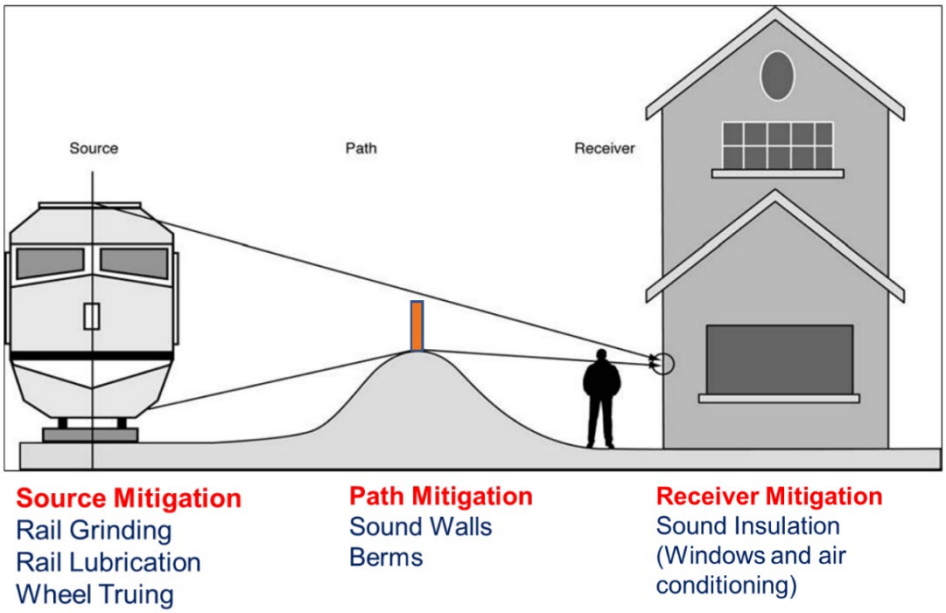


Figure 4.7-25 Typical Train Noise Source Mitigation

During final design, all impacts will be verified, and mitigation details will be designed. Mitigation may be eliminated if the final design analysis finds no impacts or may be modified if more cost-effective mitigation is identified. After light rail operations begin, if the resulting noise were to exceed FTA criteria, Sound Transit would evaluate the need for additional mitigation.

4.7.4.2 Vibration

A number of different approaches have been used by rail transit systems to reduce ground-borne vibration during operations. The most common vibration mitigation measure used on at-grade light rail systems consists of placing a resilient layer between the track and the soil. For elevated structures, highly resilient fasteners are typically used to provide vibration mitigation.

Vibration predictions would be refined during final design, before mitigation measures are finalized. There are no vibration impacts in the Federal Way, South Federal Way, or Tacoma Segment, and no mitigation is recommended. Potential mitigation locations have been identified for the Fife Segment. Potential vibration mitigation locations for each of the alternatives and design options in the Fife Segment are shown in Figures 4.7-12 through 4.7-20. Appendix J3, Noise and Vibration Technical Report, includes additional details and tables regarding the potential vibration mitigation locations.

There are two buildings where vibration impacts have been identified. One at a single-family residence on 62nd Avenue E to the east of the Fife Station, where the vibration level just exceeds the impact threshold for all alternatives. The other vibration impact is at the Travelodge, located on Pacific Highway east of 34th Avenue E, for the Pacific Highway Alternative only. The impact at the hotel is due to the very close proximity of the tracks to the building for that alternative. Additional testing inside affected structures would help to refine the vibration levels by determining the response of the foundations. The mitigation following detailed site-specific studies at these receivers could be low vibration treatments of the track and/or the receiver structure. A number of mitigation measures would be considered including ballast mats, highly resilient fasteners, floating slabs, and low-impact special trackwork, and alternative approaches for special circumstances.

4.7.4.3 Construction Noise and Vibration

Specific construction noise and vibration avoidance, minimization, and mitigation measures would be refined during the design phase of the project when more detailed construction information is available and documented in a Construction Noise and Vibration Plan. The following measures could be applied as needed to minimize temporary construction noise and vibration impacts:

- Avoiding nighttime construction in residential neighborhoods.
- Locating stationary construction equipment as far as possible from noise-sensitive sites.
- Constructing noise barriers, such as temporary walls or piles of excavated material, between noisy activities and noise-sensitive receivers.
- Routing construction-related truck traffic to roadways that would cause the least disturbance to residents.
- Using alternative construction methods to minimize the use of impact and vibratory equipment (e.g., pile drivers and compactors). If pile driving is necessary, it would be limited to daytime hours.

In addition to the measures above, it is common to require a detailed Noise and Vibration Control Plan from the contractor as part of construction. Key elements of a Noise and Vibration Control Plan could include:

- Contractor's specific equipment types.
- Schedule (dates and times of day) and methods of construction.
- Maximum noise limits for each piece of equipment with certification testing.
- Prohibitions on certain types of equipment and processes during the night or daytime hours, per local agency coordination and approved variances.
- Identification of specific sensitive receptors near construction sites.
- Methods for predicting construction noise levels.
- Implementation of noise and vibration control measures where appropriate.
- Methods for responding to community complaints in compliance with Sound Transit Outreach requirements.

4.8 Water Resources

This section discusses how the project would potentially affect surface water and groundwater resources, including streams, rivers, shorelines, floodplains, floodways, critical aquifer recharge areas, sole source aquifers, and wellhead protection areas. Considerations to avoid, minimize, or mitigate potential impacts resulting from project-related construction, operations, and maintenance activities are also included. While this section may briefly discuss related resources, please refer to the following for specific details: Land Use (Section 4.2 and Appendix H2); Ecosystems Resources (Section 4.9 and Appendix J4); Geology and Soils (Section 4.11 and Appendix H6); and Hazardous Materials (Section 4.12 and Appendix H7).

4.8.1 Requirements and Policies

Certain federal, Tribal, state, and local regulations and policies relevant to water resources in the study area are highlighted here. A full discussion of these items can be found in Appendix H5, Water Resources Supporting Information.

- Federal: Federal regulations and permits applicable to project activities that could impact water quality, create an obstruction to navigable waters, alter existing water resource-related civil works projects (such as federally authorized levees along the Puyallup River), or impact floodplains include the Clean Water Act, 33 U.S.C. § 1251 et seq., including Section 303(d) – Impaired Waters and TMDL, Section 401 – Water Quality Certification, Section 402 – National Pollutant Discharge Elimination System (NPDES), and Section 404 – Permits for Dredge or Fill; Sections 9, 10, and 408 of the Rivers and Harbors Act of 1899, 33 U.S.C. § 408; and the Floodplain Management Presidential Executive Order 11988 of May 24, 1977, and its subsequent updates (Executive Orders 13690 and 14030). Also, the EPA has jurisdictional review for projects that cross over a sole source aquifer or discharge to streams that recharge the sole source aquifer.
- Puyallup Tribe of Indians: The Puyallup Tribe has delegated authority for Section 401 Water Quality Certification as part of Section 401 of the Clean Water Act. The Tribe issues water quality standards as well as development and construction permits for all discharges on the Puyallup Tribe of Indians Reservation; including Antidegradation Implementation Procedures for properties owned by the Puyallup Tribe of Indians or land that the United States government holds in trust on behalf of the Tribe. The project would cross the Puyallup River in a reach that is regulated by Puyallup Tribal Code (Section 10.08 et seq).
- State: Work near water resources requires approvals from state agencies including Ecology for water quality, WDFW for in-water work, and WSDOT for projects in state right-of-way. Work below the ordinary high water mark (OHWM) of waters of the state in the study area would be conducted in accordance with the terms of a WDFW HPA for this project. TDLE would also cross or be near areas within WSDOT right-of-way. WSDOT is continuing its efforts to remove fish-passage barriers and is currently responding to a federal court injunction to substantially increase those efforts. TDLE bridge and culvert crossings would be designed based on applicable fish-passage requirements and placement of crossings would be coordinated with WSDOT, Tribes, and other relevant agencies.
- Local: The cities of Tacoma, Federal Way, Fife, and Milton are permittees under the Ecology NPDES Municipal Stormwater General Permit (Ecology 2021). This permit requires compliance with BMPs for design related to flow control and water quality as outlined in the Stormwater Management Manual for Western Washington (SWMMWW; Ecology 2019) or equivalent manuals as adopted by the local jurisdictions (City of Fife 2019a; City of Tacoma 2021; King County 2021a; City of Federal Way 2017; King County 2021b; Pierce County 2021; City of Milton 2022). In addition, local agencies regulate work near water

bodies, including shoreline substantial development permits or other shoreline permits near shorelines of the state, and local critical areas alteration reviews and approvals for projects impacting streams, floodplains, or wetlands.

- Sound Transit: The project would be designed in accordance with the Sound Transit Requirements Manual (Sound Transit 2024), which include design standards for stormwater management, flood risk, channel migration zones, and water crossings.

4.8.2 Affected Environment

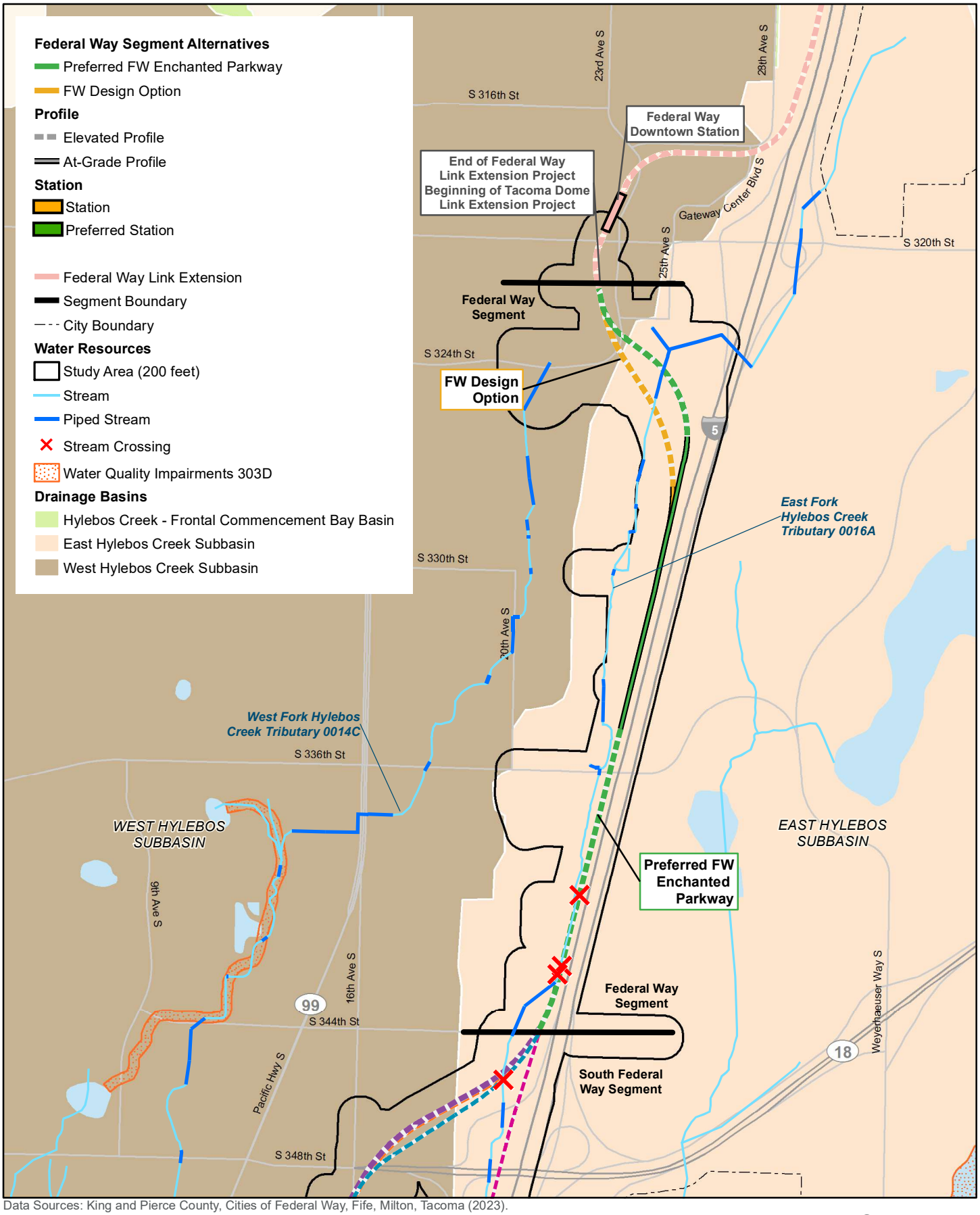
The project corridor extends from Federal Way to the Tacoma Dome and crosses the Puyallup Tribe of Indians Reservation. The affected environment includes the surface water, shorelines, stormwater, floodplains, and groundwater resources in the study area, organized into the following four segments, north to south: Federal Way Segment (Figure 4.8-1), South Federal Way Segment (Figure 4.8-2), Fife Segment (Figure 4.8-3), and Tacoma Segment (Figure 4.8-4).

4.8.2.1 Natural Water Bodies

Natural water bodies in Washington State are organized into administrative and planning boundaries known as Water Resource Inventory Areas (WRIAs), which are managed by Ecology. All alternatives for the proposed project and natural water bodies within the study area are in WRIA 10, the Puyallup/White Watershed (WDFW 2011). The surface waters in the study area discharge to the WRIA 10 stream basins of Hylebos Creek, Wapato Creek, and the Puyallup River. The stream basins in the study area all discharge to Commencement Bay within Puget Sound. Only streams in the study area are discussed here.

Ecology designates water bodies within the state with beneficial uses, such as drinking water, recreation, aquatic habitat, and industrial use, and those that are historically and currently impaired by pollutants on the Water Quality Assessment Clean Water Act Section 303(d) list (Ecology 2018). If a project site discharges to any of the 303(d)-listed bodies of water, additional treatment or flow control measures may be required. The surface waters in the study area have been historically impacted by the heavily urbanized environment, and many of the streams have reaches that have been either channelized or piped. Culverts and piped streams are described in Section 3.1.2 of Appendix J4, Ecosystems Technical Report. The industrial and commercial development in the study area has imparted a legacy of contamination dating back over a century. Contaminated sites in the study area are discussed in Section 4.12, Hazardous Materials.

Characteristics of each water body in the study area are summarized in Table 4.8-1 and discussed in more detail in Appendix H5, Water Resources Supporting Information.



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

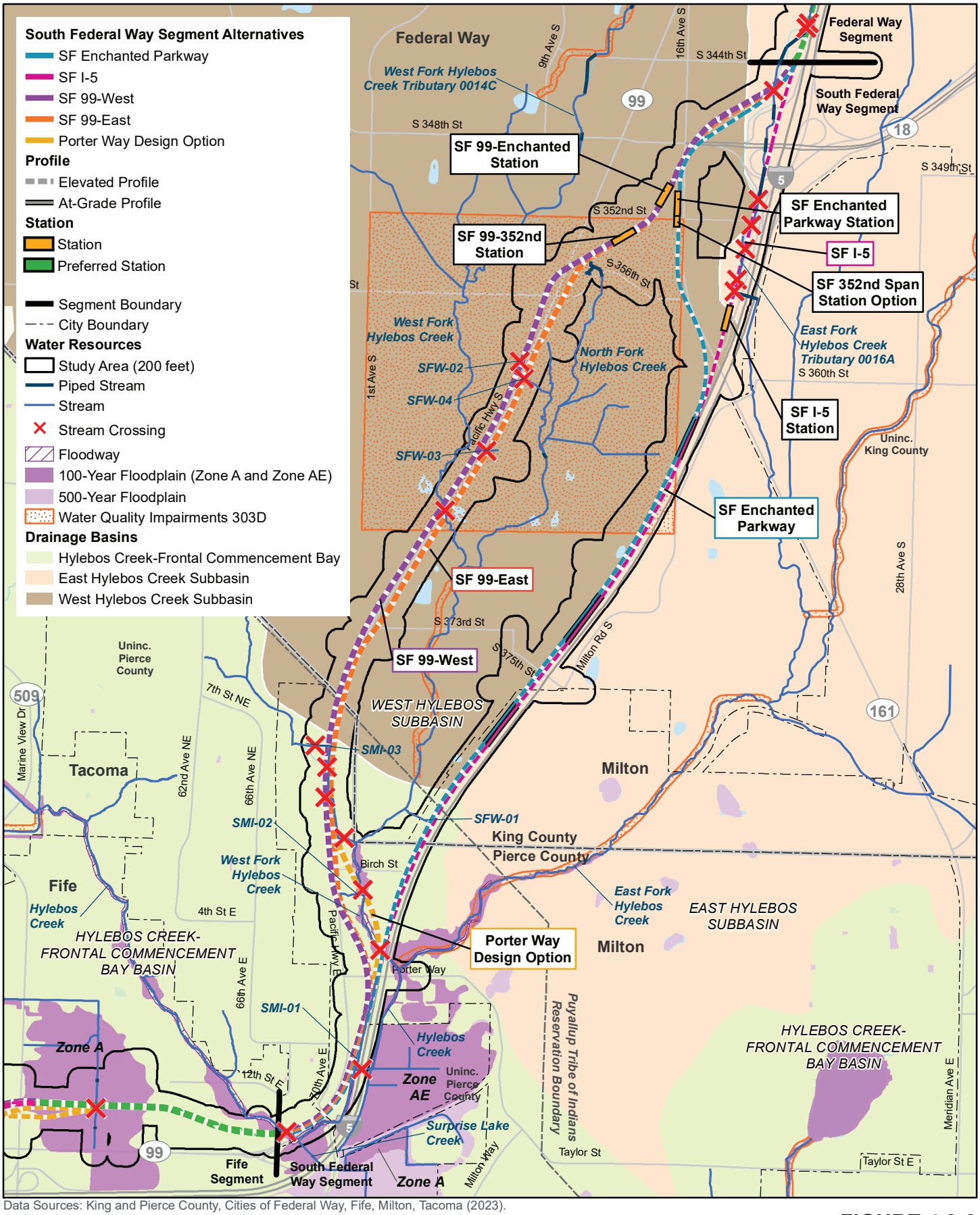
N

0 0.5 1 Mile

FIGURE 4.8-1

Water Resources Affected Environment Surface Water
Federal Way Segment

Tacoma Dome Link Extension



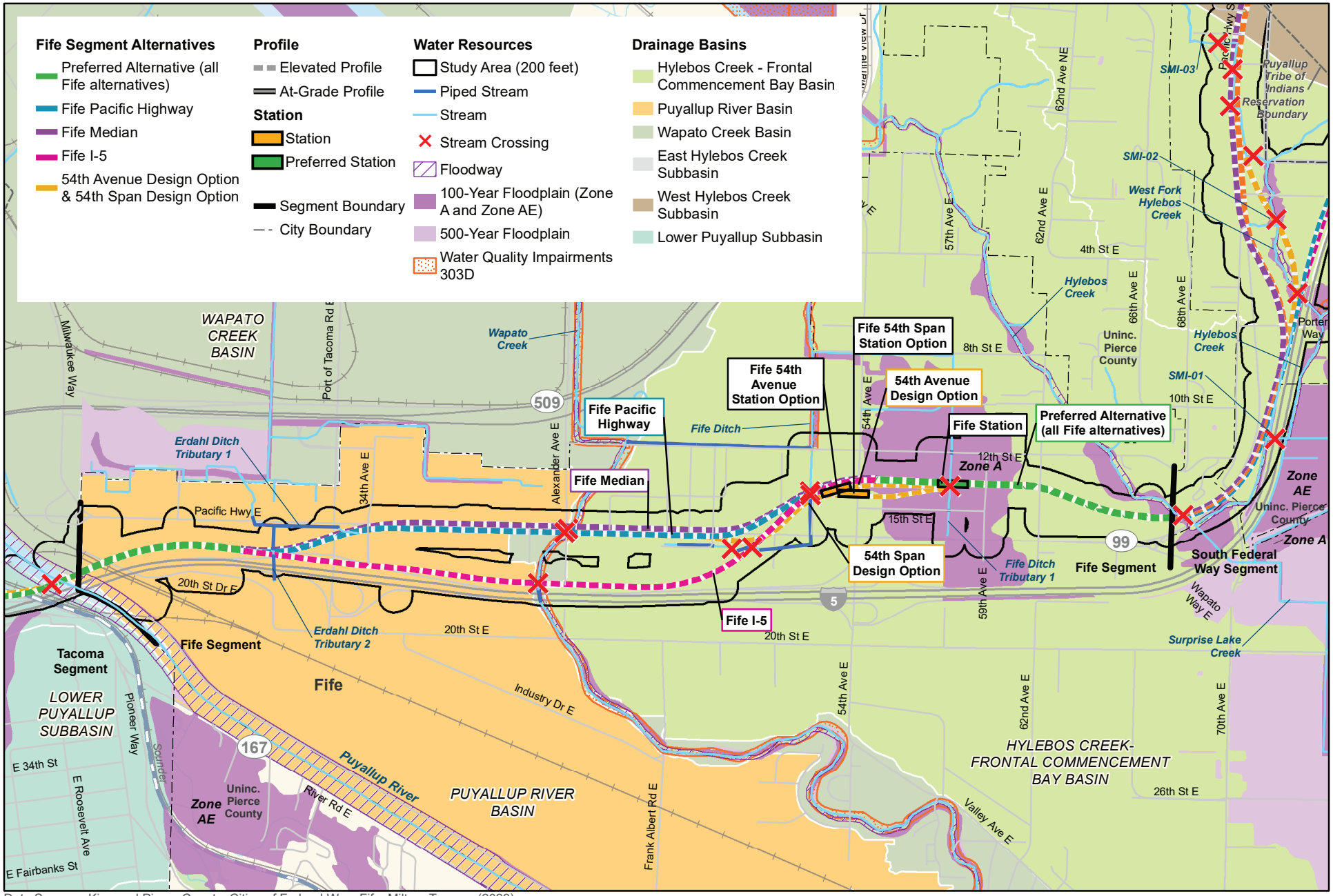
Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

Note: In 2023, the City of Fife submitted and received FEMA approval for Letters of Map Amendment that removed certain parcels and structures in the study area near the Fife Ditch Tributary 1 from the designated floodplain.

N

0 0.5 1 Mile

FIGURE 4.8-2
Water Resources Affected Environment Surface Water
South Federal Way Segment
Tacoma Dome Link Extension



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

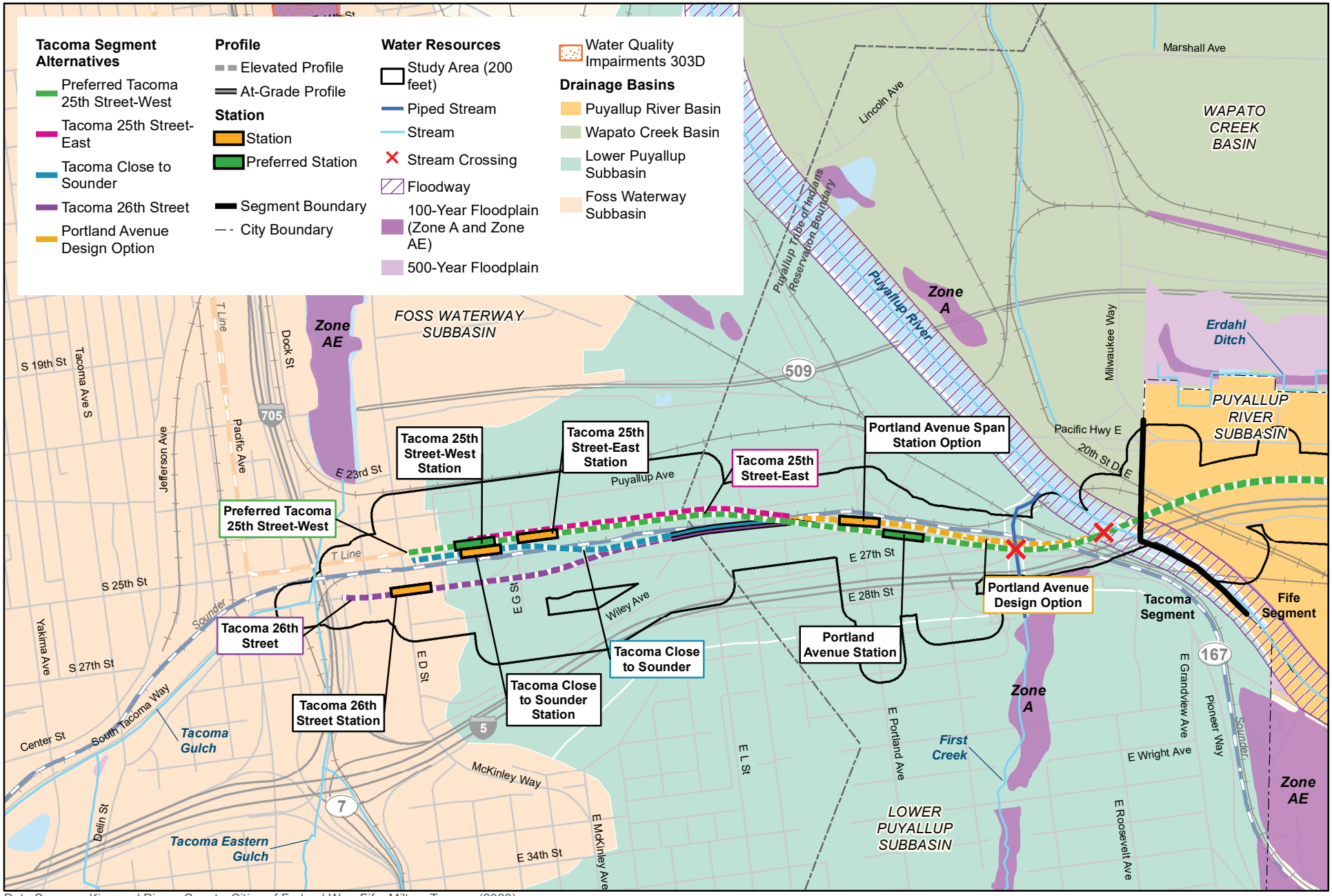
Note: In 2023, the City of Fife submitted and received FEMA approval for Letters of Map Amendment that removed certain parcels and structures in the study area near the Fife Ditch Tributary 1 from the designated floodplain.

N

0 0.5 1 Mile

FIGURE 4.8-3
Water Resources Affected Environment Surface Water
Fife Segment

Tacoma Dome Link Extension



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

0 0.5 1 Mile

FIGURE 4.8-4
Water Resources Affected Environment Surface Water
Tacoma Segment
Tacoma Dome Link Extension

Table 4.8-1 Summary of Surface Water Bodies by Segment

Surface Water Body	Stream Index No.[1]	Relevant Basin	Fish-Bearing[2]	Water Quality Impairment[3]	Shoreline Class	Flood Zone[4]
Federal Way Segment						
East Fork Hylebos Creek Tributary 0016A	10.0016A	East Hylebos Creek	Potential	–	–	–
West Fork Hylebos Creek Tributary 0014C	10.0014C	West Hylebos Creek	Potential	Lead, Copper, Zinc, PAHs[5]	–	–
South Federal Way Segment						
East Fork Hylebos Creek	10.0016	East Hylebos Creek	Potential	Bacteria	–	AE
North Fork Hylebos Creek	10.0013	West Hylebos Creek	Potential	benthic macro-invertebrate bioassessment	–	-
West Fork Hylebos Creek	10.0014	West Hylebos Creek	Potential	Bacteria, Temperature, Dissolved Oxygen	–	AE
Federal Way Stream 1 (SFW-01)	–	Hylebos Creek	No	–	–	–
Federal Way Stream 2 (SFW-02)	–	Hylebos Creek	No	–	–	–
Federal Way Stream 3 (SFW-03)	–	Hylebos Creek	Potential	–	–	–
Federal Way Stream 4 (SFW-04)	–	Hylebos Creek	Potential	–	–	–
Surprise Lake Creek	10.0009	Hylebos Creek	Yes	–	–	A
Milton Stream 1 (SMI-01)	–	Hylebos Creek	Yes	–	–	A/AE[6]
Milton Stream 2 (SMI-02)	–	Hylebos Creek	Potential	–	–	A/AE[6]
Milton Stream 3 (SMI-03)	–	Hylebos Creek	No	–	–	–
Hylebos Creek	10.0006	Hylebos Creek	Yes	–	Shoreline of the State	A/AE
Fife Segment						
Hylebos Creek	10.0006	Hylebos Creek	Yes	–	Shoreline of the State	A/AE
Fife Ditch Tributary 1[7]	–	Hylebos Creek	Potential	–	–	A
Fife Ditch (SFI1)[7]	–	Hylebos Creek	Yes	Ammonia-N, Dissolved Oxygen	–	A
Wapato Creek	10.0017	Wapato Creek	Yes	Bacteria, Dissolved Oxygen, Instream Flow	–	AE
Erdahl Ditch Tributary 1 (SFI2)	–	Puyallup River	Potential	–	–	–
Erdahl Ditch Tributary 2 (SFI3)	–	Puyallup River	Potential	–	–	–

Table 4.8-1 Summary of Surface Water Bodies by Segment (continued)

Surface Water Body	Stream Index No.[1]	Relevant Basin	Fish-Bearing[2]	Water Quality Impairment[3]	Shoreline Class	Flood Zone[4]
Tacoma Segment						
Puyallup River	10.0021	Lower Puyallup River	Yes	Bacteria, Mercury, Temperature	Shoreline of Statewide Significance	AE[8]
First Creek	–	Lower Puyallup River	Yes	–	–	A
Tacoma Eastern Gulch	–	Foss Waterway	No	–	–	–

Notes:

(1) Source: WRIA identification number references provided in Ecosystems Section 4.9. Not all streams have a WRIA number.

(2) The presence of fish in a water body dictates stormwater management requirements and other regulatory obligations; therefore, the documented or expected fish presence are indicated. See Section 4.9, Ecosystems, for additional detail.

(3) Source: 2018 Washington Department of Ecology 303(d) Water Quality Impairment List. Impairments listed occur within the segment.

(4) Source: FEMA Flood Insurance Rate Maps (53033C1235G, 53033C1250G, 53053C0168E, 53053C0169E, 53053C0188E, 53053C0189E, 53053C0306E, 53053C0307E, 53053C0326E, and 53053C0327E).

(5) Polycyclic Aromatic Hydrocarbons (PAHs), including Benzo(a)pyrene and Dibenzo(a,h)anthracene.

(6) Part of the Hylebos Creek Floodplain.

(7) Flows within and discharges from the Fife Ditch stream system are controlled in part by the Pierce County Drainage District 23 pump station, which may affect flood conveyances. In addition, the City of Fife has submitted and received FEMA approval for several Letters of Map Amendment (LOMAs) for this area that recognize that portions of the land inside of the floodplain boundary are actually above the base flood elevation and therefore are not within the regulated floodplain. Locations are presented in Appendix H5, Water Resources Supporting Information.

(8) The Puyallup River's mapped floodplain and floodway are levee-constricted.

4.8.2.2 Floodplains and Floodways

Figures 4.8-1 through 4.8-4 and Table 4.8-1 identify streams in the study area that the Federal Emergency Management Agency (FEMA) has mapped within the Special Flood Hazard Area and their associated floodways, where identified (FEMA 2017a). The floodplain designations in the study area (Zone A and Zone AE) mean these locations are subject to the base flood, which has a 1 percent chance of occurring in any given year. Climate-related uncertainties, especially anticipated future sea level rise, could potentially increase the frequency and magnitude of flooding at Special Flood Hazard Area locations.

FEMA has stated that the flood hazard mapping for this area will be revised as part of the future Puyallup River levee recertification under the National Flood Insurance Program (FEMA 2017a). However, the timing of this is unknown. FEMA has designated the currently effective flood hazard data based on analysis completed in 1979 for the cities of Fife and Milton and in 1981 for the City of Tacoma (FEMA 2017b). This historical data does not reflect subsequent development or current topographic conditions. In 2023, the City of Fife submitted and received FEMA approval for Letters of Map Amendment that removed certain parcels and structures in the study area near the Fife Ditch Tributary 1 from the designated floodplain. Sound Transit is also reviewing localized mapping of flood prone areas developed for the City of Fife based on 1990 and 1996 flood events (City of Fife 2003) and operational data from the Pierce County Drainage District 23 pump station, referenced in Table 4.8-1. Additional discussion of Sound Transit's floodplain data evaluation is presented in Appendix H5, Water Resources Supporting Information.

Key FEMA and U.S. DOT terms used in this section are as follows:

- Base Flood: The event with a 1 percent annual probability of occurring, commonly known as the 100-year flood.
- Special Flood Hazard Areas: Commonly known as 100-year floodplains, those areas subject to flooding by the base flood. FEMA designates several categories for these areas, including Zone A (a horizontal floodplain boundary has been mapped; but the associated vertical base flood elevation has not yet been determined and additional analysis is needed) and Zone AE (a vertical base flood elevation has been determined).
- Floodway: The main watercourse channel and adjacent lands that must be kept free of fill or development to avoid increasing flood elevations. Floodways are defined through detailed hydraulic analysis; therefore, many floodplains have not yet had their associated floodways identified.

Local governments can participate in FEMA's National Flood Insurance Program, and those that do must adopt certain standards to regulate development in the floodplain. A description of flood zone designations and applicable floodplain regulations for each jurisdiction in the study area are presented in Appendix H5, Water Resources Supporting Information.

4.8.2.3 Shorelines

Due to the river's flow characteristics, the State of Washington has designated the Puyallup River as a shoreline of statewide significance. As such, it is protected by the State of Washington Shoreline Management Act, where uses and shoreline activities are regulated. In the study area, the Cities of Fife and Milton, as well as Pierce County, also designate Hylebos Creek as a regulated shoreline.

Federal Way Segment

There are no designated shorelines in the Federal Way Segment (City of Federal Way 2014).

South Federal Way Segment

The mainstem of Hylebos Creek is a designated shoreline of the state in the South Federal Way Segment starting near the confluence of the East and West Fork Hylebos Creeks near Porter Way (City of Fife 2019b; City of Milton 2020) and is located within the jurisdictions of Milton, Fife, and unincorporated Pierce County. Hylebos Creek shorelines are designated as Urban Conservancy by the City of Milton (City of Milton 2020); Shoreline Residential with developed highways (like Pacific Highway/SR 99) as High Intensity by Pierce County (Pierce County 2018); and Residential and Urban Shoreline with identified sensitive areas by City of Fife. The City of Fife designates light rail and transit facilities as a permitted use within those shoreline areas subject to certain regulations (City of Fife 2019b).

Fife Segment

The mainstem of Hylebos Creek is a designated shoreline of the state in the Fife Segment and is classified as Residential and Urban Shoreline with identified sensitive areas. The City of Fife designates light rail and transit facilities as a permitted use within those shoreline areas subject to certain regulations (City of Fife 2019b). In the jurisdiction of Fife, the Puyallup River eastern shoreline is designated as Levee Shoreline. The Puyallup Tribe of Indians maintains fishing rights and retains jurisdiction within the Puyallup River itself, up to the OHWM.

Tacoma Segment

In addition to the Shoreline of Statewide Significance designation from the State of Washington, the City of Tacoma designates the Puyallup River shoreline zone as an Urban Conservancy environment, which is intended to protect and restore the public benefits and ecological functions of open spaces, natural areas, restoration sites, and other sensitive lands that are able to tolerate limited or carefully planned development or resource use.

4.8.2.4 Groundwater

Groundwater levels vary considerably throughout the project corridor, including areas underlain by glacial till through which water may infiltrate slowly and result in surface ponding of perched groundwater during periods of heavy rain. During the drier summer months, groundwater makes a critical contribution to stream baseflows and in recharging the aquifers in the study area. Figure 4.8-5 identifies aquifer recharge areas and wellhead protection areas for the study area. Additional details regarding groundwater are included in Appendix H5, Water Resources Supporting Information.

Federal Way Segment

The study area for this segment does not cross into wellhead protection areas. Refer to the South Federal Way Segment for details on groundwater protection in the City of Federal Way.

South Federal Way Segment

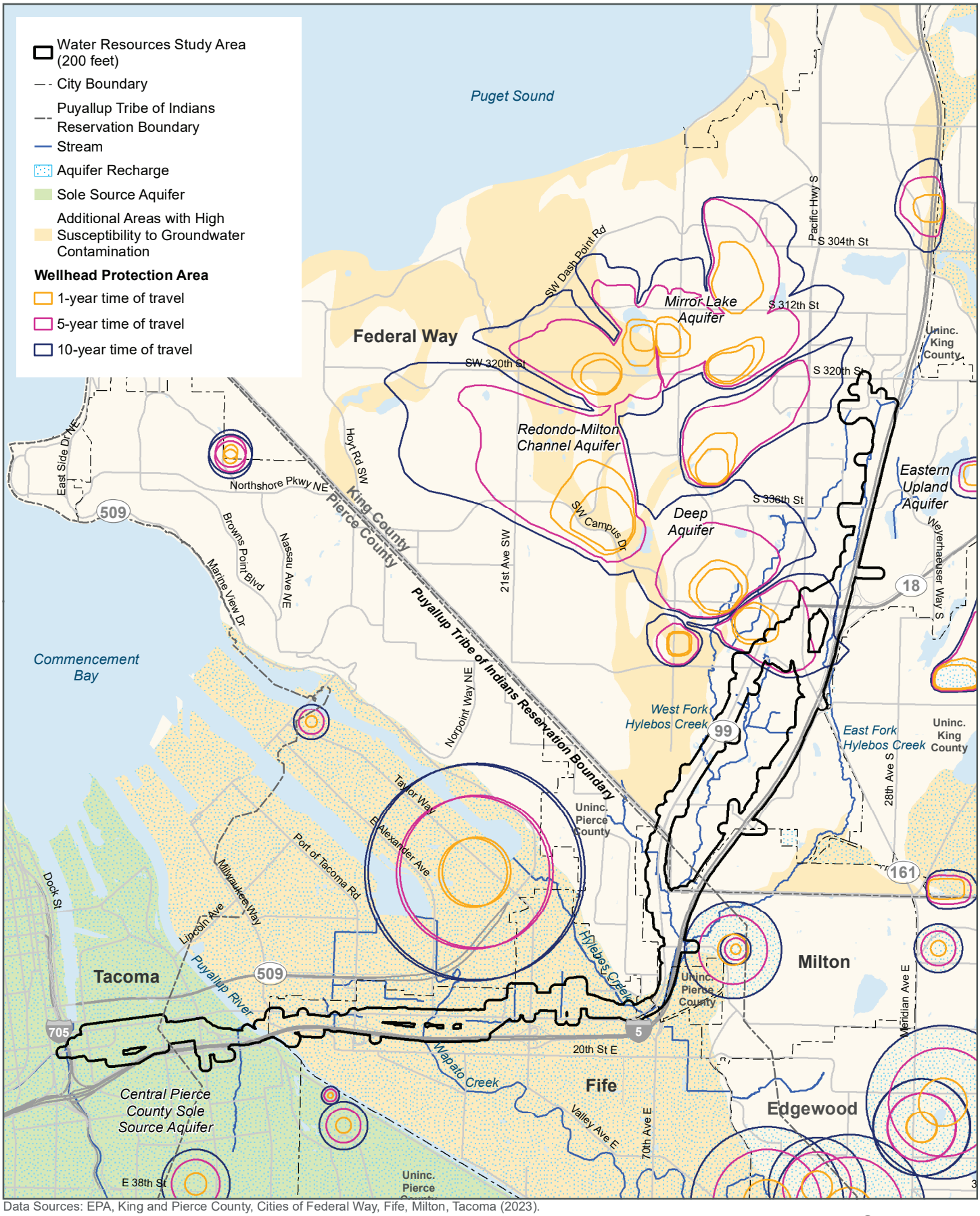
The City of Federal Way relies on groundwater as a source of drinking water. The Lakehaven Utility District manages the three main aquifer systems that underlie the city — the Redondo-Milton Channel Aquifer, the Intermediate Aquifer System (Mirror Lake and Eastland Upland aquifers), and the Deep Aquifer — in cooperation with the city. Together they have mapped wellhead protection zones and identified areas susceptible to contamination. To protect the drinking water supply, they have implemented both the State of Washington's Wellhead Protection Program and Section 1428 of the 1986 Amendments to the Federal Safe Drinking Water Act (City of Federal Way 2015). The study area for this segment contains areas of 10-year to 1-year time of travel for groundwater.

Fife Segment

The City of Fife has mapped and identified areas that have a high potential for contamination of groundwater resources (City of Fife 2019c). Due to the exceptional vulnerability and susceptibility of the aquifer recharge areas to further contamination, the City of Fife has controlled or prohibited land use activities, including the processing or handling of hazardous substances and waste pollutants, which could introduce pollution hazards within delineated aquifer recharge areas.

Tacoma Segment

The City of Tacoma sits atop the South Tacoma Aquifer, which supplies up to 40 percent of Tacoma's drinking water. Tacoma's groundwater supply is managed by the South Tacoma Groundwater Protection District (Tacoma-Pierce County Health Department 2019). The overlay zoning district designates aquifer recharge areas, as well as fixed-radius wellhead protection areas, to regulate the expected groundwater travel distances and times associated with municipal wells. Artesian conditions, which produce groundwater that flows upward due to pressure differences, have been encountered in this area (WA Department of Conservation 1961; Shannon & Wilson 2014).



Data Sources: EPA, King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

0 1 2 Miles

FIGURE 4.8-5
Water Resources Affected Environment - Groundwater
Tacoma Dome Link Extension

The study area in the Tacoma Segment includes the EPA-designated Central Pierce County Sole Source Aquifer. A sole source aquifer is an aquifer that supplies at least 50 percent of the drinking water for its service area and is located where no reasonably available alternative drinking water sources exist if the aquifer becomes contaminated (EPA 2019). As discussed in Section 4.12, Hazardous Materials, the area above the aquifer contains contaminants that pose exposure risks.

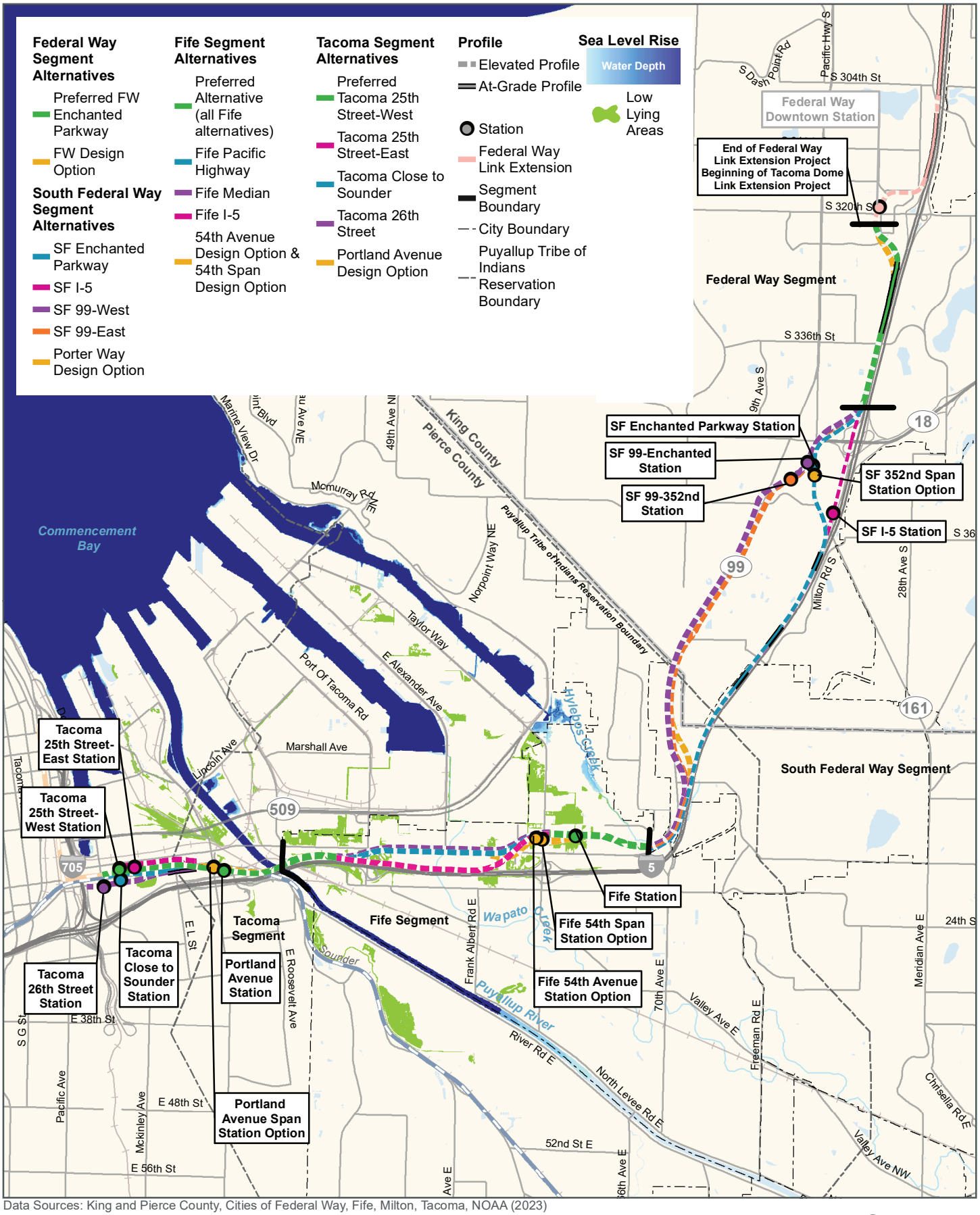
4.8.2.5 Stormwater Runoff

The land and soil that stormwater runoff travels across influence the water quality and hydraulics in the surface waters and groundwater that it flows into. Factors influencing stormwater runoff in the study area are discussed below. More details regarding these factors are presented in Appendix H5, Water Resources Supporting Information.

- Soil Types: The most common soil group present in the study area is Type C, which are dense soils that have low-infiltration and high-runoff potential. Soil Types A and B are also present along the corridor and have moderate- to high-infiltration potential and moderate- to low-runoff potential, respectively (USDA NRCS 2007).
- Land Uses: Land uses in the study area are a mixture of residential, commercial, light industrial, and vegetated areas. The impervious surfaces in the study area are a mix of pollution-generating roadway and parking areas and non-pollution-generating surfaces, including roofs, sidewalks, and stormwater ponds (considered impervious during rain events, when filled with water). Land in the Federal Way and South Federal Way segments is urbanized, with approximately 50 percent impervious surface cover and a mix of residential, commercial, industrial, and recreational land uses. The Fife Segment is approximately 60 percent impervious surface cover, with a mix of residential, commercial, industrial, and agricultural land use types. The Tacoma Segment has approximately 80 percent impervious surface cover, which is highly urbanized, with a mix of developed lands, including commercial, industrial, and Tribal uses. In addition, the SR 167 Completion Project is expected to convert some agricultural lands to impervious roadway in the South Federal Way and Fife segments. Construction of the SR 167 Completion Project is in progress: Phase 1a was completed in 2021, and Phase 1b has been underway since summer 2022.
- Stormwater Management: In the study area, most of the surface stormwater is collected by piped municipal systems along all three segments of the corridor. The systems in the study area include features such as stormwater pipes and roadside ditches, media filter drains, regional detention ponds, and vaults. Stormwater drainage systems are discussed in Section 4.15, Utilities.

4.8.2.6 Sea Level Rise

The water resources impact analysis considers projected climate change influences, such as sea level rise. Relative sea level in the study area is forecasted to rise by approximately 3 feet higher than current elevations by 2140, based on average estimates available at the time of preparing this Draft EIS (WCHRN 2018, 2024). Areas at risk of inundation have been mapped by the National Oceanic and Atmospheric Administration and are shown in Figure 4.8-6 (NOAA 2023). Sea level rise could be considerably higher, depending on greater GHG emissions or other factors. Background information regarding the relative sea level rise forecast used for the study area is presented in Appendix H5, Water Resources Supporting Information.



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma, NOAA (2023)

FIGURE 4.8-6
Relative Sea Level Rise

N

0 1 2 Miles

Tacoma Dome Link Extension

Sound Transit is also developing a Climate Change Vulnerability Assessment to further evaluate risks to the project from sea level rise. In addition, the City of Fife is also evaluating climate change and sea level rise within its jurisdiction and has plans to conduct a climate change vulnerability assessment to guide the city's update of the comprehensive plan and shoreline regulations.

4.8.3 Environmental Impacts

This section discusses the direct long-term operational and short-term construction impacts from the project alternatives to the water resources in the study area.

4.8.3.1 No-Build Alternative

The No-Build Alternative includes projects, funding packages, and proposals in the central Puget Sound region that are planned to occur with or without TDLE, as described in Chapter 2 (Section 2.2). Changes to water resources from other planned projects in the study area would occur. However, under the No-Build Alternative, light rail would not be extended to Tacoma and the associated project changes within the study area would be avoided. As a result, there would be no direct impacts from TDLE to water resources.

4.8.3.2 Long-Term Impacts for the Build Alternatives

Impacts Common to All Light Rail Alternatives

The preferred alternative and the other light rail alternatives have similar structural design components, operational activities, and general alignment locations. As a result of these similarities, they have the following common potential impacts to water resources:

- Increases in impervious surfaces: Converting vegetation or other pervious surface to hard surfaces, like new concrete portions of light rail track, stormwater ponds [considered impervious during rain events, when filled with water], parking areas, building roofs, or project road improvements, impacts water resources. Increased amounts of impervious surfaces increase runoff volumes, decrease groundwater recharge, increase flooding and flow frequencies, and stream bank erosion and sedimentation. Runoff from pollution-generating impervious surfaces that are subject to vehicle use, like parking areas, bus holding areas, or project-associated roads or road realignments, can potentially contaminate surface waters and groundwater. Non-pollution-generating impervious surfaces are not subject to vehicular use and include the light rail tracks, concrete portions of the light rail tracks,[1] stations, sidewalks, rooftops, and stormwater ponds. The Preferred Alternative and other light rail alternatives would add both pollution-generating and non-pollution-generating impervious surfaces in the study area and the vicinity of the light rail alternatives. Several alternatives include options for parking garages, which typically reduce the amount of pollution-generating impervious surface as compared with surface lots.

[1] Sound Transit and the Washington State Department of Ecology entered a Memorandum of Understanding dated December 9, 2019, in which Sound Transit agreed to conduct a study to characterize the quality of the stormwater discharged from light rail guideway. The data and analysis from the study will be used to inform the design of light rail projects that are scheduled in the Sound Transit 3 Plan to be completed between 2030 and 2041, and as necessary, Sound Transit will identify all known, available, and reasonable methods of prevention, control, and treatment (abbreviated as AKART) to define light-rail specific best management practices.

- Use of at-grade versus elevated structures: At-grade sections typically have a greater impact to surface water and groundwater resources than elevated sections of the guideway structures because they tend to have a slightly wider footprint, result in more impervious surface, have greater potential to directly conflict with municipal stormwater management facilities, may impact groundwater recharge, and require more alteration of surface grade areas and flow paths.
- Stream and river crossings: All project stream and river crossings would be elevated, but development in and around the streams can impact them through changes to their cross-section geometry, channel flows and other hydraulic properties, increased erosion, and higher risk of pollutant contamination. Table 4.8-2 summarizes these impacts.
- Floodplain and floodway crossings: Light rail projects that cross floodplains, even when elevated, must often place guideway columns within the floodplain. The columns, abutments, or other fill for proposed stations or other constructed features can reduce floodplain water storage volume and affect the hydraulics of the floodplain, which can result in displacement of floodwaters to properties upstream and adjacent to the project.

Impacts by Segment

The potential impacts on surface water resources are summarized by segment in Tables 4.8-2 and 4.8-3. The analysis that supports the comparison of alternatives and associated impacts is presented in Appendix H5, Water Resources Supporting Information.

Federal Way Segment

In the Federal Way Segment, the Preferred FW Enchanted Parkway Alternative is expected to have similar impacts on water resources with or without the FW Design Option.

The Preferred FW Enchanted Parkway Alternative (with or without the FW Design Option) parallels the East Fork Hylebos Creek Tributary 0016A, from near S 336th Street to near S 344th Street, for about 0.5 mile on an elevated guideway. Spanning the creek in this area would not be possible, and the stream would have to be relocated. The stream channel in this area would be reconfigured to include more natural features, such as meanders. Changing the physical characteristics of a stream could, however, affect its hydrology and downstream sediment regimes. The impacts would be permanent, but the new channel would be designed to maintain existing flow regimes and water quality conditions. Background on the habitat improvements included in the stream reconfiguration is discussed in Section 4.9, Ecosystems.

South Federal Way Segment

In the South Federal Way Segment, the SF Enchanted Parkway Alternative is generally expected to have less impact on water resources than the SF I-5, SF 99-West, or SF 99-East alternatives, based on total impervious surface increase, pollution-generating impervious surface increase, stream-crossings, and associated parking options (Tables 4.8-2 and 4.8-3).

South of S 344th Street, the SF I-5 Alternative would continue parallel to the East Fork Hylebos Creek Tributary 0016A for 0.6 mile. This alternative would also likely require the relocation of approximately 1,500 additional feet of the stream where it is parallel to the guideway south of the I-5/SR 18 interchange. The SF Enchanted Parkway, SF 99-West, and SF 99-East alternatives would be located west of this area and avoid these impacts.

Table 4.8-2 Surface Water: Comparison of Alternatives by Segment

Segment/ Alternative	Total Impervious Increase	Parking Structure Option[1]	At-Grade Portions[2]	Total Stream and Buffer Impact (acres)[3,4]	Total Permanent Overwater Structure Area (acres)[3,5]
Federal Way Segment[6]					
Preferred FW Enchanted Parkway	11 acres	None	About 0.6 mile (39% of segment)	2.60	0.29
FW Enchanted Parkway with FW Design Option	13 acres	None	About 0.7 mile (28% of segment)	3.16	0.31
South Federal Way Segment					
SF Enchanted Parkway	26 acres	Surface lot would have 2x more surface area than structure	About 0.5 mile (13% of segment)	3.04	0.09
SF I-5	34 acres	Surface lot would have 5x more surface area than structure	About 0.4 mile (10% of segment)	6.28	0.35
SF 99-West	29 acres	Surface lot would have 2x more surface area than structure	Segment entirely elevated	4.06	0.08
SF 99-West with Porter Way Design Option	27 acres	Surface lot would have 2x more surface area than structure	Segment entirely elevated	5.14	0.19
SF 99-East	33 acres	Surface lot would have 2x more surface area than structure	Segment entirely elevated	4.60	0.07
SF 99-East with Porter Way Design Option	32 acres	Surface lot would have 2x more surface area than structure	Segment entirely elevated	5.57	0.18
Fife Segment					
Fife Pacific Highway/ Fife Median[7]	15 acres	Surface lot would have 2.5x more surface area than structure	Segment entirely elevated	2.12	0.28
Fife Pacific Highway/ Median with 54th Avenue Design Option	14 acres	Surface lot would have 2.5x more surface area than structure	Segment entirely elevated	2.20	0.34
Fife Pacific Highway/Median with 54th Span Design Option	14 acres	Surface lot would have 2.5x more surface area than structure	Segment entirely elevated	2.16	0.35
Fife I-5[7]	17 acres	Surface lot would have 2.5x more surface area than structure	Segment entirely elevated	1.98	0.29
Fife I-5 with 54th Avenue Design Option	15 acres	Surface lot would have 2.5x more surface area than structure	Segment entirely elevated	2.05	0.34
Fife I-5 with 54th Span Design Option	15 acres	Surface lot would have 2.5x more surface area than structure	Segment entirely elevated	2.00	0.35

Table 4.8-2 Surface Water: Comparison of Alternatives by Segment (continued)

Segment/ Alternative	Total Impervious Increase	Parking Structure Option[1]	At-Grade Portions[2]	Total Stream and Buffer Impact (acres)[3,4]	Total Permanent Overwater Structure Area (acres)[3,5]
Tacoma Segment[8]					
Preferred Tacoma 25th Street-West	4 acres	None	Segment entirely elevated	0.76	0.39
Tacoma 25th Street-East	3 acres	None	Segment entirely elevated	0.76	0.39
Tacoma Close to Sounder	4 acres	None	About 0.3 mile (20% of segment)	0.76	0.39
Tacoma 26th Street	5 acres	None	About 0.3 mile (20% of segment)	0.76	0.39

Sources: Comparative analysis performed using project design files in a geographic information system (GIS).
Notes:

(1) Parking Structure Option indicates how many times larger a parking surface lot would be compared to a parking garage structure. Surface parking areas are included in the Total Impervious Increase calculations. Parking facilities at the South Federal Way and Fife station areas would provide 500 parking spaces (refers only to station parking facilities that would be constructed by the project.)

(2) At-grade mileage includes retained cut/fill mileage.

(3) Impact Footprints and Permanent Overwater Structure Areas are estimated to the nearest 0.01 acre. These totals are a sum of all water crossings in each segment, which can be seen in detail in Appendix H5, Water Resources Supporting Information.

(4) Total Stream Impact Footprint includes associated applicable jurisdictional stream buffer; stream buffers were field-delineated from OHWM or estimated/extrapolated based on similar delineated stream when field observations not available.

(5) Permanent Overwater Structure Area includes overwater channel width. In-river pier option analyzed separately. Overall, the highest impacts could be expected from placement of in-water piers despite their small over water footprint.

(6) Both options are considered in combination with both alignment alternatives. Values are presented as additive to chosen alternative.

(7) Includes preferred Fife Station.

(8) All Tacoma alternatives include the Portland Avenue Station in their calculations.

Table 4.8-3 Estimated Changes in Impervious Surface

Project Segment/ Alternative[1]	Existing Impervious			Impervious After Project			
	PGIS[2] (acres)	NPGIS[3] (acres)	Total (acres)	PGIS[2,4] (acres)	NPGIS[3] (acres)	Total (acres)	Total Change (acres)
Federal Way Segment							
Preferred FW Enchanted Parkway	3	2	5	8	8	16	+11
FW Enchanted Parkway with FW Design Option	3	3	6	11	8	19	+13
South Federal Way Segment							
SF Enchanted Parkway	17	2	19	24	21	45	+26
SF I-5	14	2	16	29	21	50	+34
SF 99-West	18	3	21	29	21	50	+29
SF 99-West with Porter Way Design Option	17	1	18	25	21	46	+28
SF 99-East	18	3	21	33	21	54	+33
SF 99-East with Porter Way Design Option	16	2	18	30	21	51	+33

Table 4.8-3 Estimated Changes in Impervious Surface (continued)

Project Segment/ Alternative[1]	Existing Impervious			Impervious After Project			
	PGIS[2] (acres)	NPGIS[3] (acres)	Total (acres)	PGIS[2,4] (acres)	NPGIS[3] (acres)	Total (acres)	Total Change (acres)
Fife Segment							
Fife Pacific Highway/Median[5]	19	3	21	21	16	37	+16
Fife Pacific Highway/Median 54th Avenue Design Option	22	4	26	25	15	40	+14
Fife Pacific Highway/Median 54th Span Design Option	23	5	28	27	15	42	+14
Fife I-5[5]	13	2	15	16	16	32	+17
Fife I-5 54th Avenue Design Option	14	3	17	17	15	32	+15
Fife I-5 54th Span Design Option	15	4	19	19	15	35	+16
Tacoma Segment							
Preferred Tacoma 25th Street-East	14	3	17	14	7	21	+3
Tacoma 25th Street-West	15	2	17	14	7	21	+4
Tacoma 26th Street	13	2	15	12	9	21	+6
Tacoma Close to Sounder	11	3	14	12	7	19	+5

Sources: Existing land cover: Analysis developed from project survey data and aerial imagery using GIS.
Proposed land cover: Analysis developed from project design files using GIS.

Notes:
(1) Previous versions included all land cover in a 200-foot study area around project elements. The analysis for this version has been revised to cover only the permanent impact footprint.
(2) PGIS (pollution-generating impervious surface): includes parking, bus areas, and roads. For conservative impact evaluation, all impervious surfaces inside the footprint and not associated with the tracks are assumed to be PGIS. Parking areas are assumed to be surface lots rather than garage structures. Also, Sound Transit and the Washington State Department of Ecology have entered into a Memorandum of Understanding dated December 9, 2019, in which Sound Transit agreed to conduct a study to characterize the quality of the stormwater discharged from light rail guideway. The data and analysis from the study will be used to inform the design of light rail projects that are scheduled in the Sound Transit 3 Plan to be completed between 2030 and 2041, and as necessary Sound Transit will identify all known, available, and reasonable methods of prevention, control, and treatment (abbreviated as AKART) to define light-rail specific best management practices.
(3) NPGIS (non-pollution-generating impervious surface): includes light rail tracks, guideways, and stations, sidewalks, and rooftops.
(4) Stormwater ponds were included in previous versions as NPGIS but are removed from this analysis (assumed to be PGIS).
(5) Includes preferred Fife Station.

The SF 99-West and SF 99-East alternatives would have stream crossings of West Fork Hylebos Creek and its associated tributaries just north of S 373rd Street that would be avoided by the SF I-5 and SF Enchanted Parkway alternatives. The SF 99-West and SF-East alternatives with the Porter Way Design Option would have two additional crossings of the West Fork Hylebos Creek system. The SF Enchanted Parkway Alternative would have the smallest area of stream crossing impact.

A section of the proposed light rail associated with all alternatives in this segment would run parallel and adjacent to Hylebos Creek just downstream of the confluence of the West and East Forks through the City of Milton and within unincorporated Pierce County. The guideway would require removal of vegetation within these riparian buffers and shoreline jurisdictions; however, Sound Transit has committed to minimizing impacts on surface water resources, and no piers or columns would be placed within the OHWMs of West Fork Hylebos or Hylebos Creek. The analysis of impacts on streams and stream buffers, including areas within the shoreline jurisdiction, is discussed in Section 4.9, Ecosystems.

The alternatives in the South Federal Way Segment would cross the Eastern Upland and Redondo/Milton Channel Aquifers and one of the associated wellhead capture zones. The SF Enchanted Parkway, SF 99-West, and SF 99-East alternatives would cross wellhead protection areas. There are no sole source aquifers located in the study area for this segment. Activities that would be included in the project, such as clearing, grading, or altering the natural conveyance of surface overland flows, all have the potential to impact groundwater resources by decreasing recharge rates and increasing the possibility of contamination.

Fife Segment

Water Resource Impacts

In the Fife Segment, the long-term impacts on water resources from all alternatives would generally be similar (Tables 4.8-2 and 4.8-3). However, the alternatives with the preferred Fife Station would have potential long-term impacts to the Fife Ditch Tributary 1, which would need to be relocated or piped.

The alternatives in the Fife Segment would not cross any wellhead protection areas; however, Pierce County has classified this area and most of the City of Fife as highly susceptible to groundwater contamination (City of Fife 2016). The entire Fife Segment, from the crossing of the mainstem of Hylebos Creek to the Puyallup River levee, has high potential for contamination of groundwater, so all alternatives would be anticipated to have similar impacts to groundwater resources. There are no sole source aquifers located in the study area for the Fife Segment, as designated by the EPA. Additional details regarding Fife groundwater protections are included in Appendix H5, Water Resources Supporting Information.

Floodplain Impacts

Floodplain impacts would potentially occur in the Fife Segment. In addition to guideway crossings of floodplains shown in Figure 4.8-3, the preferred Fife Station would be located within the Fife Ditch Tributary 1 regulatory 100-year floodplain boundary (FEMA 2017a). Sound Transit would place fill within the floodplain to build the guideway, station, and parking facilities. The Fife 54th Avenue Station Option and the Fife 54th Span Station Option would each be located outside and to the west of the FEMA effective mapped floodplain boundary.

The City of Fife Municipal Code (FMC) 17.09.030 regulates floodplains based on currently effective FEMA flood hazard mapping. FMC 15.40.030 designates a zero-rise standard for all permitted development in a regulated floodplain, and compensatory storage is required to replace equal live storage volume connected to the floodplain for any floodplain storage filled by development. However, as previously noted, the FEMA floodplain boundary is based on historical 1979 mapping and does not reflect subsequent development and current topographic conditions. Currently, as a Zone A designation, FEMA has not identified a base flood elevation for this floodplain. Because the elevations of the Fife 54th Avenue Station Option and the Fife 54th Span Station Option are similar to the preferred Fife Station, the future flood risk is likely similar for the preferred Fife Station and station options.

Sound Transit is working with the City of Fife to determine the extent of the potential flood inundation areas and understand both the regulatory requirements for floodplain development and flood risks. Base flood elevations, fill volumes, and potential loss of flood storage would be determined during future phases of the project as additional information is collected and the station design progresses. Additional details regarding regulatory requirements and the flood risk assessment are presented in Appendix H5, Water Resources Supporting Information.

The preferred Fife Station and the station options would include either a parking structure or a surface lot, either of which would provide 500 parking spaces. Potential flooding could interrupt access to the preferred Fife Station or the station options by light rail users during high-flow events when all or some of the station access points could be under water. The access points would be graded to align with existing streets, so it is expected that access to the station would be interrupted during events that would flood 12th Street E and Pacific Highway. However, during such flood events, light rail services would be able to continue to travel across the floodplain without stopping at the station in Fife.

Tacoma Segment

Water Resource Impacts

For all alternatives in the Tacoma Segment, the guideway would cross the Puyallup River with a new bridge, either with a pier-supported bridge that includes piers in the main channel of the river or a long-span bridge that would span the river. The guideway would cross First Creek to the west of the Puyallup River. TDLE would not cross the streambed of the Tacoma Gulch, but stormwater runoff from the Tacoma Segment could potentially impact the stream. The long-term impacts on water resources in this segment from all alternatives would generally be similar, with the Preferred Tacoma 25th Street-West and Tacoma 25th Street-East alternatives each expected to have slightly less impact than the Tacoma Close to Sounder and Tacoma 26th Street alternatives based on impervious surface increases, pollution-generating impervious surface decreases, and proportion of elevated segments (Tables 4.8-2 and 4.8-3).

For the Puyallup River, a designated shoreline of statewide significance, areas within the shoreline jurisdiction above the OHWM outside of Tribally owned property are regulated by the cities of Tacoma and Fife. Work within the OHWM of the river or on Tribally owned property is within the jurisdiction of the Puyallup Tribe of Indians. The Washington Department of Fish and Wildlife and Ecology, the Puyallup Tribe of Indians, and other resource agencies would be consulted for development proposals within the study area that could affect anadromous fishery resources. A detailed discussion of impacts that could affect fish and wildlife is provided in Section 4.9, Ecosystems. Long-term impacts to water resources at the Puyallup River crossing include bridge abutments on the riverbank or new support piers within the water, depending upon design option. These structures have the potential to affect scour, deposition, and infiltration patterns.

The Tacoma Segment would not cross any wellhead protection areas designated by the South Tacoma Groundwater Protection District. The study area west of the Puyallup River is designated as the Central Pierce County Sole Source Aquifer, which would be crossed by all four alternatives, making all alternatives subject to EPA review. Drilling in commercially or industrially developed areas like the study area carries the risk of encountering unexpected soil and groundwater conditions. There are four known high-risk sites with potential to generate contaminated soils or groundwater in the Tacoma Segment that are identified in Section 4.12, Hazardous Materials.

Where TDLE would cross the sole source aquifer, the project has the potential to disturb layers of contaminated soil and introduce migration pathways for pollutants into the aquifer as a result of pile driving or placement of support structures. Stormwater runoff from normal light rail operation on guideway structures and trackway has a low risk of carrying additional pollutants to the aquifer because these surfaces are classified as non-pollution generating (see footnote in Section 4.8.3.2). Also, the presence of artesian groundwater conditions has the potential to reduce the downward migration of contaminants along the outer boundaries of structures drilled into the soil by creating pressurized counterflow from the aquifer along the pathways. Due to the

industrial legacy in the Tacoma Segment and the close proximity of the proposed alternatives, no notable difference in impact can be identified between the four alternatives. All alternatives would construct comparable numbers of columns in the Tacoma Segment and are expected to have comparable impacts.

For all alternatives, an optional Portland Avenue bike and pedestrian bridge is also being considered that would connect the Portland Avenue Station or the Portland Avenue Span Station Option to the neighborhoods and Puyallup Tribe of Indians facilities on the south side of I-5. It would be above existing roadways, sidewalks, and developed areas, and would be non-pollution generating. This optional bridge is not expected to result in changes in runoff.

Floodplain/Floodway Impacts

Evaluation of hydraulic impacts to the Puyallup River's floodplain, floodway, and existing scour/deposition patterns is based on proposed encroachments and pier configurations for in-river piers. The reduction of conveyance capacity by new structural elements (piers, columns, footings, etc.) in the channel would potentially increase the base flood elevation and the floodplain footprint. Placement of a structure in the channel and the alignment angle to the flow of those structures would result in a decrease to the channel conveyance area that could also increase the potential risk of scour. In addition, increases in the footing lengths could result in increases to both scour lengths and scour depths at pier elements. If left uncontrolled, long-term increases in scour can impact sediment transport patterns in the river and present structural risks to the bridge itself. However, the bridge piers would be designed to withstand scour and prevent bridge instability.

The TDLE project includes two bridge design options: 1) a long-span bridge option that would clear span the approximately 430-foot mapped floodplain and floodway of the Puyallup River and 2) a pier-supported bridge option that has a shorter span and would place piers in the main channel of the river. The long-span bridge option would be expected to minimize impacts on the floodplain and floodway, while the pier-supported bridge option would be expected to have more impacts on the floodplain and mapped floodway and river channel as compared to the long-span option.

4.8.3.3 Construction Impacts for the Build Alternatives

Impacts Common to All Light Rail Alternatives

All light rail alternatives would have similar potential types of construction-related impacts on water resources because construction equipment and techniques would be similar. However, the magnitudes of construction-related impacts could vary for each alternative, because work segments with larger overland construction (including more at-grade portions) or larger overwater construction would have more disturbed ground area (see Table 4.8-2), with more areas requiring BMPs to protect sensitive areas. The activities that could affect water resources include:

- Earthwork, trench work, stockpiling, and material transport: Soil exposed in sloped excavations, fills, or trench work is especially susceptible to local erosion until vegetation is established, pavement is installed, or the surface is otherwise permanently stabilized. If exposed soil becomes dry, it can be eroded by wind. Loose soil can be carried off site by water or wind to stormwater drains or streams, where it increases turbidity in the water. Construction vehicle tires can carry soil onto roadways, where the soil could be carried into ditches or streams during storms.

- Concrete work and paving: The pH in surface water can be increased to levels harmful to fish and wildlife if runoff or surface water comes in contact with process water or slurry from concrete work or curing concrete.
- Construction machinery: Equipment leaks or spills of hydrocarbons and other hazardous materials can affect water quality in nearby water resources and have a secondary impact on other parameters, such as pH levels or dissolved oxygen.
- Stream and river crossings: Overwater and in-water work and construction in streams, rivers, and their associated buffers can pose a direct risk to water quality through pollutant spills, sediment transport, stream bank erosion or wind deposition of stockpiled materials. During in-water construction work, installation of pilings and use of cofferdams disturbs the substrate and vegetation and would increase the risk of scour. This has the potential to mobilize any contaminated sediments that may be present at the project site and contribute to turbidity and sedimentation. In addition, in-water work could result in permanent loss of aquatic and riparian vegetation and woody debris, which could impact water quality. Work along the banks of streams and rivers can increase bank erosion and the risk for uncontained spills.
- Construction in floodplains: Temporary fill material or construction stockpiles placed in a floodplain during construction can displace flood waters onto adjacent property if a flood event occurs during the construction period.

Federal Way Segment

The construction-related impacts of the alternative and design option in the Federal Way Segment would be similar, with guideway location differing only at the northern end near S 324th Street.

South Federal Way Segment

As previously described, longer overwater segments can pose more risk of contamination, sedimentation, and scour during construction. The SF I-5 Alternative would parallel East Fork Hylebos Creek Tributary 0016A for the longest overwater segment, requiring 1,500 feet of additional stream relocation as compared to all the other alternatives. Stream relocation may be required for overwater segments of the SF 99-West and SF 99-East alternatives with or without the Porter Way Design Option. Construction impacts for overwater crossings of West Fork Hylebos Creek and Hylebos Creek at the southern extent of the South Federal Way Segment would be identical for all the alternatives and the design options.

TDLE parking facilities would be constructed on properties that are acquired for construction staging and station areas, but construction of parking facilities at a station in South Federal Way may be deferred for up to 3 years after light rail service begins. If parking were to be allowed on surface lots prior to full project construction, temporary storm water management would likely be required.

Fife Segment

The Fife I-5 Alternative, with any of the three station locations, would have a larger overall construction area than the Fife Pacific Highway and Fife Median alternatives. Also, TDLE parking facilities would be constructed on properties that would be acquired for construction staging and station areas, but, pursuant to the Board's realignment plan, construction of permanent parking facilities in the Fife Segment may be deferred for up to 3 years after light rail service begins. If parking were to be allowed on surface lots prior to full project construction, temporary stormwater management would likely be required.

Tacoma Segment

In the Tacoma Segment, the Preferred Tacoma 25th Street-West and Tacoma 25th Street-East alternatives would have slightly smaller overland construction areas than the Tacoma Close to Sounder and Tacoma 26th Street alternatives.

The pier-supported bridge option involving construction of piers in the Puyallup River would have greater potential for in-water impacts than the long-span option. For either bridge type, temporary impacts and modifications to the levees along the Puyallup River may occur while constructing column foundations and would require coordination with and approval by USACE through Section 408 of the Rivers and Harbors Act. In-water work, dredging, or discharge of fill materials associated with construction of the pier-supported bridge option would trigger Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act, as well as Tribal 401 Water Quality Certification. Construction activities associated with both bridge options would comply with all regulations of the permit review processes and take steps to avoid or minimize impacts to aquatic resources.

Soil disturbance in industrially developed areas carries the risk of encountering unexpected conditions. Contaminants could be found during construction that are above the Washington Model Toxics Control Act thresholds; Sound Transit would develop BMPs and standard operating procedures to minimize the impacts. Unavoidable contamination of groundwater could occur during pile driving associated with project construction. This could cause a direct transfer of contaminants from an upper layer to a lower, previously uncontaminated layer of the aquifer, creating the potential to spread the contaminants off the project site. All drilling and construction activities would follow Ecology and EPA Sole Source Aquifer requirements.

4.8.3.4 Indirect Impacts

As the population of the region increases, vehicular traffic and the demand for development would also increase. The TDLE project could reduce some future vehicle traffic by providing the opportunity for light rail use, reducing vehicle-related stormwater pollutants. The project could attract residents to the urban areas closer to light rail stations, resulting in a reduction in development and associated increases in stormwater runoff in undeveloped areas of the watershed, commonly known as urban sprawl.

Additionally, the project would support the redevelopment of areas surrounding the stations, which would improve existing stormwater treatment infrastructure by bringing flow control and water quality facilities up to current standards. Therefore, the TDLE project could indirectly offset some adverse impacts to water resources caused by population growth.

4.8.3.5 Avoidance and Minimization of Impacts

Sound Transit seeks to prevent or minimize potential impacts on water resources by following local stormwater management regulations, using appropriate BMPs, encouraging sustainable low-impact development approaches where feasible, and preparing for climate-related uncertainties where practicable. In addition to traditional stormwater management facilities, BMPs also include project planning measures, design elements, implementation practices, inspections, and monitoring. This section discusses BMPs that would be included in the project design. Further details of these practices can be found in Appendix H5, Water Resources Supporting Information.

Initial design planning efforts recognize climate-related uncertainties, such as increased precipitation and sea-level rise, and potential impacts to water resources. Climate-related hydrologic changes could include increases in peak flow rates and velocities, which could result in increased flood elevations and scour. Once the Board confirms or modifies the Preferred Alternative after publication of the Draft EIS, Sound Transit would include consideration of climate change data, which predicts the effects of the buildup of GHG gases, based on current understanding of atmospheric physics and chemistry. Strategies to minimize these impacts may include:

- Estimation of potential flood risks.
- Provide freeboard (the distance between the waterline and the lowest point of a structure) above the current or projected base flood elevation according to federal and state guidance.
- Channel stabilization and strengthening (either through hard armoring with riprap or soft armoring with vegetation) around structural elements to resist scour.
- Increase storage volume by a certain percentage, where flow control is required to account for potential increases in rainfall depths.
- Increase treatment flow rates by a similar percentage, where water quality treatment is required to account for potential higher increases in future precipitation.

Measures Common to All Light Rail Alternatives

Project Design and Structure Placement to Avoid Water Resources

To minimize impacts on water resources, the alternatives would avoid placement of piers or columns below the OHWM of streams and rivers and associated stream buffers and floodplains to the greatest extent possible. To meet the standards of the statewide and city shoreline plans, the project design would (wherever possible) include elements that preclude the need for shoreline strengthening (either through hard armoring with riprap or softshore armoring with vegetation to protect the banks from scouring), flood control works, vegetation removal, and other shoreline modifications. Where modification or stabilization measures cannot be avoided, BMPs and low-impact development techniques for surface water management would be implemented to minimize adverse impacts on existing shoreline ecological functions. Outlets from stormwater management facilities would generally connect to existing systems, where such systems exist, and may necessitate the addition of new discharge points where there is not an existing connection.

Stream Modifications

To mitigate impacts on water resources, all stream crossings would be designed to maintain or improve flow regimes and to maintain water quality.

New Outfalls

The project may result in new point discharges either directly or indirectly into natural receiving waters, which could require downstream drainage easements and permits for new structures. BMPs required by NPDES permits would be implemented for any of the potential discharge points that may empty into waters of statewide significance.

Flow Control

Conservative flow control strategies would be implemented by controlling runoff based on a target of forested land use conditions. Flow control would be implemented using detention ponds, detention vaults, guideway dispersion, bioretention, or infiltration facilities. Stormwater

ponds and detention vaults would be located outside of wetlands, to the degree possible, and situated so as not to relocate or alter fish-bearing streams. More detailed information will be provided in the Conceptual Stormwater Design Report as the design progresses.

Water Quality – Control of Contaminants

Section 4.12, Hazardous Materials, discusses methods to control the release of pollutants from contaminated areas. This would include preventing transfer to surface water resources, particularly near any catch basins or receiving waters.

Water Quality Treatment

The project would provide water quality management to Enhanced Treatment standards (intended to provide a higher rate of removal of dissolved metals than Basic Treatment) for all post-project pollution-generating impervious surfaces (PGIS). This is expected to prevent impacts to surface water and groundwater quality. More detailed information will be provided in the Conceptual Stormwater Design Report as the design progresses.

Floodplain Compensatory Storage

Proportionate amounts of compensatory flood storage would be provided to offset the encroachment of fill in the regulated floodplain from constructed project elements. The requirements for compensatory flood storage or other measures to avoid or minimize impacts to the regulated floodplains are outlined in the local city and county floodplain protection ordinances. Sound Transit will confirm the needed amount of compensatory flood storage, pending determination of base flood elevations for Zone A floodplains. Additional survey work and/or hydraulic analysis may be required to determine appropriate volumes and locations of compensatory flood storage.

Groundwater Protection

The TDLE project does not include vehicle maintenance areas or hazardous materials use or storage. Pollution-generating project runoff from normal operations would be directed to stormwater management systems for treatment and discharge. If unplanned or emergency vehicle maintenance became necessary, operational measures used to prevent impacts to the wellhead protection areas and the Central Pierce County Sole Source Aquifer may include:

- Runoff containment, collection, and, where applicable, treatment before discharge.
- Use of secondary containment for hazardous materials unloading and storage.

Structural features that could be part of the project design to prevent impacts to the wellhead protection areas and the Central Pierce County Sole Source Aquifer may include:

- Using concrete crossties, which are typical to Sound Transit light rail (Sound Transit 2021) rather than wooden crossties that may have been treated with creosote.
- Evaluating the use of closed or open-ended steel pipe piles, which have been found to prevent or minimize migration of contaminants (Shannon and Wilson 2014).
- Avoiding the use of H-piles and driven concrete piles due to their potential to create pathways for contamination migration.
- Avoiding the use of vertical timber support piles, which can facilitate wicking and chemical leaching.

- Designing and constructing pile tips to prevent overcutting the ground around the piles as they are driven. This would decrease the chances of forming pathways for contamination along the exterior boundaries of the structural elements.
- Specifying the outside diameter of the driving mechanism tool to match or be smaller than the outside diameter of the pile itself. This would reduce the potential for gaps to form between the exterior element boundary and the surrounding soils, creating pathways for contamination.

Construction BMPs

Sound Transit would develop and implement a Construction Stormwater Pollution Prevention Plan to serve as the overall construction stormwater mitigation plan. This plan would be submitted to Ecology and be required to be implemented for the duration of construction as part of the NPDES Construction Stormwater General Permit compliance. The Construction Stormwater Pollution Prevention Plan would include the following elements:

- Temporary Erosion and Sediment Control.
- Spill Prevention, Control, and Countermeasures.
- Concrete Containment and Disposal.
- Dewatering Management.
- Fugitive Dust Control.

Construction of the bridge crossing the Puyallup River and portions of the Tacoma Segment would cross lands under the jurisdiction of the Puyallup Tribe of Indians Reservation. The Puyallup Tribal Code (Section 15.12 et seq.) establishes district classifications, in substantial compliance with the Puyallup Tribe of Indians Comprehensive Land Use Plan, for all lands within the boundaries of the reservation. Sound Transit would follow the Tribe's Antidegradation Implementation Procedures, which apply to any discharges on the Puyallup Tribe of Indians Reservation.

Through compliance with applicable construction permits and BMPs that the permits would incorporate, the light rail alternatives are not expected to adversely affect water resources during construction.

Discussion of specific BMPs is provided in Appendix H5, Water Resources Supporting Information.

Federal Way Segment

The relocation of the East Fork Hylebos Creek Tributary 0016A stream channel in the Federal Way Segment would be designed to maintain existing flow regimes and water quality conditions to minimize impacts to its hydrology and downstream sediment regimes. Sound Transit would also implement the avoidance and minimization measures described for wetlands, streams, and their buffers in Section 4.9, Ecosystems.

South Federal Way Segment

The relocation of the East Fork Hylebos Creek Tributary 0016A stream channel in the South Federal Way Segment would be designed to maintain existing flow regimes and water quality conditions to minimize impacts to its hydrology and downstream sediment regimes. Sound Transit would also implement the avoidance and minimization measures described for wetlands, streams, and their buffers in Section 4.9, Ecosystems.

To avoid and minimize impacts to the Eastern Upland and Redondo/Milton Channel Aquifers and wellhead capture zones located in the South Federal Way Segment, Sound Transit would implement the water quality treatment, groundwater protection measures, and construction BMPs listed above.

Fife Segment

As discussed above for all light rail alternatives, proportionate amounts of compensatory flood storage would be provided to offset the encroachment of fill in the regulated floodplain from constructed project elements. In addition, as required by FMC 17.05, Critical Areas General Provisions, the City of Fife regulates projects within flood hazard areas to protect the public against property damage resulting from flooding, unnecessary maintenance and replacement of public facilities, and other related risks.

The project must also comply with FMC 15.40, Flood Damage Protection. FMC 15.40 requires that development permitted in a flood hazard area be designed to a zero-rise standard and that all nonresidential structures (which include staircases, elevated walkways, station platforms, etc.) within a flood hazard area must have either the lowest floors elevated 1 foot or more above the base flood elevation or have structures that are flood-proofed. Flood-proofed structures are built to be watertight, can withstand loads from floodwaters, will not float away, and have been certified by a registered professional engineer or architect. FEMA lists dry-proofing measures in their guidance on the National Flood Insurance Program for the design and certification of dry flood proofing for nonresidential buildings in a Special Flood Hazard Area Zone (FEMA 2021). Specific dry-proofing measures to be included in the final design will also be identified through coordination with the City of Fife.

The TDLE project would be designed to comply with these City regulations at the time of permitting.

Tacoma Segment

Temporary impacts and modifications to the levees along the Puyallup River during bridge construction would follow protection measures and requirements from the USACE.

Also, to avoid and minimize impacts to the South Tacoma Aquifer and the Central Pierce County Sole Source Aquifer located in the Tacoma Segment, Sound Transit would implement the water quality treatment, groundwater protection measures, and construction BMPs listed above.

4.8.4 Potential Mitigation Measures

Sound Transit will implement the required avoidance and minimization measures described above, most of which are inherent to the project design. Based on implementation of the avoidance and minimization measures, no significant, unavoidable impacts to water resources are expected. In the event of potential exceptions, mitigation measures are described below.

4.8.4.1 Measures Common to All Light Rail Alternatives

For unavoidable long-term impacts on streams, Sound Transit would develop a compensatory mitigation plan during the permitting phase in accordance with applicable federal, state, local and Tribal requirements. The mitigation plan for streams, wetlands, and buffers is described in more detail in Section 4.9.4 (Ecosystems).

4.8.4.2 Federal Way Segment

The relocation of the East Fork Hylebos Creek Tributary 0016A stream channel in the Federal Way Segment would be designed to maintain existing flow regimes and water quality conditions to minimize impacts to its hydrology and downstream sediment regimes. Sound Transit would also implement the mitigation measures described for wetlands, streams, and their buffers in Section 4.9.4, Ecosystems.

4.8.4.3 South Federal Way Segment

The relocation of the East Fork Hylebos Creek Tributary 0016A stream channel in the South Federal Way Segment would be designed to maintain existing flow regimes and water quality conditions to minimize impacts to its hydrology and downstream sediment regimes. Sound Transit would also implement the mitigation measures described for wetlands, streams, and their buffers in Section 4.9.4, Ecosystems.

For the Eastern Upland and Redondo/Milton Channel Aquifers and wellhead capture zones located in the South Federal Way Segment, the water quality treatment, groundwater protection measures, and construction BMPs listed above are expected to avoid and minimize significant impacts to groundwater and no further mitigation is expected to be necessary.

4.8.4.4 Fife Segment

Sound Transit would provide proportionate amounts of compensatory flood storage to offset the encroachment of fill in the regulated floodplain from constructed project elements. In the unlikely event that compensatory storage measures could not avoid changes to the base flood elevation, Sound Transit would work with the City of Fife and FEMA to update the effective Special Flood Hazard Area through a Certified Letter of Map Revision(CLOMR)/Letter of Map Revision (LOMR) process or other appropriate mapping revision based on federal requirements.

4.8.4.5 Tacoma Segment

If the Puyallup River short-span option with in-water piers were selected, the project could impact river hydraulics and channel scour. Engineering bridge design work would be undertaken to minimize impacts, which could include some or all of the following:

- Minimize the number of in-water piers and shaping piers in a streamlined manner.
- Set the abutments back onto the overbank areas so construction would not encroach into the channel.
- Size bridge openings to pass the 100-year peak flood discharge with little or no increase to the water surface elevation.
- Minimize interior piers.

Measures for mitigating impacts from in-water work of placing piers in the Puyallup River would include work to prevent or minimize scour of the riverbed. Examples of mitigation measures could include the addition of riprap or other hard (rocks) or soft (sand or vegetation) material to stabilize the riverbed. Placement of fill or obstructing structures in the river's main channel could require creation of compensatory flood storage to offset any loss of storage volume capacity. An increase to the base flood elevation might require conveyance offsets, or the Special Flood Hazard Area might need to be revised to reflect proposed impacts. Scour and net rise impacts of the final design will be determined through detailed hydraulic modeling once a preferred alternative is selected.

For the South Tacoma Aquifer and the Central Pierce County Sole Source Aquifer in the Tacoma Segment, the water quality treatment, groundwater protection measures, and construction BMPs listed above are expected to avoid and minimize significant impacts to groundwater and no further mitigation is expected to be necessary.

4.9 Ecosystem Resources

4.9.1 Introduction to Resource and Regulatory Requirements

This section evaluates the potential effects of the TDLE alternatives on aquatic species and habitat (aquatic resources); vegetation, wildlife, and wildlife habitat (terrestrial resources); wetlands; and special-status species and habitats (including threatened and endangered species, marine mammals, and natural resource areas protected under Tribal resource regulations, local critical areas ordinances and/or shoreline master programs).

Ecosystem resources are protected by Tribal, federal, state, and local regulations that govern planning, land use, and management activities affecting wetlands, streams, and fish and wildlife species and their habitats. Sound Transit therefore considered applicable regulations and guidance as part of this analysis. The Ecosystem Resources Technical Report (Appendix J4) provides detailed information on the regulations, analysis methods, affected environment, potential species and habitats, and impacts discussed in this section.

The Puyallup River, Hylebos Creek, and other streams in the study area are within the treaty-protected Usual and Accustomed areas of the Puyallup Tribe of Indians. Project-related impacts on these streams could affect the productivity of fisheries and potentially harm Tribal treaty rights. Sound Transit is therefore addressing potential effects on fish and fish habitat in this analysis and is coordinating with affected Tribes regarding these potential effects.

4.9.2 Affected Environment

The study area for aquatic resources and wetlands includes all areas within 300 feet of the project footprint. This encompasses the area within which project construction and operation could deliver sediment or pollutants to streams and where vegetation clearing could affect riparian habitat quality. This distance is also the largest potential width of regulatory buffers that may be required for wetlands in the project area. In the Puyallup River, the study area is extended to include all portions of the waterbody where underwater noise from in-water pile driving could exceed background levels (e.g., to the first bends in the channel upstream and downstream of potential locations of in-water piers).

The study area for terrestrial resources includes areas within 200 feet of the project footprint. This represents a conservative estimate of the area in which project construction and operation could affect vegetation cover and habitat quality for terrestrial wildlife. To address wildlife potentially affected by project-related noise and human activity, resource analysts also reviewed documented occurrences of sensitive wildlife species within 0.25 mile of project construction areas.

To identify ecosystem resources and evaluate potential project-related impacts, Sound Transit:

- Reviewed scientific literature, agency websites, and analyses completed for other projects near the study area.
- Consulted with local Tribes, and federal, state, and local agencies.
- Reviewed geographic information system (GIS) data and evaluated aerial imagery.
- Performed field investigations, including reconnaissance and limited delineation surveys of streams, wetlands, and vegetation.

4.9.2.1 Aquatic Species and Habitat

The study area for aquatic resources includes 20 streams, which are listed in Table 4.9-1 and shown in Figures 4.9-1 through 4.9-6. All streams in the study area are described and mapped in greater detail in the Ecosystem Resources Technical Report (Appendix J4). Most of these streams are in the Hylebos Creek watershed. Hylebos Creek is an independent tributary that discharges to the Hylebos Waterway along the eastern shore of Puget Sound's Commencement Bay in Tacoma. The other streams in the study area are Wapato Creek (another independent tributary that discharges to the Blair Waterway in Commencement Bay), the Puyallup River, First Creek (a small tributary to the Puyallup River), and two artificially created drainage systems that convey surface water runoff to the Blair Waterway. The following subsections describe aquatic resources in each project segment. Discussions in this document focus on salmonids (Chinook salmon, chum salmon, coho salmon, pink salmon, sockeye salmon, steelhead, cutthroat trout, and bull trout) because these species are a management concern due to habitat degradation and population declines.

Habitat was assessed with the assumption that anadromous fish may one day be able to enter stream reaches where no natural barriers exist, even if human-created barriers prevent access under current conditions. Using information gathered during field reconnaissance and from other sources (e.g., WDFW fish passage barrier maps), biologists evaluated the accessibility of streams in the study area, identifying downstream impediments to fish passage.

In addition to the impacts of urbanization and other human activities that occurred in the last century, fish and fish habitat in the study area face stressors associated with climate change (Puyallup Tribe of Indians 2016). For example, increasing air temperatures are expected to contribute to elevated water temperatures in streams, with resultant impacts on salmonid migration timing, growth rates, and vulnerability to toxins, diseases, and parasites (McCullough 1999; Katinić et al. 2015). Shifting precipitation regimes may also affect stream flows, leading to reduced availability of spawning and rearing habitat and an increased risk that eggs and juveniles will be destroyed by severe flood flows during winter (Bisson 2008).

Table 4.9-1 Summary of Streams in the Study Area

Stream Name	Stream Index No.[1]	State Interim Water Type[2]	Local Jurisdiction	Local Jurisdiction Stream Classification[3]	Local Jurisdiction Buffer Width[3]
Federal Way Segment					
East Fork Hylebos Creek Tributary 0016A	10.0016A	3	Federal Way	F	100
West Fork Hylebos Creek Tributary 0014C	10.0014C	3	Federal Way	F	100
South Federal Way Segment					
East Fork Hylebos Creek Tributary 0016A	10.0016A	3	Federal Way	F	100
Federal Way Stream 1 (SFW-01)	N/A	5	Federal Way/ Milton	Ns	30/65
Federal Way Stream 2 (SFW-02)	N/A	5	Federal Way	Ns	30
Federal Way Stream 3 (SFW-03)	N/A	3	Federal Way	F	100
Federal Way Stream 4 (SFW-04)	N/A	3	Federal Way	F	100
West Fork Hylebos Creek	10.0014	2	Milton	F	150
North Fork Hylebos Creek	10.0013	2	Federal Way	F	100
Milton Stream 1 (SMI-01)	N/A	3	Milton/ Pierce County	F/F_1	150/150
Milton Stream 2 (SMI-02)	N/A	2	Milton	F	150
Milton Stream 3 (SMI-03)	N/A	5	Milton	Ns	65
Hylebos Creek[4]	10.0006	1	Pierce County/ Milton/Fife	F_1/S/1	150/165/ Case-by-Case[5]
Surprise Lake Creek	10.0009	3	Fife	3	Case-by-Case
Fife Segment					
Fife Ditch Tributary 1[6]	N/A	4	Fife	N/A	N/A
Fife Ditch[6]	N/A	4	Fife	N/A	N/A
Wapato Creek	10.0017	2	Fife	2	Case-by-Case
Erdahl Ditch Tributary 1[6]	N/A	4	Fife	N/A	N/A
Erdahl Ditch Tributary 2[6]	N/A	4	Fife	N/A	N/A
Tacoma Segment					
Puyallup River[4]	10.0021	1	Tacoma/Fife	S/1	150/ Case-by-Case
First Creek	N/A	3	Tacoma	F_1	150

Notes:

(1) WRIA identification numbers according to Williams et al. (1975) and King County (1990); N/A indicates the stream is not identified in either of those sources.

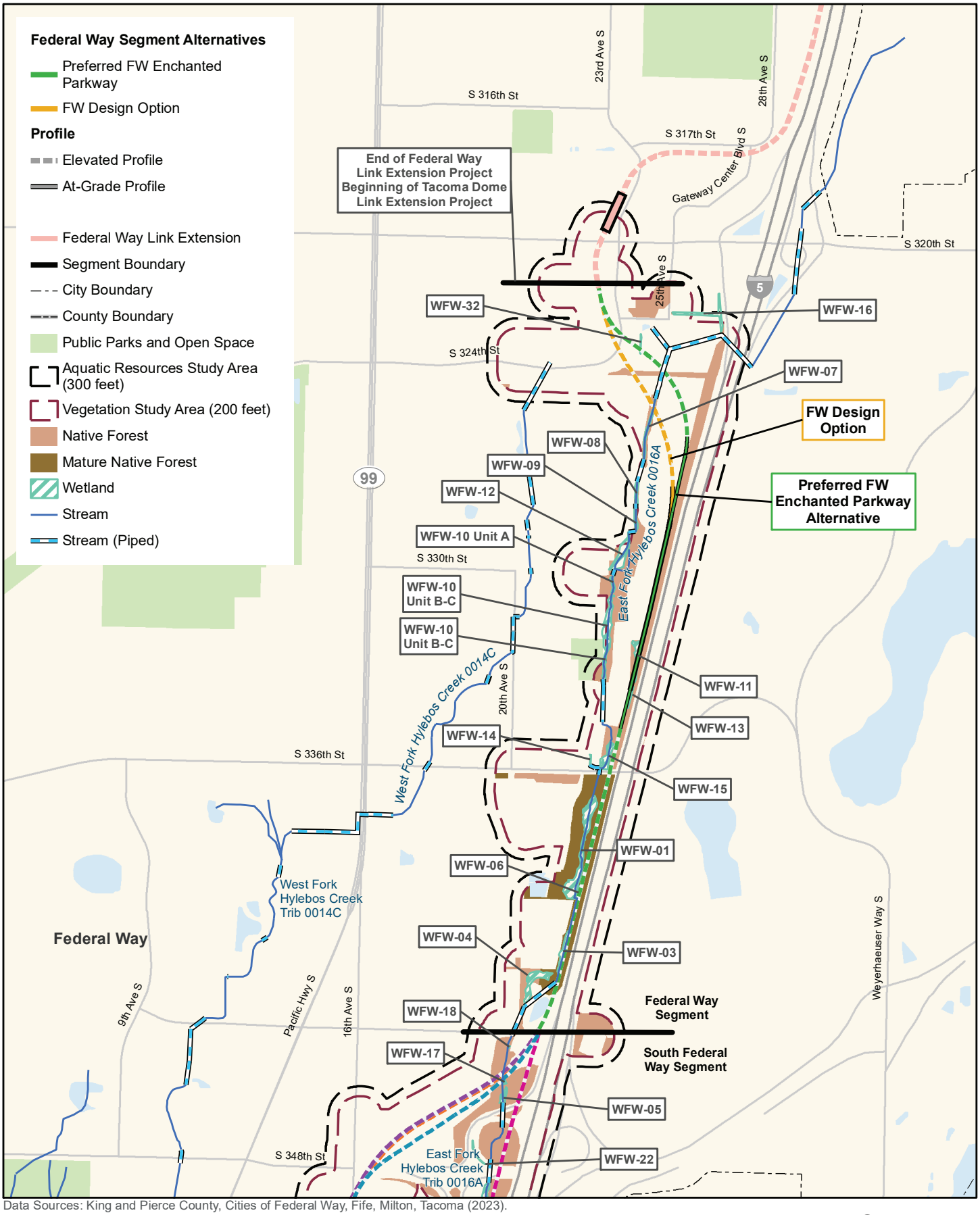
(2) Per WAC 222-16-031, Type 1 waters are shorelines of the state; Type 2 waters have a have a high fish, wildlife, or human use; Type 3 waters have a moderate to slight fish, wildlife, or human use; Type 4 waters are perennial, non-fish-bearing streams; Type 5 waters are seasonal, non-fish-bearing streams.

(3) Per Federal Way Municipal Code 19.145.270 (revised October 15, 2019), Milton Municipal Code 18.16.640(D), Tacoma Municipal Code 13.11.420, Fife Municipal Code 17.15.050, and/or Pierce County Code 18E.40.60, as applicable. Numeric classifications are as described under WAC 222-16-031 (see preceding footnote). Other classifications: F = streams with fish habitat; F_1 = natural waters containing salmonid fishes; Ns = seasonal, non-fish habitat streams; S = shorelines of the state.

(4) Hylebos Creek and the Puyallup River are classified as shorelines of the state. Despite this classification, the Pierce County Code does not classify Hylebos Creek as a Type S stream, instead assigning it a classification of F_1.

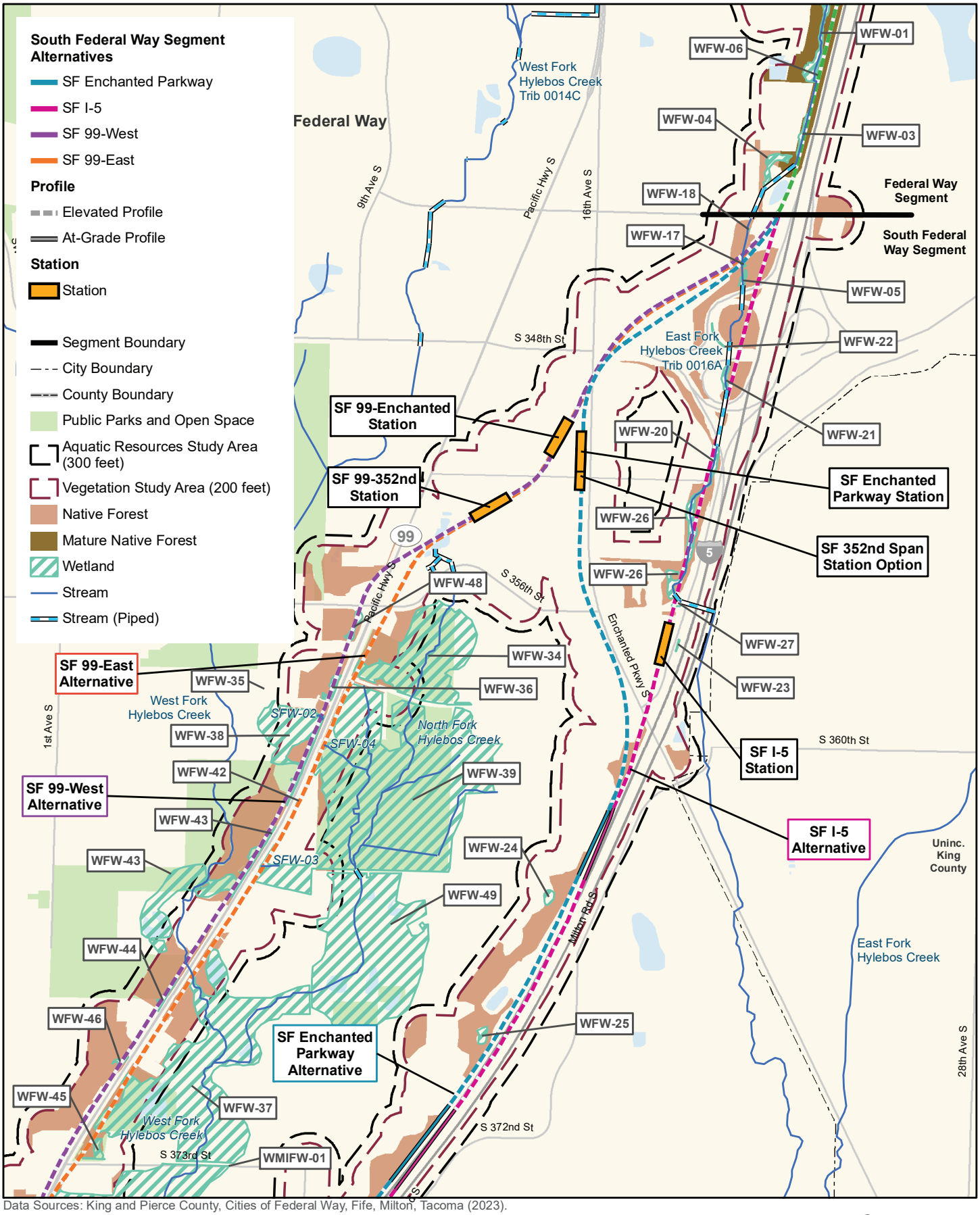
(5) Per Fife Municipal Code 17.15.050, the widths of buffers on streams are to be determined by the community development director on a case-by-case basis. To evaluate the potential impacts of the alternatives on riparian areas, the following buffer widths were used for streams in Fife: Type 1 – 165 feet; Type 2 – 150 feet; Type 3 – 115 feet. These widths are based on the buffers for corresponding stream types in the Milton Municipal Code.

(6) Fife Ditch, Erdahl Ditch, and their tributaries serve primarily as stormwater conveyance ditches with pump stations at the outlets. Based upon WDFW surveys, WDFW has determined that they are non-fish bearing ditches and will therefore not be regulated as streams by WDFW or the City of Fife.



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

FIGURE 4.9-1
Ecosystem Resources Study Area
Federal Way Segment
Tacoma Dome Link Extension



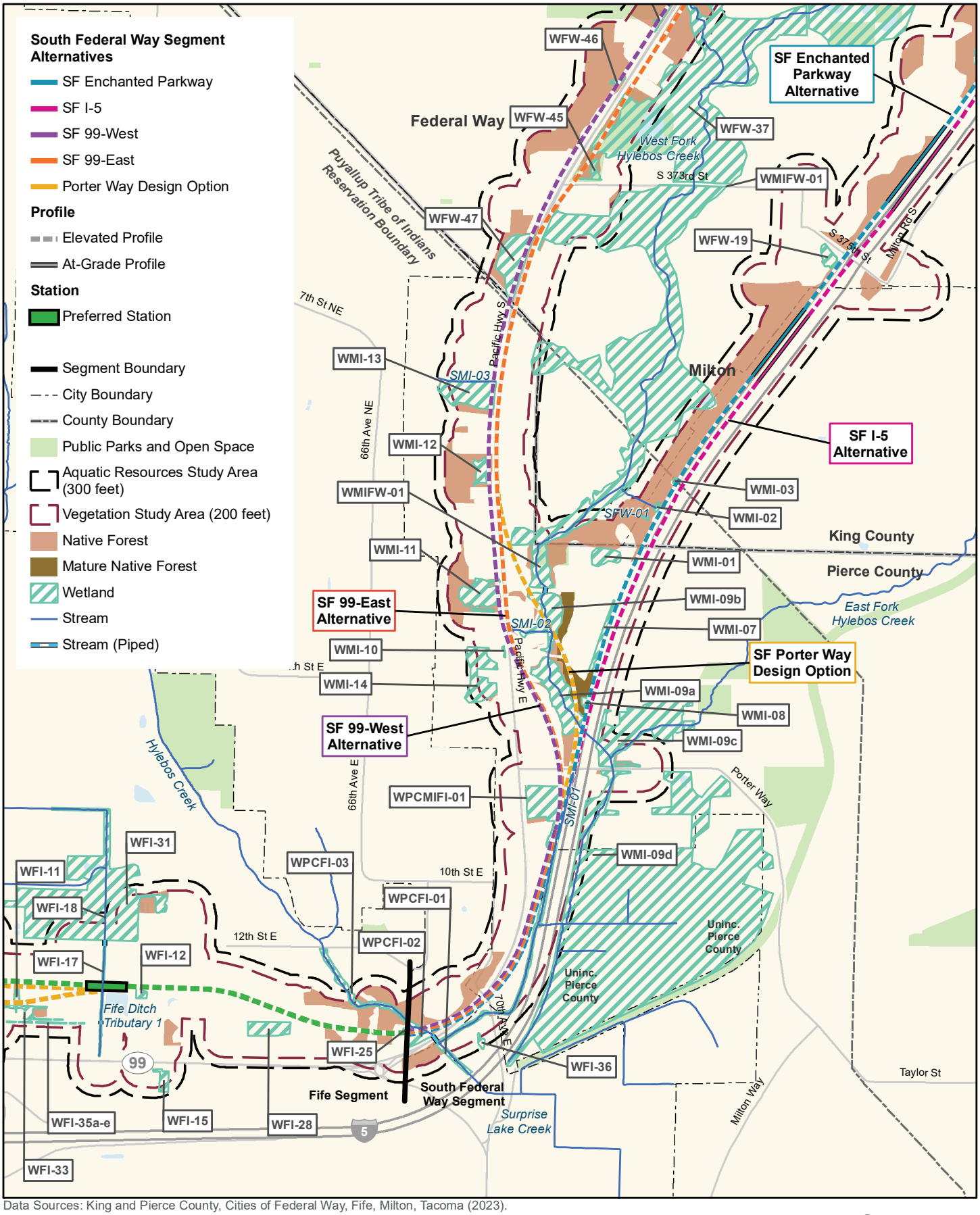
Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

0 0.5 1 Mile

FIGURE 4.9-2
Ecosystem Resources Study Area
South Federal Way Segment

Tacoma Dome Link Extension

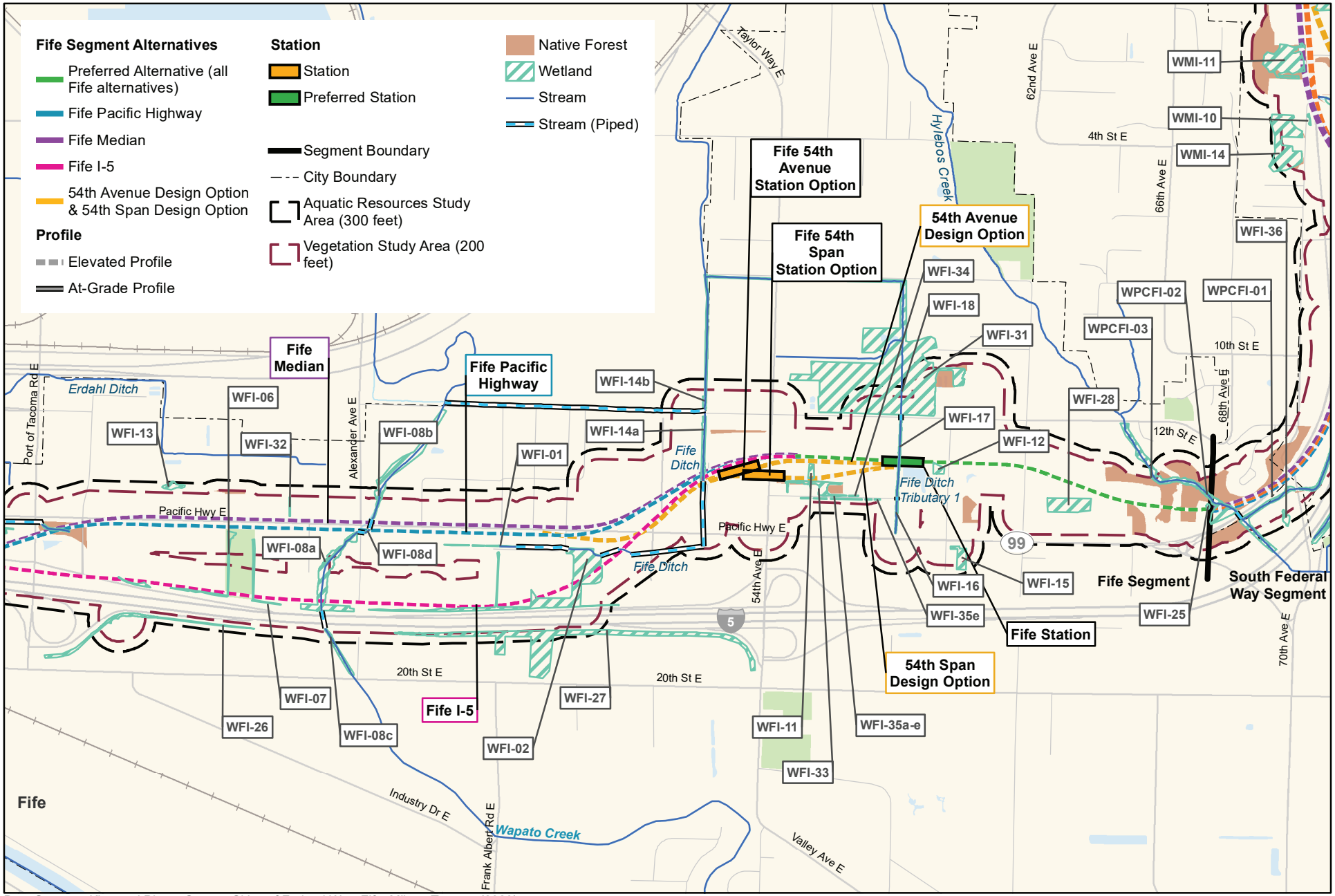


Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

FIGURE 4.9-3
Ecosystem Resources Study Area
South Federal Way Segment
Tacoma Dome Link Extension

N

0 0.5 1 Mile



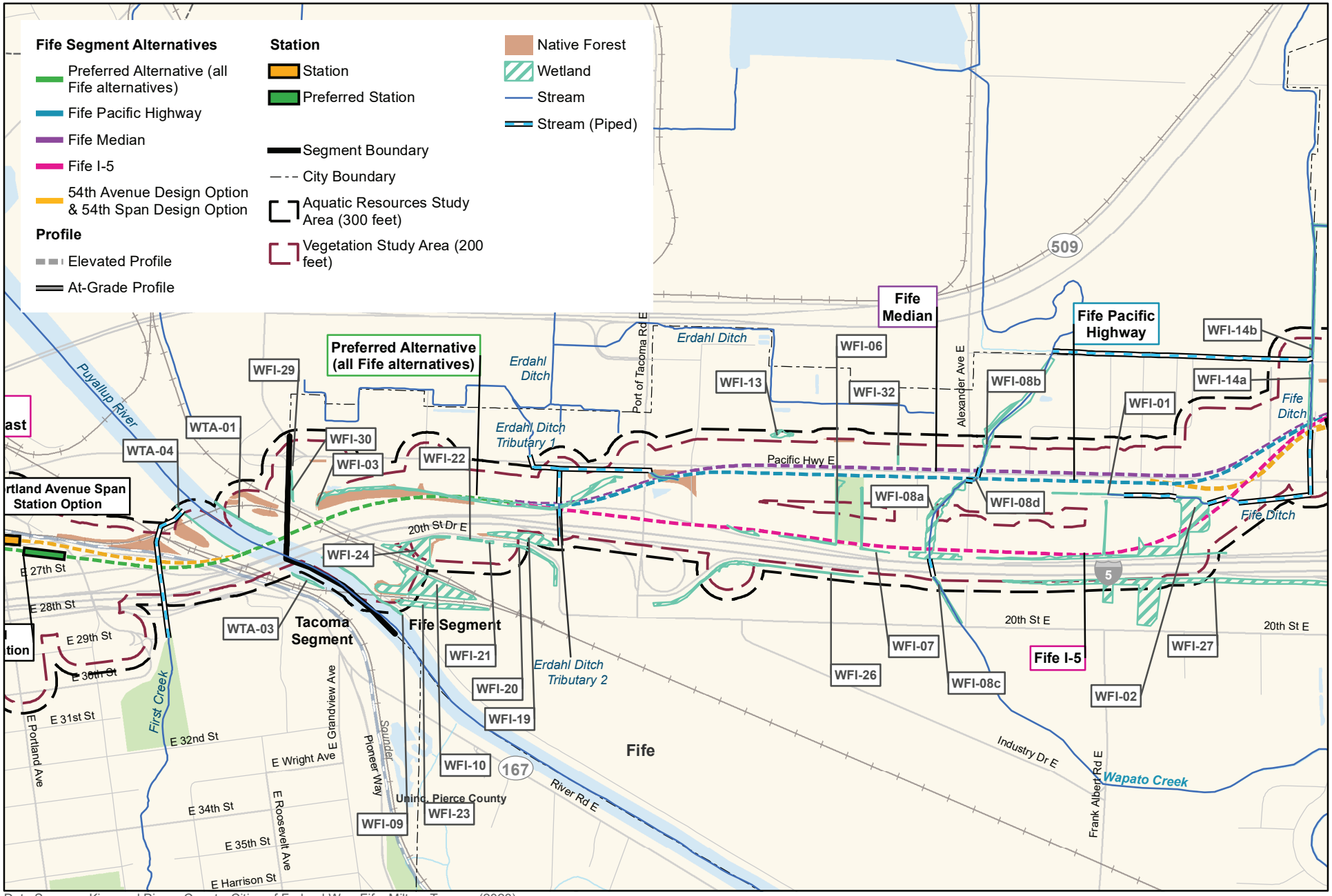
Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

0 0.5 1 Mile

FIGURE 4.9-4
Ecosystem Resources Study Area
Fife Segment

Tacoma Dome Link Extension



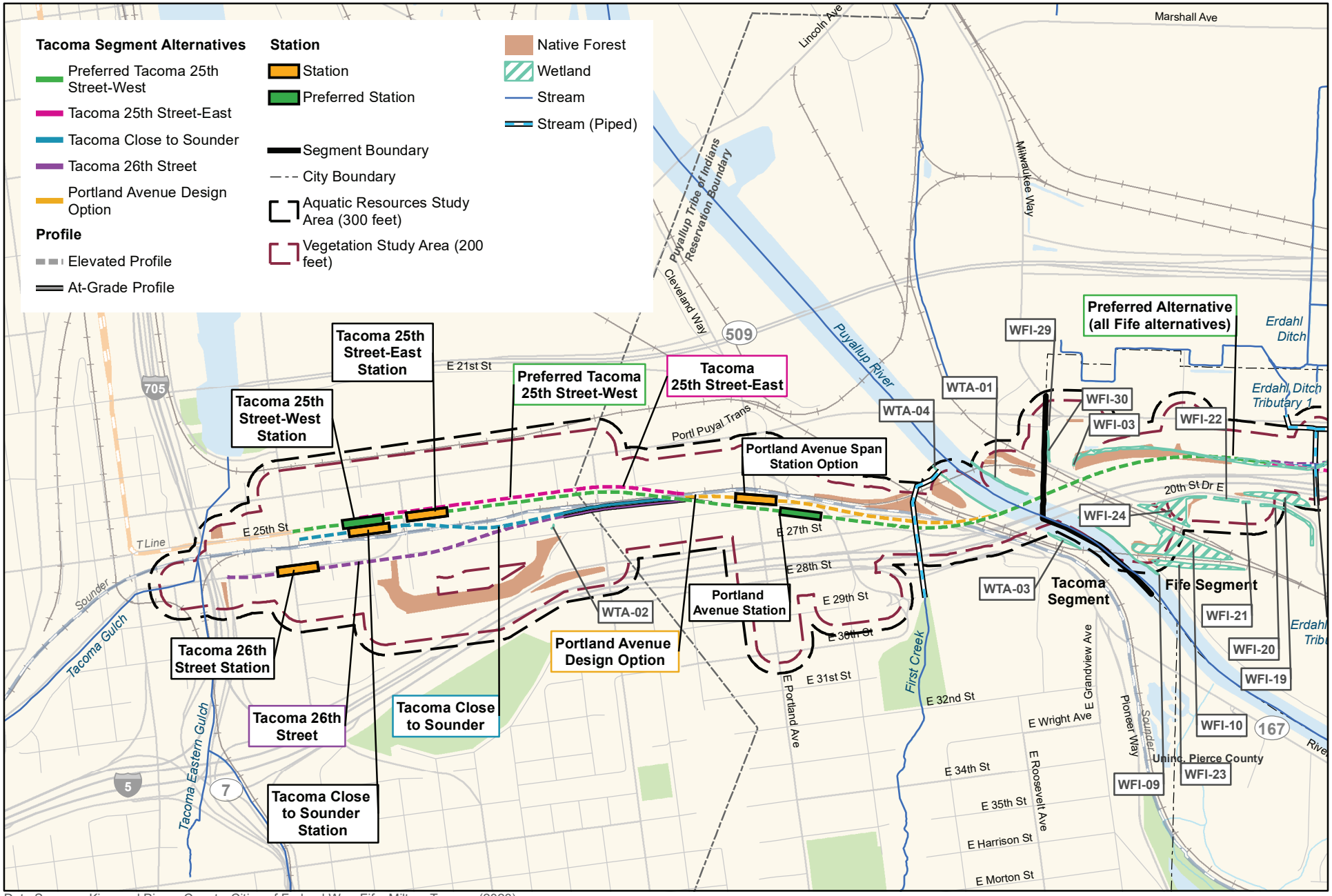
Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

0 0.5 1 Mile

FIGURE 4.9-5
Ecosystem Resources Study Area
Fife Segment

Tacoma Dome Link Extension



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

FIGURE 4.9-6
Ecosystem Resources Study Area
Tacoma Segment

Tacoma Dome Link Extension

Federal Way Segment

Two streams are present in the Federal Way Segment. These are East Fork Hylebos Creek Tributary 0016A and West Fork Hylebos Creek Tributary 0014C.

East Fork Hylebos Creek Tributary 0016A parallels the alignment alternatives for approximately 2 miles, substantially more than any other stream in the TDLE study area. The stream flows southward through the study area, confined by I-5 to the east and residential, commercial, and light industrial developments to the west (Figure 4.9-2). Near S 356th Street, the stream turns east and crosses under I-5 to join other tributaries, forming East Fork Hylebos Creek.

The segments of East Fork Hylebos Creek Tributary 0016A in the study area flow intermittently. The streambed in this area is typically dry during late summer and early fall. Much of the stream is confined within a straight and uniform (ditch-like) channel profile. Dense patches of reed canarygrass have become established in some low-energy areas, exacerbating the deposition of fine sediment and degradation of potential spawning gravels. Riparian habitat conditions in the study area are variable. From S 336th Street to S 344th Street, the stream passes through a corridor of native mature forest habitat that extends more than 100 feet from the stream in either direction.

There is no documented fish use in East Fork Hylebos Creek Tributary 0016A; however, the stream is considered potentially accessible to fish. Under current conditions, human-created barriers to fish passage prevent anadromous salmonids from entering stream reaches in the study area (NWIFC 2023; WDFW 2023b). The presence of resident fish is unlikely, given the intermittent flow of the stream and the presence of human made barriers between the study area and potential population sources downstream. However, the basin size, channel width, and gradient of the stream indicate the potential to support fish in the future. The Northwest Indian Fisheries Commission (2023) classifies stream reaches in the study area as potentially accessible to coho salmon and steelhead. If access were restored to the East Fork Hylebos Creek Tributary 0016A, it would provide limited rearing habitat for both steelhead and coho salmon. Both species rear in freshwater for more than a year before outmigrating to marine waters and are thus reliant on high quality rearing habitat to complete their life cycles. Because of the intermittent nature of the stream, rearing habitat would be limited during the late summer and early fall.

A piped segment of West Fork Hylebos Creek Tributary 0014C, near the stream's headwaters, is present in the northern portion of the study area. After it exits the pipe immediately downstream of the study area, the intermittently flowing stream is confined within a combined in-line stormwater facility and wetland in the Belmor golf course. From there, the stream flows south, eventually joining other tributaries to form West Fork Hylebos Creek.

South Federal Way Segment

The South Federal Way Segment includes portions of 12 streams (Table 4.9-1) described below from north to south. One stream (East Fork Hylebos Creek Tributary 0016A) is also present in the Federal Way Segment and is described above.

North Fork Hylebos Creek originates in regional stormwater facilities immediately north of S 356th Street. A small segment of the stream near its headwaters flows through the study area, where it is confined in a straight, ditch-like channel. Riparian vegetation in the study area is limited to a narrow band (50 feet) of immature mixed coniferous and deciduous forest. Stream reaches in the study area are on the 303(d) list, based on the benthic macroinvertebrate

bioassessment parameter (Ecology 2023). Salmonid species known or expected to be present in North Fork Hylebos Creek in or near the study area are coho salmon and steelhead (WDFW 2023a; NWIFC 2023).

Federal Way Stream 2 (SFW-02) originates in a wetland (WFW-38) on the west side of SR 99, just south of S 359th Street. The stream is assumed to join North Fork Hylebos Creek east of SR 99. Riparian vegetation outside the SR 99 right-of-way consists primarily of native, deciduous forest. The stream channel, as it parallels the roadway, is primarily vegetated with Himalayan blackberry and reed canarygrass. The stream is likely intermittent. There is no documented fish use of SFW-02 (WDFW 2023a; NWIFC 2023).

Federal Way Stream 4 (SFW-04) emerges from beneath SR 99 in an approximately 18-inch-diameter culvert and is a tributary to North Fork Hylebos Creek. This stream may be the downstream continuation of SFW-02. Riparian habitat in the study area consists primarily of native, deciduous forest. Currently, there is no documented fish use of SFW-04 (WDFW 2023a; NWIFC 2023). Because this section of stream is connected to North Fork Hylebos Creek, at least during some parts of the year, fish species present in North Fork Hylebos Creek may also enter SFW-04 in the study area.

Federal Way Stream 3 (SFW-03) originates in a large wetland (WFW-43) west of SR 99. After crossing under SR 99, the stream flows approximately 200 feet east before the channel loses definition in a large wetland (WFW-39). It is assumed that the stream is connected to North Fork Hylebos Creek outside of the study area. Riparian habitat in the study area consists primarily of native, deciduous forest. Currently, there is no documented fish use of SFW-03 (WDFW 2023a; NWIFC 2023). Because this section of stream is likely connected to North Fork Hylebos Creek, at least during some parts of the year, fish species present in North Fork Hylebos Creek may also enter SFW-03 in the study area.

West Fork Hylebos Creek is a perennially flowing stream that originates in West Hylebos Wetlands Park near S 348th Street in Federal Way and flows southward through forested habitats west of SR 99. The stream is joined by several tributaries before it crosses beneath I-5 in Milton and joins East Fork Hylebos Creek to form Hylebos Creek. West Fork Hylebos Creek is considered to contain the highest quality habitat within the Hylebos Creek watershed, which can be attributed in part to the large riparian wetland complexes that buffer the stream from some of the adverse impacts associated with the highly developed watershed (EarthCorps 2016; King County 1990; HDR 2014). Riparian habitat in the study area is predominantly deciduous forest, although some conifers are present. Invasive species in the understory may diminish riparian habitat quality.

West Fork Hylebos Creek in the study area is a migration corridor for Chinook salmon, chum salmon, coho salmon, steelhead, and cutthroat trout, and it provides rearing habitat for juveniles of all species except chum salmon. Coho salmon have been documented spawning within the study area (WDFW 2023a; NWIFC 2023). The City of Federal Way has identified the lower reaches of West Fork Hylebos Creek (near the southern end of the South Federal Way Segment) as a top priority for conservation within their jurisdiction. The City has undertaken a substantial effort to acquire properties and to begin restoration of degraded habitat in those areas (EarthCorps 2016). The Puyallup Tribe of Indians is also focused on restoration of salmon habitat in Hylebos Creek and its tributaries.

Milton Stream 3 (SMI-03) has yet to be assessed in the field due to access restrictions. Existing maps and aerial imagery indicate that the stream enters West Fork Hylebos Creek near the

King/Pierce county line, approximately 500 feet north of Birch Street. It is unknown whether fish from West Fork Hylebos Creek have access to reaches of SMI-03 in the study area.

Federal Way Stream 1 (SFW-01) is an ephemeral (flowing only during and following rainfall) tributary to West Fork Hylebos Creek near the King-Pierce county line. The stream originates on the east side of I-5 and is conveyed beneath I-5 in an approximately 36-inch-diameter culvert. West of I-5, the stream flows approximately 400 feet due west to its confluence with West Fork Hylebos Creek. The stream channel in the study area is uniform and straight narrows to approximately 1.5 to 2 feet wide in some areas, with 7-foot-high vertical banks. Riparian vegetation is limited to reed canarygrass and Himalayan blackberry in the WSDOT right of-way; farther west, the stream passes through areas of mature red alder. There is no documented fish use of SFW-01. The narrow channel and steep gradient (>20%) limit the potential for fish to use the stream in the study area.

Milton Stream 2 (SMI-02) crosses SR 99 near the intersection of 70th Avenue E and then flows approximately 400 feet east to its confluence with West Fork Hylebos Creek. Stream flow is likely intermittent. The channel is straight and narrow, with an average bankfull width ranging between 2 and 3 feet. Riparian habitat in much of the study area is poor and dominated by invasive species, including Himalayan blackberry and English ivy. However, once the stream enters the broad floodplain of West Fork Hylebos Creek, the quality of riparian habitat increases. Fish use of the stream has not been documented, but there are no barriers that would prevent fish from entering the stream from West Fork Hylebos Creek.

Milton Stream 1 (SMI-01) originates in a roadside ditch on the west side of I-5 immediately south of Porter Way and flows 0.3 mile south to meet Hylebos Creek as the latter emerges from under I-5. Some segments of the stream in the study area flow intermittently; others flow perennially. The stream channel is choked with reed canarygrass and does not provide suitable spawning habitat for salmonids. The riparian corridor is generally narrow and constrained by fill slopes associated with I-5 to the east and commercial development to the west, limiting its functional capacity. Fish use of the stream has not been documented, but there are no known/documented barriers that would prevent fish from entering the stream from Hylebos Creek.

Hylebos Creek enters the study area from the east, on the opposite side of I-5 from the alignment alternatives. From the confluence of the East Fork Hylebos Creek and West Fork Hylebos Creek (immediately north of Porter Avenue) downstream to its mouth, this perennial stream is classified as a shoreline of the state. The stream passes under I-5 and then flows southward through a narrow, grassy strip between the freeway and a commercial property. The stream then turns westward, passing under 70th Avenue E and SR 99 (Pacific Highway E) and flowing northwest out of the study area. Hylebos Creek is crossed by the alignment alternatives after it passes under SR 99. Riparian habitat in the study area is generally low-quality, dominated by low-growing and invasive species. Habitat quality improves near the SR 99 crossing, where areas of native trees and shrubs are present. Overall, the lack of mature riparian trees in the study area limits the potential for recruitment of large woody debris to the stream, which not only reduces habitat complexity and cover but can contribute to elevated stream temperatures. Salmonid use of Hylebos Creek is similar to that described for West Fork Hylebos Creek, above (WDFW 2023b; NWIFC 2023).

Surprise Lake Creek, at the southern end of the South Federal Way Segment, drains residential and agricultural areas in Edgewood and Fife before joining Hylebos Creek immediately upstream of SR 99. The segment of the stream in the study area flows perennially. Riparian vegetation in

the study area is a mixture of native shrubs, invasive shrubs, and herbaceous plants. The stream is accessible to fish that are present in Hylebos Creek.

Fife Segment

The Fife Segment includes segments of Fife Ditch Tributary 1, Fife Ditch, Wapato Creek, Erdahl Ditch Tributary 1, and Erdahl Ditch Tributary 2. Under current conditions, the capacity of these streams to support salmonids is limited by poor water quality, altered peak and base flows, lack of suitable spawning habitat, inadequate cover, low-quality riparian habitat, or some combination of those factors.

Fife Ditch Tributary 1 originates on the north side of Pacific Highway E in the study area and flows 0.5 mile north before turning west and flowing 0.4 mile to its confluence with Fife Ditch. In the study area, the watercourse likely flows perennially and is confined to a ditch bordered primarily by grasses and invasive shrubs, such as Himalayan blackberry. There is no documented fish use of Fife Ditch Tributary 1, but NWIFC (2023) classifies stream reaches in the study area as potentially accessible to coho salmon, Chinook salmon, pink salmon, and steelhead. WDFW has determined that Fife Ditch Tributary 1 is a non-fish bearing stormwater ditch based upon WDFW surveys in support of the WSDOT SR 167 Completion project (Penk 2023a, personal communication).

Fife Ditch drains runoff from industrial, commercial, residential, and agricultural areas in Fife, emptying to Hylebos Creek through a tide gate and pump station just upstream of the Hylebos Waterway. The watercourse is contained in pipes for most of its length in the study area. Some segments in the study area support perennial flow, and others flow intermittently. Riparian vegetation near surface-flowing segments consists primarily of reed canarygrass and mowed grasses and herbaceous vegetation. Very few trees are present in the riparian corridor in the study area. According to NWIFC (2023) chum salmon, coho salmon, and steelhead have been documented in Fife Ditch immediately downstream of the study area; NWIFC (2023) classifies stream reaches in the study area as potentially accessible to those species, along with Chinook salmon and pink salmon. However, documented fish distribution shown for Fife Ditch may not be valid due to stream mapping errors which incorrectly show Wapato Creek flowing into Fife Ditch. Local information provided by the Port of Tacoma for the Lower Wapato Creek Habitat Project indicates that there is no hydrologic connection between Wapato Creek and Fife Ditch; therefore, fish use may only be presumed. Recently, WDFW has determined, based upon surveys conducted by WDFW in 2019 and 2020, that Fife Ditch and its tributaries are non-fish bearing stormwater ditches (Penk 2023a, personal communication).

Wapato Creek flows approximately 13 miles through agricultural, residential, and light industrial areas, entering the study area near I-5 and flowing an additional mile to its discharge point into Blair Waterway. Stream reaches in the study area experience critical low-flow conditions, and the channel may sometimes dry up. The channel of Wapato Creek in the study area is confined by fill slopes with little functioning floodplain. There is little or no functioning riparian habitat along the stream in the study area, and the stream channel is dominated by reed canarygrass. Wapato Creek in the study area is included on the current list of impaired waters in Washington State, based on high bacteria levels and low concentrations of dissolved oxygen (Ecology 2023). Wapato Creek in the study area provides rearing habitat for coho salmon; chum salmon and winter steelhead have also been documented (WDFW 2023a; NWIFC 2023). The stream is also assumed to be accessible to Chinook salmon and pink salmon. In 2021, in partnership with the Puyallup Tribe of Indians, the Port of Tacoma completed the Lower Wapato Creek Habitat Project approximately 0.2 mile downstream of the study area.

The Erdahl Ditch drainage system was constructed to convey surface water runoff from the western portion of Fife to the Blair Waterway. Both Erdahl Ditch Tributary 1 and Erdahl Ditch Tributary 2 in the study area flow intermittently and are largely contained in pipes. The surface-flowing segment of Erdahl Ditch Tributary 1 in the study area is maintained as a stormwater conveyance facility at the interchange between southbound I-5 and Port of Tacoma Road. The only surface-flowing segment of Erdahl Ditch Tributary 2 in the study area (approximately 50 feet in length) lies between I-5 and the commercial property to the north. The two watercourses likely converge (within pipes) on the south side of Pacific Highway E before being piped to an open channel north of the roadway. Both watercourses are assumed to be accessible to Chinook salmon, chum salmon, coho salmon, pink salmon, and steelhead (NWIFC 2023). Recent communications with WDFW indicate that the Erdahl Ditch tributaries will be considered non-fish bearing stormwater ditches, similar to the Fife Ditch Tributary (Penk 2023b, personal communication).

Tacoma Segment

The Tacoma Segment includes segments of the Puyallup River and First Creek, a tributary to the Puyallup River.

Draining an area of more than 950 square miles, the Puyallup River is the largest watercourse in the study area. The Puyallup River is classified as a shoreline of statewide significance based on mean annual flows exceeding 1,000 cubic feet per second. The river has been extensively modified through flood control projects, hydropower development, agriculture, and urbanization. Extensive tide flats and floodplain wetlands near the river's mouth, including the segment in the study area, were filled in the 19th and 20th centuries to support industrial land uses. Riparian vegetation in this segment is limited by the presence of I-5 and nearby development as well as by vegetation management practices on the flood control levee that bounds the river.

The cities of Tacoma and Fife, overseen by the Washington State Department of Ecology, have regulatory authority within the shoreline jurisdiction of the river. The Puyallup Tribe of Indians has jurisdiction for work within the ordinary high water mark (OHWM) of the river in the study area, as well as authority under Section 401 of the Clean Water Act for water quality. In addition, the Washington Department of Fish and Wildlife is responsible for preserving, protecting, and perpetuating fish resources, as required under the Hydraulic Code (Chapter 77.55 RCW).

The Puyallup River supports populations of numerous salmonid species, including Chinook salmon, chum salmon, coho salmon, cutthroat trout, pink salmon, sockeye salmon, steelhead, and bull trout (WDFW 2023a; NWIFC 2023). For most of these species, the river segment in the study area serves primarily as a migratory corridor between marine habitats and spawning areas in the upper watershed. As discussed in Section 4.9.2.4, marine mammals may also use riverine habitats in the study area.

According to WDFW (2023a) and NWIFC (2023), the lower Puyallup River may provide rearing habitat for juvenile Chinook salmon and coho salmon. However, the Puyallup River channel bed in the study area is of uniform depth and consists of relatively uniform sand and silt material. The riverbed in this area provides limited, if any, rearing function for juvenile or adult salmonids (NMFS and USFWS 2009). In studies that encompassed the river in the study area, Puyallup Tribal Fisheries (2005) found few areas of gravel suitable for spawning; where present, gravel was generally too compacted to provide suitable spawning substrates.

First Creek originates in Tacoma on the plateau above the Puyallup River and flows north for approximately 2.7 miles before discharging through a culvert into a tidally influenced segment of the Puyallup River north of I-5. In the study area, the stream is contained entirely in pipes. The stream's flow regime (perennial or intermittent) in the study area is undetermined. First Creek is assumed to be accessible to Chinook salmon, chum salmon, coho salmon, pink salmon, and steelhead (NWIFC 2023).

4.9.2.2 Vegetation, Wildlife, and Wildlife Habitat

Much of the study area is dominated by urban development, including industrial, commercial, and residential areas. Analysts identified and delineated 11 vegetation cover types in the study area and evaluated their relative habitat value. The cover types (commercial, residential, grassland, invasive brush, native brush, non-native forest, mature native forest, other native forest, wetland/stream, river channel, and stormwater pond) are described in Appendix J4, Ecosystem Resources Technical Report. Relative habitat value is based on habitat structure, scarcity in the study area, disturbance types and frequency, and time required for ecosystem functions to recover following clearing and site restoration. Wildlife use of habitats in urban landscapes depends on the general location of the habitat, the size and type of undisturbed habitats, the degree of connectivity and extent of travel corridors between and among these habitats, and the types and levels of human activity.

Much of the study area (77 percent) is dominated by areas of high-intensity urban development with little vegetation cover and minimal habitat value (see Table J4.3-11 in Appendix J4, Ecosystem Resources Technical Report). Trees and other landscaping in residential areas provide limited habitat value. Other common vegetation cover types, particularly in the rights-of-way of I-5 and other roads, are grassy areas and patches of invasive shrubs (e.g., Himalayan blackberry). The relative habitat value of all such areas is low to moderate.

Wildlife use of such areas is generally limited to adaptable species, such as house sparrows, European starlings, rats, mice, raccoons, Virginia opossums, and eastern gray squirrels. Birds such as rock pigeons and cliff swallows commonly build nests on bridges and road overpasses, and many bat species use such structures as temporary roosting sites. Red-tailed hawks and other raptors prey on voles and other small mammals that are found in abundance in grassy vegetation, such as in the I-5 right-of-way. Peregrine falcons have been observed in the study area and are known to nest on nearby bridges. Open-water habitats, such as wetlands and stormwater detention ponds, provide resting and foraging areas for waterfowl. Animals that use habitats in the study area are exposed to high levels of disturbance generated by human activity in commercial and industrial areas and traffic on I-5 and major arterial roadways.

Compared to other cover types, areas classified as mature native forest or other native forest have greater biological diversity and higher value as wildlife habitat. Approximately 13 percent of the study area is classified as mature native forest or other native forest (see Table J4.3-11 in Appendix J4, Ecosystem Resources Technical Report). Most patches of forest cover in the study area are fragmented and separated from surrounding habitat areas by development and roads. Despite their isolation, these areas still provide habitat for resident and migratory songbirds, as well as for hawks, owls, woodpeckers, and small mammals. The greatest acreage and largest patches of forested habitat are in the South Federal Way Segment. The largest patch of mature native forest, approximately 15 acres in size, parallels I-5 near S 336th Street in the Federal Way Segment (Figure 4.9-1).

Streams and riparian areas are used as travel corridors by many wildlife species. In most areas, I-5 and SR 99 impede the movement of wildlife between the Green River and Puyallup River

valleys in the east and the Puget Sound shoreline to the west. In the South Federal Way Segment, I-5 crosses West Fork Hylebos Creek on a low (less than 10 feet above ground) bridge. This bridge may facilitate the movement of small- to medium-sized mammals along the stream corridor. The 20-foot-wide-by-10-foot-high culvert that conveys West Fork Hylebos Creek under SR 99 likely provides a similar degree of connectivity for small- to medium-sized mammals and amphibians.

4.9.2.3 Wetlands

Sound Transit identified a total of 106 wetlands in the study area. The wetlands are shown in Figure 4.9-1 through Figure 4.9-6 in this EIS and are summarized in Table J4.3-12 in Appendix J4, Ecosystem Resources Technical Report. See Figures J4.3-1 through J4.3-14 in Appendix J4 for depictions of wetland locations in more detail.

Throughout much of the study area, industrial, commercial, or residential development has substantially altered natural wetlands and watercourses. In the Federal Way Segment and the north section of the South Federal Way Segment, most wetlands are forested, riverine wetlands associated with the East Fork Hylebos Creek Tributary 0016A. Due to their proximity to developed areas and I-5, they reduce pollutant loading in the stream. Confinement by development limits the wetlands' ability to attenuate flood flows, however. Most wetlands in the central section of the South Federal Way Segment are associated with North Fork Hylebos Creek and West Fork Hylebos Creek. These riverine/depressional wetlands provide diverse and complex habitats with multiple vegetative structures and varied hydroperiods. In many cases, the hydrologic connections between these streams and associated wetlands appear to have been disrupted by the construction of SR 99 and other roads. Nevertheless, they provide valuable water quality and hydrologic functions due to their proximity to pollution-generating development and a broad, densely vegetated floodplain that can attenuate flood velocities.

The remainder of the study area (i.e., from the southern end of the South Federal Way Segment through the Fife Segment and the Tacoma Segment) is highly developed with largely commercial and industrial uses, which severely confines many of the wetlands. The majority of the wetlands are depressional, but some are associated with streams. Many wetlands, particularly in the Fife Segment, are managed as roadside ditches. A few forested wetlands remain near the Puyallup River, but they are fragmented by I-5, the Union Pacific Railway, and the Puyallup River levee. These wetlands do not provide high-value habitat, but they do provide limited water quality functions since many abut developed areas.

In many areas, the vegetated buffers of wetlands are degraded and limited by roads, buildings, parking lots, and other impervious surfaces. In residential areas, many buffers include landscaped lawns and other maintained areas. Where wetland buffers overlap stream buffers, the buffers are often less constrained and include riparian vegetation, such as mixed deciduous/coniferous forests.

4.9.2.4 Special-Status Species and Habitats

The following section addresses species and habitats that have special status under statutes, regulations, plans, and policies that have been established to protect ecosystem resources. These include species listed or proposed for listing under the ESA, as well as critical habitat that has been designated or proposed for designation for ESA-listed species; marine mammals that are protected under the Marine Mammal Protection Act (MMPA); and natural resource areas protected under local critical areas ordinances, shoreline master programs, and/or Tribal resource regulations. Many

of these regulations require approval procedures, such as the issuance of environmental permits before project implementation; others require agency consultation.

Threatened and Endangered Species

Three ESA-listed fish species — Puget Sound Chinook salmon, Puget Sound steelhead, and bull trout (all of which are listed as Threatened) — may be present in streams in the action area. Some stream segments in the study area have been designated as critical habitat for these species. These species or critical habitat are known or expected to be present in the following streams in the study area:

- West Fork Hylebos Creek (bull trout, Chinook salmon and steelhead; critical habitat for Chinook salmon and steelhead).
- North Fork Hylebos Creek (bull trout and steelhead).
- SFW-03 and SFW-04 (bull trout and steelhead).
- SMI-01 and SMI-02 (bull trout, Chinook salmon, and steelhead).
- Hylebos Creek (bull trout, Chinook salmon and steelhead; critical habitat for Chinook salmon and steelhead).
- Fife Ditch (steelhead; critical habitat for steelhead).
- Wapato Creek (steelhead; critical habitat for steelhead).
- Puyallup River (Chinook salmon, steelhead, and bull trout; no critical habitat designated due to Tribal ownership of the riverbed and bank).

ESA-listed fish could potentially enter other streams in the study area where natural or human-created barriers do not preclude access. Before initiating ESA Section 7 consultation for this project, Sound Transit would coordinate with USFWS and NMFS to identify stream segments where project-related activities could adversely affect ESA-listed species.

In addition to the fish species identified above, Southern Resident killer whales (listed as Endangered) are known to use habitats in Puget Sound, including Commencement Bay. Although the study area for aquatic species and habitat does not extend into Puget Sound, analyses in this report address the potential for Southern Resident killer whales to be indirectly affected by project-related impacts on their prey species.

The USFWS Information, Planning, and Conservation planning tool identified four ESA-listed wildlife species (marbled murrelet, yellow-billed cuckoo, streaked horned lark, and North American wolverine), and one species proposed for listing (northwestern pond turtle), as potentially occurring in areas that might be affected by the project. None of these species is expected to occur in the study area because no suitable habitat is present (see Appendix J4, Ecosystem Resources Technical Report).

In addition, the USFWS Information, Planning, and Conservation planning tool identified one ESA-listed plant species (marsh sandwort) as potentially occurring in areas that might be affected by the project. As discussed in Appendix J4, this species is not expected to occur in the study area due to lack of suitable habitat and distance from extant populations.

Marine Mammals

Harbor seals, California sea lions, and Steller sea lions often congregate in Commencement Bay. Seals and sea lions have been observed foraging on fish in the Puyallup River in the study area at all times of year. Marine mammals are not expected to be present in any other portions of the study area. Seals and sea lions are protected from harassment and harm under the MMPA. Compliance with the MMPA for in-water work may require coordination with and possibly the issuance of an incidental take permit or incidental harassment authorization by NMFS.

Areas Protected under Local Critical Areas Ordinances

Local critical areas ordinances specify requirements for the protection of two kinds of ecosystem components: fish and wildlife habitat conservation areas and wetlands. Wetlands are described in Section 4.9.2.3, above. The definition and identification of fish and wildlife habitat conservation areas vary among the five jurisdictions (Federal Way, Fife, Milton, Tacoma, and Pierce County) that encompass the TDLE study area. All five jurisdictions identify streams, lakes, and other waters of the state as fish and wildlife habitat conservation areas; these aquatic resources are described in Section 4.9.2.1. Other habitat types and areas identified as fish and wildlife habitat conservation areas under local critical areas ordinances are:

- Priority habitats, as classified by WDFW (Fife and Tacoma).
- State natural area preserves and natural resource conservation areas (Tacoma).
- Areas critical for habitat connectivity, including Open Space Corridors designated in the City's comprehensive plan (Tacoma).
- Areas established by the Puyallup Tribe of Indians Tribal government as habitat areas of Tribal importance for economic, social, cultural, and ceremonial reasons (Fife).
- Special habitat areas, including oak woodlands, prairies, aspen stands, and meadows (Fife).
- Old-growth/mature forests and areas with abundant and well-distributed snags and logs (Pierce County).

The only priority habitats that have been mapped by WDFW in the study area are wetland areas (WDFW 2023a; see Section 4.9.2.3). Riparian areas, another WDFW priority habitat type, are present along surface-flowing streams in the study area but are not mapped by WDFW. The condition of riparian habitats in the study area is described in Section 4.9.2.1. Some of the forested areas in the study area meet WDFW's criteria for the Mature Forest priority habitat type; such areas are labeled as Mature Native Forest in Figures 4.9-1, 4.9-2, and 4.9-3.

There are no state-designated natural area preserves or natural resource conservation areas in the study area. A small portion of an Open Space Corridor designated in the City of Tacoma's comprehensive plan falls within the study area, but it is not crossed by any of the alternative alignments. No oak woodlands, prairies, aspen stands, or meadows have been identified in the study area. The City of Tacoma also protects designated biodiversity areas and corridors, but no mapped biodiversity areas are crossed by any of the alternative alignments.

Sound Transit has initiated conversations with the Puyallup Tribe of Indians to identify any habitat areas of Tribal importance established by the Tribal government within the portion of the study area that lies within the reservation.

Fish and wildlife habitat conservation areas in Federal Way, Milton, Fife, Tacoma, and Pierce County all include areas with which federally listed endangered or threatened species have a primary association. The potential use of habitats by ESA-listed species in the study area is discussed under the heading, Threatened and Endangered Species, above.

The other designations that confer status to certain species under either local critical areas ordinances or shoreline master programs are:

- State listing as endangered, threatened, or sensitive species (all jurisdictions).
- State listing as candidate or monitor species (Fife and Pierce County only).
- Classification as priority species by WDFW (all jurisdictions except Milton and Pierce County).
- Identification as species of local importance (specified in Pierce County only).

All salmonid fish are WDFW priority species and Pierce County species of local importance. In addition, bull trout are a candidate species for state listing. WDFW also identifies seals and sea lions as priority species but considers them a management priority only at haul-outs (WDFW 2008). WDFW (2023a) does not identify any seal or sea lion haul-outs in the study area. No other aquatic species for which fish and wildlife habitat conservation areas may be established are known or expected to be present in the study area.

WDFW (2023a) does not identify any occurrences of priority wildlife species within 0.25 mile of any of the project alternatives. Priority species may nevertheless use habitats in the study area. Forested areas in the study area could provide suitable habitat for the following WDFW priority species: band-tailed pigeon, pileated woodpecker, Vaux's swift, big brown bat, Myotis bats, and Townsend's big-eared bat. Hooded mergansers and wood ducks may nest in forested wetlands. Big brown bats may use bridge structures as roosts or maternity colonies.

Areas Within the Shoreline Jurisdiction

Two streams in the ecosystems study area fall under the jurisdiction of the Shoreline Management Act: Hylebos Creek and the Puyallup River. Portions of the study area near Hylebos Creek fall within the shoreline jurisdictions of Milton, Fife, and Pierce County. Portions of the study area near the Puyallup River fall within the shoreline jurisdictions of Fife and Tacoma. The shoreline master programs of all these governments include provisions to ensure no net loss of ecological function in shoreline areas. These programs also include provisions for the protection of critical areas, including wetlands. In Fife and Tacoma, the standard buffer widths for wetlands in the shoreline regulations are the same as those established in those cities' critical areas regulations; the same is true for Pierce County. The City of Milton approved use of the final draft of the city's shoreline master program, dated September 21, 2020, which includes updated buffer widths for wetlands. Milton's critical areas ordinance was approved in 2006. As a result, wetland buffer widths in Milton's shoreline master program differ from those in the critical areas regulations.

Areas Protected by Tribal Regulations

The Puyallup Tribal Code (Section 15.12 et seq.) establishes district classifications, in substantial compliance with the Puyallup Tribe of Indians Comprehensive Land Use Plan, for all lands within the boundaries of the Puyallup Tribe of Indians Reservation. The locations and boundaries of the zoning districts are shown on the Tribe's official zoning map, which is kept on file in the Tribe's Land Use Office and is available for inspection by Tribal members.

Certain activities on Tribal trust lands may be undertaken only after permits have been issued by the Tribe, such as the construction of buildings or structures within 200 feet of shorelines or wetlands and dredging or filling of watercourses or wetlands (including pile driving). The Puyallup Tribe of Indians also has jurisdiction within the OHWM of the Puyallup River in the study area.

4.9.3 Environmental Impacts

This section identifies and evaluates the potential impacts of the alternatives, including the No-Build Alternative. Methodologies and assumptions incorporated into the analysis are described in the Ecosystem Resources Technical Report (Appendix J4).

4.9.3.1 No-Build Alternative

The No-Build Alternative also includes projects, funding packages, and proposals in the central Puget Sound region that are planned to occur with or without TDLE, as described in Chapter 2 (Section 2.2). The No-Build Alternative would not have any direct long-term impacts on ecosystem resources in most of the study area. Conversely, implementing the No-Build Alternative would preclude potential beneficial environmental effects over the long term, such as tempering increases in motor vehicle traffic in the region or facilitating the concentration of residential and commercial growth in planned growth centers.

Effects of guideway extension for the OMF South project would include the realignment of the channel of East Fork Hylebos Creek Tributary 0016A, as well as degradation of stream functions and values as a result of decreased forest cover in the stream's riparian buffer. Additional impacts would include the permanent loss of 3 to 4 acres of mature native forest habitat (an additional 6 to 11 acres of mature native forest habitat would fall within the permanent impact footprint of the OMF site), as well as impacts on the following wetlands and/or wetland buffers: Wetlands WFW-01, WFW-03, WFW-04, WFW-06, WFW-07, WFW-11, WFW-12, WFW-13, WFW-15, and WFW-32.

Construction of OMF South would entail removing approximately 420 feet of East Fork Hylebos Creek Tributary 0016A near S 344th Street from culverts and restoring the stream to a surface-flowing channel. Daylighting this segment would increase the amount of aquatic habitat available in the stream system.

Completion of WSDOT's I-5/SR 161/SR 18 Triangle Interchange Vicinity project could affect several wetlands in the South Federal Way Segment. That project would also involve the correction of several fish passage barriers on East Fork Hylebos Creek Tributary 0016A. As of November 2023, the project has been suspended, with no timeline for resumption.

The study area for WSDOT's SR 167 Completion Project intersects the TDLE study area in the Fife and Milton area. The SR 167 Completion Project includes the creation and/or restoration of approximately 2.6 miles of stream habitat and 110 acres of riparian buffer associated with Hylebos Creek, Surprise Lake Creek, and Wapato Creek. Some areas proposed for riparian habitat restoration fall within the TDLE study area, but none of the proposed stream relocation sites do (FHWA and WSDOT 2018). Consequently, habitat restoration completed for the SR 167 Completion Project would increase the availability of high-quality habitat in the TDLE study area.

Several of the wetlands and streams that will be affected by Stages 1a and 1b of the SR 167 Completion Project fall within the TDLE study area and may thus be diminished or even eliminated under the No-Build Alternative. The TDLE study area also includes some sites in Fife

identified by FHWA and WSDOT (2018) as potential wetland mitigation sites. The No-Build Alternative may also include some wetland creation, restoration, and/or enhancement in the study area. The SR 167 Completion Project will also enlarge or replace existing stream crossing structures on SMI-01, Hylebos Creek, Surprise Lake Creek, Fife Ditch Tributary 1, and Fife Ditch. The crossings on SMI-01, Hylebos Creek, and Surprise Lake Creek are in the TDLE study area. These structures will allow for continued fish passage or provide additional fish passage into stream reaches to which access is currently impeded. The new structures also provide additional movement opportunities for terrestrial wildlife, including under I-5 (FHWA and WSDOT 2018).

4.9.3.2 Long-Term Impacts for the Build Alternatives

Under any of the project alternatives, direct long-term impacts on ecosystem resources would occur where permanent features such as project facilities overlap ecosystem components such as streams, stream buffers, structurally complex vegetation, wetlands, or wetland buffers. Long-term impacts of light rail development on ecosystem resources are described below, followed by comparisons of the effects of the alternatives in each segment.

Analyses in this section assume that appropriate measures would be implemented and would perform as expected to avoid and minimize project-related impacts (see Section 4.9.3.5). In all segments, the station design alternatives or options would have no appreciable differences in their impacts on ecosystem resources; therefore, the analyses of the impacts of the alternatives incorporate all stations equally.

Tabular summaries of the impacts of the alternatives on aquatic resources, terrestrial resources, and wetlands are presented in the segment-specific impact analyses. More detailed analyses and figures are presented in the Ecosystem Resources Technical Report (Appendix J4).

Impacts Common to All Alternatives

Areas within about 15 feet of light rail facilities would be cleared for construction. Critical areas and buffers would be restored with native shrubs and other site-appropriate plant species afterward, but trees and other tall vegetation within the vegetative clearance zone near elevated guideways would be permanently removed for track safety. In areas that are currently dominated by invasive species (e.g., Himalayan blackberry, reed canarygrass), post-construction planting would improve habitat conditions by increasing structural and species diversity. In areas that currently support forested habitats, tree removal and replacement with lower-growing species would reduce habitat quality and diversity. Forested vegetation in wetlands and riparian corridors would be permanently converted to lower-growing shrub and emergent vegetation communities, thus reducing wetland and riparian functions.

If TDLE is constructed in phases, the M.O.S. to the station in South Federal Way and, to a lesser degree, the M.O.S. to the station in Fife would have the same type of ecosystem impacts, just in a smaller geographic area, until the remaining phases were completed.

Aquatic Species and Habitat

Direct long-term impacts on aquatic resources (including special-status species and habitats, as defined in Section 4.9.2.4) would occur where permanent features, such as project facilities, alter in-stream habitat or riparian functions.

Sound Transit has committed to minimizing the need to place existing streams in new culverts and has designed the TDLE alternatives to avoid new stream piping whenever possible. If any

existing culverts must be modified or replaced to accommodate new light rail facilities, or if any new culverts need to be installed, the new or replacement structures would be designed and installed in accordance with WDFW's Water Crossing Design Guidelines (Barnard et al. 2013) and with WDFW's climate change guidance for water crossings (Wilhere et al. 2016). In addition, Sound Transit would coordinate with WSDOT to ensure that the development of TDLE provides adequate space for any future replacement of WSDOT-owned culverts that are currently barriers to fish passage.

At all locations where they cross surface-flowing streams, all the alternatives would be on elevated guideways. At most crossings, the elevated structure would span the stream, and the support columns would be placed on either side, beyond the stream banks and outside the OHWM. Columns would be spaced and located to maximize their distance from streams. As such, at most stream crossings, the streambed and bank would not be modified and there would be no long-term impacts on in-stream habitat. Unavoidable impacts on streams are discussed in the analyses of segment-specific impacts, below. Table 4.9-2 presents a comparison of the project alternatives' potential impacts on aquatic species and habitat based on the length of stream centerlines and the amount of stream buffer area within the permanent impact footprint of each alternative in each segment.

Table 4.9-2 Potential Long-Term Impacts on Aquatic Resources by Alternative

Alternative	Stream Impact by Water Type[1, 2]	Affected Stream(s)	Stream Buffer Impact (acres)[1, 3]
Federal Way Segment			
Preferred FW Enchanted Parkway	Type F: 900 linear feet	East Fork Hylebos Creek Tributary 0016A	2.0
Preferred FW Enchanted Parkway with Design Option	Type F: 1,000 linear feet	East Fork Hylebos Creek Tributary 0016A	2.6
South Federal Way Segment			
SF Enchanted Parkway	Type S: 50 linear feet (0.02 acre)	Hylebos Creek	2.8
	Type F: 100 linear feet (0.03 acre for West Fork Hylebos Creek)	East Fork Hylebos Creek Tributary 0016A West Fork Hylebos Creek	
SF I-5	Type S: 50 linear feet (0.02 acre)	Hylebos Creek	5.6
	Type F: 900 linear feet (0.03 acre for West Fork Hylebos Creek)	East Fork Hylebos Creek Tributary 0016A West Fork Hylebos Creek	

Table 4.9-2 Potential Long-Term Impacts on Aquatic Resources by Alternative (continued)

Alternative	Stream Impact by Water Type[1, 2]	Affected Stream(s)	Stream Buffer Impact (acres)[1, 3]
SF 99-West	Type S: 50 linear feet (0.02 acre)	Hylebos Creek	3.7
	Type F: 100 linear feet (0.02 acre for West Fork Hylebos Creek)	East Fork Hylebos Creek Tributary 0016A West Fork Hylebos Creek	
	Type Ns: 350 linear feet	SFW-02 SMI-03	
SF 99-West with Porter Way Design Option	Type S: 50 linear feet (0.02 acre)	Hylebos Creek	4.3
	Type F: 200 linear feet (0.12 acre for West Fork Hylebos Creek)	East Fork Hylebos Creek Tributary 0016A West Fork Hylebos Creek SMI-02	
	Type Ns: 350 linear feet	SFW-02 SMI-03	
SF 99-East	Type S: 50 linear feet (0.02 acre)	Hylebos Creek	4.3
	Type F: 300 linear feet (0.01 acre for West Fork Hylebos Creek)	East Fork Hylebos Creek Tributary 0016A West Fork Hylebos Creek SFW-03 SFW-04 SMI-02	
	Type Ns: 250 linear feet	SMI-03	
SF 99-East with Porter Way Design Option	Type S: 50 linear feet (0.02 acre)	Hylebos Creek	4.7
	Type F: 400 linear feet (0.12 acre for West Fork Hylebos Creek)	East Fork Hylebos Creek Tributary 0016A West Fork Hylebos Creek SFW-03 SFW-04 SMI-02	
	Type Ns: 250 linear feet	SMI-03	

Table 4.9-2 Potential Long-Term Impacts on Aquatic Resources by Alternative (continued)

Alternative	Stream Impact by Water Type[1, 2]	Affected Stream(s)	Stream Buffer Impact (acres)[1, 3]
Fife Segment			
Fife Pacific Highway/ Fife Median[4]	Type F: 50 linear feet	Wapato Creek	0.2
	Type Np 400 linear feet	Fife Ditch Tributary 1 Fife Ditch Erdahl Ditch Tributary 1 Erdahl Ditch Tributary 2	
Fife Pacific Highway/ Fife Median with either 54th Avenue Design Option[4, 5]	Type F: 50 linear feet	Wapato Creek	0.2
	Type Np 300 linear feet	Fife Ditch Tributary 1 Fife Ditch Erdahl Ditch Tributary 1 Erdahl Ditch Tributary 2	
Fife I-5	Type F: 50 linear feet	Wapato Creek	0.2
	Type Np 300 linear feet	Fife Ditch Tributary 1 Fife Ditch Erdahl Ditch Tributary 2	
Fife I-5 with either 54th Avenue Design Option[5]	Type F: 50 linear feet	Wapato Creek	0.2
	Type Np 200 linear feet	Fife Ditch Tributary 1 Fife Ditch Erdahl Ditch Tributary 2	
Tacoma Segment[6]			
Preferred Tacoma 25th Street-West	Type S: 0.4 acre	Puyallup River	0.1
Tacoma 25th Street-East	Type S: 0.4 acre	Puyallup River	0.1
Tacoma Close to Sounder	Type S: 0.4 acre	Puyallup River	0.1
Tacoma 26th Street	Type S: 0.4 acre	Puyallup River	0.1

Notes:

(1) Impacts on most streams are reported as the length of the stream's centerline that falls within the permanent impact footprint, rounded to the nearest 50 linear feet. Based on the size and breadth of the Puyallup River, impacts on that watercourse are reported as the area (in acres) of the river that falls within the permanent impact footprint. As discussed in Appendix J4, the values in this table do not necessarily represent actual anticipated impacts, such as filling stream channels or enclosing them in pipes. Instead, these values indicate the relative degree of potential impacts on streams and stream buffers. See text for discussion.

(2) Stream typing in accordance with WAC 222-16-030.

(3) Buffer impact values represent all affected areas inside functional stream buffers, including areas that overlap wetland buffers.

(4) The impacts of the Fife Pacific Highway and Fife Median alternatives on all streams would be identical.

(5) The impacts of the 54th Avenue and 54th Span design options for the Fife Segment alternatives on all streams would be identical.

(6) Under any of the Tacoma Segment alternatives, the design options for the bridge crossing the Puyallup River would have different impacts that are not reflected in the permanent impact footprint. See text for discussion.

Where an alternative overlaps a stream's riparian buffer, the ecological function of that buffer would be diminished or eliminated. Substantial decreases in riparian function would occur where areas of tree or shrub cover in a stream's riparian zone are converted to light rail facilities or to vegetation types (e.g., lawns, ornamental landscaping) with less structural or compositional diversity. Where riparian vegetation, regardless of current condition, is removed altogether, potential future riparian functions would be eliminated. Potentially affected riparian functions and processes include fish and wildlife habitat provision; food chain support; water temperature moderation; infiltration; groundwater recharge and discharge; sediment delivery, transport, and storage; organic matter input; nutrient and pathogen removal; and stream channel formation and maintenance. In all four TDLE project segments, none of the alternatives would entail the construction of at-grade guideways immediately adjacent to streams or their associated riparian areas.

Additional impacts may occur where guideways pass over surface-flowing streams. Shade from structures placed over streams may affect the behavior of fish and the productivity of the food web in the affected stream segments. Out-migrating juvenile salmonids may respond to shadows from overwater structures by pausing at the upstream end of the darkened area or moving into deeper waters, potentially increasing their vulnerability to predation (Kemp and Williams 2008; Moore et al. 2013). Shade from overwater structures may also provide hiding cover for potential predators.

Runoff from impervious surfaces created or replaced for construction and operation of TDLE would be detained and/or treated, as appropriate, in accordance with the Sound Transit Design Criteria Manual and applicable local, state, and federal requirements. Appropriate treatment of runoff from PGIS would reduce the concentration of contaminants that enter receiving waters. However, water that passes through stormwater management facilities may still contain contaminants (albeit in reduced concentrations) that can harm fish in receiving waters. These impacts could extend a considerable distance downstream, potentially affecting fish, including ESA-listed species, in stream reaches outside of the study area. In addition, during major storm events, the capacity of those facilities may be exceeded, and some runoff may enter streams and other surface waters without receiving treatment.

Based on Sound Transit's commitment to design the proposed project to meet all applicable stormwater management requirements, none of the alternatives would be expected to have long-term adverse effects on flow regimes in streams. Peak stream flows would not increase because the stormwater systems built for the proposed project would be designed to simulate predevelopment hydrology. Additional measures to reduce stormwater runoff, such as low-impact development or other on-site measures, would be considered at a more advanced phase of project development.

Operation of TDLE would not be expected to increase nighttime illumination of fish-bearing waters (which could increase the risk of predation on juvenile salmonids) because the tracks would have no overhead lighting and the train headlights would be directed parallel to the tracks.

Vegetation, Wildlife, and Wildlife Habitat

Long-term impacts on vegetation and wildlife habitat (including areas that receive protection under local or Tribal resource regulations) would vary, depending on the affected land cover type. In much of the study area, the replacement of existing impervious surfaces and structures would constitute a minimal change in ecological functions, such as the capacity to support wildlife. In such areas, grass and low-growing vegetation along the alignment would provide some habitat for ground-dwelling small mammals, such as mice and voles.

The severity of impacts on plants and animals would be greater where cover types dominated by native or structurally complex vegetation (i.e., the mature native forest, other native forest, or wetland/stream cover types, including forested wetlands) are affected. Removing trees, snags, and understory vegetation would eliminate nesting and foraging sites for birds, roosting sites for bats, and hiding cover for small mammals. Alternatives that affect a greater area of such habitat types would have a higher likelihood of adverse effects on vegetation and wildlife. Table 4.9-3 presents a comparison of potential impacts on the two native forest cover types. Potential long-term impacts on the wetland/stream cover type are addressed in the analyses of impacts on wetlands and aquatic habitats.

Table 4.9-3 Potential Long-Term Impacts on Native Forest Habitats by Alternative

Alternative	Impacts on Mature Native Forest (acres)	Impacts on Other Native Forest (acres)
Federal Way Segment		
Preferred FW Enchanted Parkway (with or without Design Option)	2	3
South Federal Way Segment		
SF Enchanted Parkway	1	10
SF I-5	1	16
SF 99-West	0	9
SF 99-West with Porter Way Design Option	1	9
SF 99-East	0	8
SF 99-East with Porter Way Design Option	1	8
Fife Segment		
Fife Pacific Highway/Fife Median[1]	0	1
Fife Pacific Highway/Fife Median with either Design Option[2]	0	2
Fife I-5 with or without either Design Option[2]	0	1
Tacoma Segment		
All Alternatives	0	0

Notes:
(1) The impacts of the Fife Pacific Highway and the Fife Median alternatives would be identical.
(2) The impacts of the 54th Avenue and 54th Span design options for the Fife I-5 Alternative would be identical.

The severity of impacts would depend on the type of structure. Construction and operation of at-grade segments of guideway would entail the permanent removal of nearly all vegetation within the permanent impact footprint. In contrast, vegetation would be able to grow underneath elevated structures in some areas, although the vegetation would be limited by the reduced availability of sunlight and water. Where elevated structures are built over critical areas and buffers, disturbed areas would be revegetated with native species. As discussed above, to minimize operational conflicts while still providing habitat benefits, areas within about 15 feet of elevated structures would typically be planted with smaller-stature trees and shrubs.

TDLE operations would entail moderate to high levels of human activity and associated noise and light. Notably, all the alternative alignments and station locations are adjacent to I-5 or other high-use roadways and are in developed areas with existing relatively high levels of human activity. Wildlife present in habitats in or near the project alternatives are regularly exposed to these sources of disturbance.

If activity or noise levels noticeably exceed current conditions, affected animals may be displaced from otherwise suitable habitat, potentially leading to competition with animals that occupy suitable habitat at other sites with less disturbance. Such competition may produce

increased stress and decreased reproductive success for affected individuals. Animals displaced from areas of suitable habitat may be exposed to an elevated risk of predation or vehicle collisions while they are seeking new areas of suitable habitat. Based on the limited amount of area that would be affected under any of the alternatives, such effects would not be expected to measurably reduce the regional populations of any wildlife species. None of the project alternatives is within 0.25 mile of a documented breeding area or other sensitive site for any special-status wildlife species.

Long-term impacts on the movement of wildlife through the study area would vary depending on the type of structure. Animals would be able to pass beneath elevated guideway segments. The general lack of vegetation in at-grade segments would likely pose a barrier to movement. Under any of the alternatives, most of the guideway would be on elevated structures and would run parallel to I-5 and other roadways that currently impede the movement of wildlife. As such, none of the alternatives would be expected to substantially alter the already impeded movement of wildlife through the study area.

Wetlands

Any of the build alternatives would have direct, long-term impacts on wetlands and wetland buffers. Filling or excavating for column placement or at-grade guideway construction would reduce the area and function of wetlands and their buffers by permanently modifying vegetation, hydric soils, and/or hydrology. Grading and filling can permanently change a wetland's capacity to store stormwater, filter pollutants, protect stream banks, and provide habitat for wildlife.

The analysis of impacts on wetlands is based on the total area of any wetland or buffer that is within the permanent footprint of the guideway, regardless of the guideway's profile at that location. Although elevated guideways would not permanently fill every wetland identified within the permanent impact footprint, some wetland areas below elevated guideways would likely experience long-term effects due to shading and reduced rainfall.

Direct long-term impacts on wetlands per segment and alternative are found in Table 4.9-4, below.

Table 4.9-4 Potential Long-Term Wetland Impacts by Alternative

Alternative	Total Wetland Impacts (acres)[1,2]	Wetland Impact by Ecology Category (acres)[1,2,3]	Impacted Wetland I.D.	Total Wetland Buffer Impacts (acres)[1,2,4]
Federal Way Segment				
Preferred FW Enchanted Parkway	0.54	Category II: 0.20 Category III: 0.34 Category IV: <0.01	WFW-03, WFW-06, WFW-11, WFW-13, WFW-15, WFW-32	2.78
FW Design Option	0.56	Category II: 0.20 Category III: 0.36 Category IV: <0.01	WFW-03, WFW-06, WFW-07, WFW-11, WFW-13, WFW-15	3.18

Table 4.9-4 Potential Long-Term Wetland Impacts by Alternative (continued)

Alternative	Total Wetland Impacts (acres)[1,2]	Wetland Impact by Ecology Category (acres)[1,2,3]	Impacted Wetland I.D.	Total Wetland Buffer Impacts (acres)[1,2,4]
South Federal Way Segment				
SF Enchanted Parkway	2.65	Category I: 0.16 Category II: 1.67 Category III: 0.83 Category IV: <0.01	WFW-17, WFW-19, WFW--24, WMI-01, WMI-02, WMI-03, WMI-06, WMI-07, WMI-08, WMI-09a, WPCFI-02, WPCMIFI-01	5.79
SF I-5	3.77	Category I: 0.16 Category II: 1.67 Category III: 1.93 Category IV: <0.01	WFW-19, WFW-20, WFW--21, WFW-24, WFW-26, WFW-27, WMI-01, WMI-02, WMI-03, WMI-06, WMI-07, WMI-08, WMI-09a, WPCFI-02, WPCMIFI-01	8.52
SF 99-West	6.31	Category I: 1.11 Category II: 4.65 Category III: 0.54 Category IV: 0.01	WFW-36, WFW-38, WFW-39, WFW-43, WFW-44, WFW-46, WFW-47, WFW-48, WMI-09a, WMI-10, WMI-11, WMI-12, WMI-13, WMIFW-01, WPCFI-02, WPCMIFI-01	11.18
SF 99-West with Porter Way Design Option	6.68	Category I: 1.18 Category II: 4.97 Category III: 0.54	WFW-36, WFW-38, WFW-39, WFW-43, WFW-44, WFW-46, WFW-47, WFW-48, WMI-09a, WMI-09b, WMI-11, WMI-12, WMI-13, WMIFW-01, WPCFI-02, WPCMIFI-01	11.38
SF 99-East	7.33	Category I: 1.02 Category II: 6.01 Category III: 0.30	WFW-34, WFW-36, WFW-37, WFW-39, WFW-42, WFW-43, WFW-47, WMI-09a, WMI-11, WMI-12, WMI-13, WMIFW-01, WPCFI-02, WPCMIFI-01	10.95
SF 99-East with Porter Way Design Option	7.75	Category I: 1.09 Category II: 6.37 Category III: 0.30	WFW-34, WFW-36, WFW-37, WFW-39, WFW-42, WFW-43, WFW-47, WMI-09a, WMI-09b, WMI-11, WMI-12, WMI-13, WMIFW-01, WPCFI-02, WPCMIFI-01	11.13
Fife Segment				
Fife Pacific Highway	2.24	Category II: 0.01 Category III: 0.97 Category IV: 1.26	WFI-03, WFI-04, WFI-08a, WFI-08d, WFI-12, WFI-14a, WFI-17, WFI-25, WFI-28, WFI-30	3.76
Fife Pacific Highway and 54th Avenue Design Option	2.04	Category II: 0.01 Category III: 0.77 Category IV: 1.26	WFI-03, WFI-04, WFI-08a, WFI-08d, WFI-12, WFI-14a, WFI-17, WFI-25, WFI-28, WFI-30	3.70
Fife Pacific Highway and 54th Span Design Option	2.29	Category II: 0.01 Category III: 0.87 Category IV: 1.26	WFI-03, WFI-04, WFI-08a, WFI-08d, WFI-12, WFI-14a, WFI-17, WFI-25, WFI-28, WFI-30, WFI-33	3.90
Fife Median	2.24	Category II: 0.01 Category III: 0.97 Category IV: 1.26	WFI-03, WFI-04, WFI-08a, WFI-08d, WFI-12, WFI-14a, WFI-17, WFI-25, WFI-28, WFI-30	3.76
Fife Median and 54th Avenue Design Option	2.04	Category II: 0.01 Category III: 0.77 Category IV: 1.26	WFI-03, WFI-04, WFI-08a, WFI-08d, WFI-12, WFI-14a, WFI-17, WFI-25, WFI-28, WFI-30	3.70

Table 4.9-4 Potential Long-Term Wetland Impacts by Alternative (continued)

Alternative	Total Wetland Impacts (acres)[1,2]	Wetland Impact by Ecology Category (acres)[1,2,3]	Impacted Wetland I.D.	Total Wetland Buffer Impacts (acres)[1,2,4]
Fife Median and 54th Span Design Option	2.29	Category II: 0.01 Category III: 1.02 Category IV: 1.26	WFI-03, WFI-04, WFI-08a, WFI-08d, WFI-12, WFI-14a, WFI-17, WFI-25, WFI-28, WFI-30, WFI-33	3.90
Fife I-5	3.16	Category II: 0.07 Category III: 1.82 Category IV: 1.26	WFI-02, WFI-03, WFI-05, WFI-06, WFI-07, WFI-08a, WFI-12, WFI-14a, WFI-17, WFI-25, WFI-28, WFI-30,	3.38
Fife I-5 and 54th Avenue Design Option	2.96	Category II: 0.07 Category III: 1.63 Category IV: 1.26	WFI-02, WFI-03, WFI-05, WFI-06, WFI-07, WFI-08a, WFI-12, WFI-14a, WFI-17, WFI-25, WFI-28, WFI-30	3.28
Fife I-5 and 54th Span Design Option	3.20	Category II: 0.07 Category III: 1.87 Category IV: 1.26	WFI-02, WFI-03, WFI-05, WFI-06, WFI-07, WFI-08a, WFI-11, WFI-12, WFI-14a, WFI-17, WFI-25, WFI-28, WFI-30, WFI-33	3.48
Tacoma Segment				
Preferred Tacoma 25th Street-West	<0.01	Category III: <0.01	WTA-04	0.05
Tacoma 25th Street-East	<0.01	Category III: <0.01	WTA-04	0.05
Tacoma Close to Sounder	<0.01	Category III: <0.01	WTA-04	0.05
Tacoma 26th Street	<0.01	Category III: <0.01	WTA-04	0.05

Notes:
(1) Totals may vary from the sum of individual numbers due to rounding.
(2) Wetland ratings (Hruby and Yahnke 2023) are preliminary and subject to review by permit authorities.
(3) Values presented in this table represent all affected areas inside functional wetland buffers, including areas that overlap with stream buffers. Wetland areas and stream areas, defined by the OHWM, are excluded from wetland buffer areas.

Federal Way Segment

Aquatic Species and Habitats

The potential long-term impacts to streams and stream buffers for alternatives in the Federal Way Segment are compared in Table 4.9-2. The alignment of the Preferred FW Enchanted Parkway Alternative would parallel East Fork Hylebos Creek Tributary 0016A for approximately 0.5 mile, from near S 336th Street to near S 344th Street. Approximately 900 linear feet of East Fork Hylebos Creek Tributary 0016A (surface-flowing) fall within the permanent impact footprint of this alternative.

The guideway in this area would be elevated. Nearly all of the existing forested riparian habitat along that stretch of stream would be cleared for construction, and trees would not be allowed to grow back within 15 feet of the guideway and associated facilities. Impacts in this reach would include the permanent conversion of forested riparian habitat to scrub/shrub-dominated habitats, degradation of stream functions and values as a result of loss of forested riparian cover, and channel relocation and reconfiguration.

Approximately 1,700 feet of the stream channel in this area would be realigned and relocated approximately 40 to 70 feet west of the elevated guideway. Currently, much of East Fork Hylebos Creek Tributary 0016A in this area is confined within a straight and narrow channel that lacks complexity. The design for the realigned stream channel is expected to include meanders and other features to enhance the availability and diversity of aquatic habitats. Large woody debris would be placed in and near the stream channel to provide additional habitat complexity. In some areas, the width of the vegetated riparian area would be constrained by project features; in other areas, opportunities to increase the width of the vegetated riparian area may arise. The actual layout of the stream channel would be developed as the design advances in consultation with Tribes, permitting agencies, and other stakeholders.

Some segments of the stream in this area would be within the permanent impact footprint but would not be relocated. Long-term impacts to those stream segments would be associated with reductions in the width of the vegetated riparian zone, as described below.

The FW Design Option at the northern end of the mainline tracks would affect approximately 100 linear feet more of East Fork Hylebos Creek Tributary 0016A than the Preferred FW Enchanted Parkway Alternative (Table J4.4-1). The FW Design Option would intersect the northern end of the stream in Belmor; the Preferred FW Enchanted Parkway Alternative would avoid it altogether.

Vegetation, Wildlife, and Wildlife Habitat

The potential long-term impacts to native forest habitat for alternatives in the Federal Way Segment are compared in Table 4.9-3. Approximately 2 acres of mature native forest habitat and 3 acres of other native forest habitat along I-5 south of S 336th Street would be impacted, reducing the amount of habitats that provide high-value ecosystem functions. The Preferred FW Enchanted Parkway Alternative and the FW Design Option would have similar impacts on native forest cover.

Wetlands

The potential long-term impacts to wetlands and wetland buffers for alternatives in the Federal Way Segment are compared in Table 4.9-4. Both the Preferred FW Enchanted Parkway Alternative and the FW Design Option have a little more than a half an acre of direct long-term impacts; however, the Preferred FW Enchanted Parkway Alternative would have fewer direct long-term impacts to wetlands. Additional impacts under the Design Option include impacts to Wetland WFW-07 and its buffer, a Category III wetland located at the northern end of the track. In this segment, the tracks would be elevated in areas where the tracks intersect wetland areas, particularly in the southern portion of this segment.

South Federal Way Segment

Aquatic Species and Habitats

The potential long-term impacts to streams and stream buffers for alternatives in the South Federal Way Segment are compared in Table 4.9-2. South of S 344th Street, the SF I-5 Alternative would continue to follow the course of East Fork Hylebos Creek Tributary 0016A for 0.6 mile south of the Federal Way Segment, affecting forested riparian habitat in the I-5/SR 18 interchange and immediately upstream of the culvert where the stream passes under I-5. These impacts would be similar in kind to those described for the Preferred FW Enchanted Parkway Alternative, above.

The SF I-5 Alternative would also likely require the realignment of an additional approximately 1,500 feet of the stream, where it is paralleled by the guideway south of the I-5/SR 18 interchange. As discussed above, reconfiguration may provide opportunities for habitat improvements, such as adding channel sinuosity and habitat complexity.

By turning westward and following SR 161 or SR 99 through this area, the other alternatives would avoid most of these impacts. Compared to the other alternatives, the SF I-5 Alternative would affect substantially more stream channel and buffer habitat than any of the other alternatives. As a result of stream crossings along SR 99, the SF 99-West and SF 99-East alternatives would affect more stream and stream buffer habitat than the SF Enchanted Parkway Alternative. The Porter Way Design Option for the SF 99-West and SF 99-East alternatives would parallel West Fork Hylebos Creek for approximately 1,700 feet and would add a stream crossing, resulting in greater impacts on streams and stream buffers.

Where they cross West Fork Hylebos Creek and Hylebos Creek (both of which are documented salmon-bearing streams), all South Federal Way Segment alternatives would permanently reduce forested habitat in the streams' riparian buffers. These impacts could affect the future riparian restoration areas along Hylebos Creek for the SR 167 Completion Project planned by WSDOT (see Chapter 5, Cumulative Impacts). Construction within 200 feet of Hylebos Creek would require permanent vegetation removal within the shoreline jurisdiction.

Both the SF 99-West Alternative and the SF 99-East Alternative would affect parcels near SR 99 that have been acquired or that are planned for acquisition by the City of Federal Way for conservation and restoration of West Fork Hylebos Creek. None of the other alternatives would affect any city-owned parcels that are identified as conservation priorities. Both the SF 99-West Alternative and the SF 99-East Alternative would affect two Tribal parcels that contain wetlands and riparian habitat associated with West Fork Hylebos Creek. The Porter Way Design Option would avoid impacts to ecological resources on the two Tribal parcels.

South of S 344th Street, the SF I-5 Alternative would continue to follow the course of East Fork Hylebos Creek Tributary 0016A for another 0.6 mile, clearing forested riparian habitat in the I-5/SR 18 interchange and immediately upstream of the culvert where the stream passes under I-5. This alternative would also likely require the relocation of an additional approximately 1,500 feet of the stream, where it is paralleled by the guideway south of the I-5/SR 18 interchange. By turning westward and following SR 161 through this area, the SF Enchanted Parkway Alternative would avoid these impacts. Compared to the SF Enchanted Parkway Alternative, the SF I-5 Alternative would impact more than twice as much of the stream and its buffer.

Vegetation, Wildlife, and Wildlife Habitat

The potential long-term impacts to native forest habitat for alternatives in the South Federal Way Segment are compared in Table 4.9-3. The SF Enchanted Parkway Alternative and the SF I-5 Alternative would impact approximately 1 acre of mature native forest habitat along West Fork Hylebos Creek. The SF 99-West and SF 99-East alternatives would avoid this patch of mature forest, but the Porter Way Design Option for either of those alternatives would overlap a little more than 0.5 acre of the patch.

The greatest area of potential impacts on the other native forest cover type would occur under the SF I-5 Alternative, which would affect several patches of other native forest south of the I-5/SR 18 interchange. All other alternatives would avoid these patches.

Wetlands

The potential long-term impacts to wetlands and wetland buffers for alternatives in the South Federal Way Segment are compared in Table 4.9-4. The SF Enchanted Parkway Alternative would have substantially fewer long-term impacts on wetlands than all other alternatives in this segment. The SF I-5 Alternative has approximately 1.1 acres more of impacts than the SF Enchanted Parkway Alternative and would affect four additional wetlands (WFW-20, WFW-21, WFW-26, and WFW-27) — all of which are associated with East Fork Hylebos Creek Tributary 0016A — that would be avoided by the SF Enchanted Parkway Alternative. These four wetlands generally have moderate functions and are rated Category II and III.

The two SR 99 alternatives have substantially more (2 to 3 times more) impacts than the SF Enchanted Parkway Alternative. Of the two SR 99 alternatives, the SF 99-West Alternative has the fewest impacts to wetlands and their buffers. The majority of impacts to wetlands along the SR 99 alternatives affect Category II wetlands. However, the alternatives would also affect Category I wetlands. Many of the wetlands found under the two alternatives are associated with West Fork Hylebos Creek, North Fork Hylebos Creek, and their tributaries and provide valuable habitat to fish and other wildlife. The Porter Way Design Option to the SF 99-West and SF 99-East alternatives, would add more than one-third acre of direct, long-term impacts by crossing West Fork Hylebos Creek twice and affecting its associated wetlands, Wetlands WMI-09b and WMI-09a, both Category II wetlands.

Fife Segment

Aquatic Species and Habitats

The potential long-term impacts to streams and stream buffers for alternatives in the Fife Segment are compared in Table 4.9-2. Under all three alternatives, construction and operation of the elevated preferred Fife Station and associated ground-level facilities would require approximately 150 linear feet of Fife Ditch Tributary 1 to be relocated and/or placed in a new culvert. These impacts would not occur if either of the station design options at 54th Avenue E is implemented. Fife Ditch and Fife Ditch Tributary 1 are considered non-fish bearing and function only as stormwater conveyance.

The Fife Pacific Highway, Fife Median, and the Fife I-5 alternatives and associated design options would be on elevated guideways throughout the Fife Segment. As such, long-term impacts on most streams would be associated only with shading from overhead structures and with riparian vegetation clearing. Other than the impacts of the preferred Fife Station on Fife Ditch Tributary 1, no in-water work, relocation of streams, or alteration of in-stream habitat is anticipated for any of the alternatives in the Fife Segment.

All of the Fife Segment alternatives would have the same amount of impact on the one fish-bearing stream (Wapato Creek) that they would cross. In addition, all of the alternatives would affect the same amount of stream buffer on fish-bearing streams (Hylebos Creek and Wapato Creek). Under any of the alternatives, neither of the design options would modify the effects of the alternatives on fish-bearing streams or their buffers.

Riparian habitat conditions at these stream crossings are generally degraded, consisting primarily of willow, reed canarygrass, and Himalayan blackberry, with few trees present at some sites. As such, the impacts of the alternatives on aquatic habitats and species in the Fife Segment would likely be less severe than at stream crossings in other segments. However, the presence of light rail structures in all these areas would limit options for riparian habitat restoration in the future.

Vegetation, Wildlife, and Wildlife Habitat

The potential long-term impacts to native forest habitat for alternatives in the Fife Segment are compared in Table 4.9-3. None of the Fife alternatives would impact mature native forest. All alternatives and design options would have similar effects on areas of the other native forest or wetland/stream cover types.

Wetlands

The potential long-term impacts to wetlands and wetland buffers for alternatives in the Fife Segment are compared in Table 4.9-4. The Fife Pacific Highway and Fife Median alternatives would have fewer impacts on wetlands and their buffers than the Fife I-5 Alternative. This difference is largely because the alternatives along Pacific Highway E would avoid Wetland WFI-02 altogether (a Category III wetland). In addition, the alternative alignments along Pacific Highway E would affect a much smaller area of Wetland WFI-08a, a Category III wetland associated with Wapato Creek, compared to the Fife I-5 Alternative. The 54th Avenue Design Option would have fewer impacts than the 54th Span Design Option, primarily because the 54th Avenue Design Option avoids impacting Wetland WFI-33 and WFW-11, both Category III wetlands.

The preferred Fife Station would result in some long-term impacts on Wetland WFI-17. Neither the 54th Avenue Design Option station nor the 54th Span Design Option station would directly affect wetlands.

Tacoma Segment

Aquatic Species and Habitats

The potential long-term impacts to streams and stream buffers for alternatives in the Tacoma Segment are compared in Table 4.9-2. The long-term impacts of the alternative in the Tacoma Segment on aquatic resources would be essentially identical and would be associated with shading and placement of permanent in-water structures. Under all four alternatives, the construction of elevated guideway over a piped segment of First Creek would not be expected to affect that stream. Under any of the alternatives, the long-span and pier-supported options for the bridge crossing the Puyallup River would have markedly different impacts.

All four alternatives would cross the Puyallup River downstream (northwest) of the I-5 bridge. If the long-span bridge option is selected, the impacts of the bridge on aquatic habitats would be minimal. The bridge would be narrower and substantially higher above the water than the existing I-5 bridge. As a result, the shadow it casts on the water would be smaller and more diffuse than that of the existing bridge. No in-water structures would be needed to support a long-span bridge.

In contrast, a pier-supported bridge would not be as high above the water as a long-span bridge, and the presence of piers in the river would affect habitat conditions for fish, including ESA-listed Chinook salmon, steelhead, and bull trout. Bridge piers and bridge structures can cast shade and create areas of slow water, both of which may provide favorable habitat conditions for predators of special-status fish. The light rail bridge would increase the amount of river habitat affected by piers and overhead structures.

In-water piers would permanently displace benthic (riverbed) habitat, as well as affect patterns of scour and deposition, which can affect prey resources for fish. As discussed in Section 4.9.2.1, however, the Puyallup River in the study area likely serves primarily as a migratory corridor for salmonids. For this reason, combined with the footprint of the piers,

impacts on riverbed habitat would not be expected to have appreciable adverse effects on salmonids. The primary risks to fish would be associated with in-water work for installation of temporary work trestles and support piers. Impacts of these activities are described in Section 4.9.3.3, Construction Impacts for the Build Alternatives.

Vegetation, Wildlife, and Wildlife Habitat

The potential long-term impacts to native forest habitat for alternatives in the Tacoma Segment are compared in Table 4.9-3. None of the alternatives in the Tacoma Segment would have any measurable long-term impacts on native forest habitat.

Wetlands

The potential long-term impacts to wetlands and wetland buffers for alternatives in the Tacoma Segment are compared in Table 4.9-4. The Tacoma alternatives would have minimal (less than 0.01 acre) long-term impacts on Wetland WTA-04, which is a Category III wetland associated with the Puyallup River.

4.9.3.3 Construction Impacts for the Build Alternatives

Temporary, construction-related impacts would occur where streams, stream buffers, structurally complex vegetation, wetlands, or wetland buffers are affected by clearing and ground-disturbing work but are revegetated following construction. Construction-related impacts of light rail development on ecosystem resources are described below, followed by comparisons of the effects of the alternatives in each segment. Analyses in this section assume that appropriate measures would be implemented and would perform as expected to avoid and minimize impacts during construction (see Section 4.9.3.5). More detailed analyses and figures are presented in the Ecosystem Resources Technical Report (Appendix J4).

If construction of TDLE parking facilities at stations in both South Federal Way and Fife is deferredup to 3 years after initial service opens, the same construction-related effects on ecosystem resources would also apply at these two station locations at the time the parking facilities are constructed.

Impacts Common to All Alternatives

Aquatic Species and Habitat

Temporary, construction-related impacts on aquatic resources (including special-status species and habitats) would occur where streams and stream buffers (i.e., riparian habitat) are affected by clearing and ground-disturbing work but are revegetated following construction. As discussed in the next subsection, the duration of temporary impacts on riparian habitat would vary depending on the type of vegetation that is affected. In addition, ground-disturbing work and equipment use in or near surface-flowing waters would present the risk of delivering sediment or contaminants (e.g., fuel, hydraulic fluids) to streams, temporarily degrading water quality. Evaluations of the potential impacts of the alternatives are based on the length of surface-flowing streams and the area of stream buffer within the construction impact footprint for each alternative (Table 4.9-5).

Table 4.9-5 Potential Construction-Related Impacts on Aquatic Resources by Alternative

Alternative	Stream Impact by Water Type[1,2]	Affected Stream(s)	Stream Buffer Impact (acres)[1,3]	Affected Stream Buffer(s)
Federal Way Segment				
Preferred FW Enchanted Parkway	Type F: 850 linear feet	East Fork Hylebos Creek Tributary 0016A	5.0	East Fork Hylebos Creek Tributary 0016A
Preferred FW Enchanted Parkway with Design Option	Type F: 950 linear feet	East Fork Hylebos Creek Tributary 0016A	5.3	East Fork Hylebos Creek Tributary 0016A
South Federal Way Segment				
SF Enchanted Parkway	Type S: 450 linear feet	Hylebos Creek	6.9	Hylebos Creek East Fork Hylebos Creek Tributary 0016A SFW-01 West Fork Hylebos Creek SMI-01
	Type F: 2,200 linear feet	East Fork Hylebos Creek Tributary 0016A West Fork Hylebos Creek SMI-01		
SF I-5	Type S: 450 linear feet	Hylebos Creek	11.5	Hylebos Creek East Fork Hylebos Creek Tributary 0016A SFW-01 West Fork Hylebos Creek SMI-01
	Type F: 3,200 linear feet	East Fork Hylebos Creek Tributary 0016A West Fork Hylebos Creek SMI-01		
SF 99-West	Type S: 450 linear feet	Hylebos Creek	7.1	Hylebos Creek East Fork Hylebos Creek Tributary 0016A West Fork Hylebos Creek SFW-03 SFW-04 SMI-01 SMI-02 SFW-02 SMI-03
	Type F: 2,050 linear feet	East Fork Hylebos Creek Tributary 0016A West Fork Hylebos Creek SFW-04 SMI-01 SMI-02		
	Type Ns: 50 linear feet	SFW-02 SMI-03		
SF 99-West with Porter Way Design Option	Type S: 450 linear feet	Hylebos Creek	12.9	Hylebos Creek East Fork Hylebos Creek Tributary 0016A West Fork Hylebos Creek SFW-03 SFW-04 SMI-01 SMI-02 SFW-02 SMI-03
	Type F: 2,950 linear feet	East Fork Hylebos Creek Tributary 0016A West Fork Hylebos Creek SFW-04 SMI-01 SMI-02		
	Type Ns: 50 linear feet	SFW-02 SMI-03		

Table 4.9-5 Potential Construction-Related Impacts on Aquatic Resources by Alternative (continued)

Alternative	Stream Impact by Water Type[1,2]	Affected Stream(s)	Stream Buffer Impact (acres)[1,3]	Affected Stream Buffer(s)
SF 99-East	Type S: 450 linear feet	Hylebos Creek	7.4	Hylebos Creek East Fork Hylebos Creek Tributary 0016A North Fork Hylebos Creek West Fork Hylebos Creek SFW-03 SFW-04 SMI-01 SMI-02 SFW-02 SMI-03
	Type F: 2,150 linear feet	East Fork Hylebos Creek Tributary 0016A West Fork Hylebos Creek SFW-03 SFW-04 SMI-01 SMI-02		
	Type Ns: <50 linear feet	SFW-02 SMI-03		
SF 99-East with Porter Way Design Option	Type S: 450 linear feet	Hylebos Creek	13.2	Hylebos Creek East Fork Hylebos Creek Tributary 0016A North Fork Hylebos Creek West Fork Hylebos Creek SFW-03 SFW-04 SMI-01 SMI-02 SFW-02 SMI-03
	Type F: 3,000 linear feet	East Fork Hylebos Creek Tributary 0016A West Fork Hylebos Creek SFW-03 SFW-04 SMI-01 SMI-02		
	Type Ns: <50 linear feet	SFW-02 SMI-03		
Fife Segment				
Fife Pacific Highway/ Fife Median	Type S: <50 ft	Hylebos Creek	0.5	Hylebos Creek Wapato Creek
	Type F: 100 linear feet	Wapato Creek		
	Type Np 1,250	Fife Ditch Fife Ditch Tributary 1 Erdahl Ditch Tributary 1 Erdahl Ditch Tributary 2		
Fife Pacific Highway/ Fife Median with either 54th Avenue Design Option	Type S: <50 ft	Hylebos Creek	0.6	Hylebos Creek Wapato Creek
	Type F: 100 linear feet	Wapato Creek		
	Type Np 1,750 linear feet	Fife Ditch Fife Ditch Tributary 1 Erdahl Ditch Tributary 1 Erdahl Ditch Tributary 2		
Fife I-5	Type S: <50 ft	Hylebos Creek	1.0	Hylebos Creek Wapato Creek
	Type F: 100 linear feet	Fife Ditch Tributary 1 Fife Ditch Wapato Creek Erdahl Ditch Tributary 2		
	Type Np 1,400 linear feet	Fife Ditch Tributary 1 Fife Ditch Wapato Creek Erdahl Ditch Tributary 2		

Table 4.9-5 Potential Construction-Related Impacts on Aquatic Resources by Alternative (continued)

Alternative	Stream Impact by Water Type[1,2]	Affected Stream(s)	Stream Buffer Impact (acres)[1,3]	Affected Stream Buffer(s)
Fife I-5 with either 54th Avenue Design Option	Type S: <50 ft	Hylebos Creek	1.0	Hylebos Creek Wapato Creek
	Type F: 100 linear feet	Wapato Creek		
	Type Np 2,000 linear feet	Fife Ditch Tributary 1 Fife Ditch Erdahl Ditch Tributary 2		
Tacoma Segment[4]				
Preferred Tacoma 25th Street-West	Type S: 1.0 acre	Puyallup River	0.1	Puyallup River
Tacoma 25th Street-East	Type S: 1.0 acre	Puyallup River	0.1	Puyallup River
Tacoma Close to Sounder	Type S: 1.0 acre	Puyallup River	0.1	Puyallup River
Tacoma 26th Street	Type S: 1.0 acre	Puyallup River	0.1	Puyallup River

Notes:

(1) Impacts on most streams are reported as the length of the stream's centerline that fall within the construction impact footprint, rounded to the nearest 50 feet. Based on the size and breadth of the Puyallup River, impacts on that watercourse are reported as the area (in acres) of the river that falls within the construction impact footprint. As discussed in the introduction to Chapter 4, the values in this table do not necessarily represent actual anticipated impacts, such as filling stream channels or enclosing them in pipes. Instead, these values indicate the relative degree of potential impacts on streams and stream buffers. See text for discussion.

(2) Stream typing in accordance with WAC 222-16-030.

(3) Buffer impact values represent all affected areas inside functional stream buffers, including areas that overlap wetland buffers.

(4) Under any of the Tacoma Segment alternatives, the design options for the bridge crossing the Puyallup River would have different impacts that are not reflected in the construction-related impact footprint. See text for discussion.

Vegetation, Wildlife, and Wildlife Habitat

Construction-related impacts on terrestrial resources (including areas that receive protection under local critical areas ordinances) would include temporary loss or degradation of terrestrial habitats as well as disturbance due to construction-related noise, light, and human activity. If bats are using existing structures in the study area (e.g., highway bridges over Hylebos Creek and the Puyallup River) for roosting sites or maternity colonies, these behaviors may be disrupted by construction activities. Nesting birds on such structures may similarly be disturbed or displaced.

The duration of temporary impacts would vary depending on the type of vegetation that is affected. Impacts on grasses and areas dominated by fast-growing invasive species would generally be short-lived, with functions typically returning to pre-impact levels within one growing season. In contrast, temporary impacts on woody vegetation generally last longer because trees and/or shrubs require several years or decades to achieve the size and stature necessary to provide pre-impact functions, such as canopy habitat.

Areas cleared for construction would be susceptible to colonization by noxious weeds and other invasive plants. The risk of colonization would be proportional to the amount of area temporarily disturbed by construction; an alternative with a greater extent of ground disturbance would pose a higher risk of contributing to the establishment or spread of noxious weeds and invasive plants.

Table 4.9-6 presents a comparison of potential construction-related impacts on the two native forest cover types, as well as the total extent of the area that would be affected by construction-related clearing under each alternative. Evaluations of the potential impacts of the alternatives are based on the area of the native forest cover types and the total area within the construction impact footprint for each alternative (Table 4.9-6). It is conservatively assumed for this analysis that all areas within that footprint will be cleared; the actual extent of temporary clearing would be determined as the project design advances. See Appendix J4 for additional explanation.

Table 4.9-6 Potential Construction-Related Impacts on Vegetation, by Alternative

Alternative	Mature Native Forest (acres)	Other Native Forest (acres)	All Other Cover Types (acres)[1]	Total Temporary Impact Area (acres)
Federal Way Segment				
Preferred FW Enchanted Parkway	4	8	35	47
Preferred FW Enchanted Parkway with FW Design Option	4	8	37	49
South Federal Way Segment				
SF Enchanted Parkway	1	17	62	80
SF I-5	1	21	46	68
SF 99-West	0	14	73	87
SF 99-West with Porter Way Design Option	2	15	77	94
SF 99-East	0	12	79	91
SF 99-East with Porter Way Design Option	2	12	85	99
Fife Segment				
Fife Pacific Highway/Fife Median[2]	0	3	59	62
Fife Pacific Highway/Fife Median with either Design Option[3]	0	3	52	55
Fife I-5	0	2	62	64
Fife I-5 with either Design Option[3]	0	2	61	63
Tacoma Segment				
Preferred Tacoma 25th Street-West	0	<0.5	45	45
Tacoma 25th Street-East	0	<0.5	45	45
Tacoma Close to Sounder	0	<0.5	31	31
Tacoma 26th Street	0	1	32	33

Notes:

(1) Other cover types include commercial, residential, grassland, invasive brush, non-native forest, wetland/stream, river channel, and stormwater pond.

(2) The impacts of the Fife Pacific Highway and the Fife Median alternatives would be identical.

(3) The impacts of the 54th Avenue and 54th Span design options for the Fife I-5 Alternative would be identical.

Given the widespread occurrence of Himalayan blackberry and other invasive plant species in the study area, any of the project alternatives would provide the opportunity to reduce, at least temporarily, invasive species through vegetation removal. In some areas, noxious weeds may be eradicated because cover types dominated by invasive species would be converted to landscaping and other areas where invasive species would be controlled. In areas where invasive species are replaced with native species, construction-related impacts may result in improved habitat function. Maintenance and monitoring of invasive plant species are common elements of restoration plans, which are developed during the permitting phase of the project.

Where restoration of temporarily disturbed sites is proposed, maintenance of invasive species would likely be required or recommended as part of permit approvals.

Wetlands

Temporary, construction-related impacts on wetland resources would occur where wetlands or wetland buffers are affected by clearing and ground-disturbing work but are restored and revegetated following construction. Based upon the federal definition used by USACE, "temporary" means these impacts would not be permanent and wetland areas would be restored in less than 4 years after construction starts. Temporary impacts may include reduction or alteration of wetland area, soils, hydrology, vegetation, or type. Construction-related dewatering may temporarily alter groundwater discharge to wetlands. Wetland and wetland buffer functions could also be impacted by soil compaction, accidental spills of hazardous substances, noise and other human-caused disturbance, sedimentation, and introduction of invasive species. Similar to terrestrial resources, the duration of temporary impacts on wetlands can vary depending on the type of vegetation that is affected. Evaluations of the potential impacts of the alternatives are based on the area of wetlands and wetland buffers within the construction impact footprint for each alternative (Table 4.9-7).

Table 4.9-7 Potential Construction-Related Impacts on Wetlands by Alternative

Alternative	Total Wetland Impacts (acres)[1]	Wetland Impact by Ecology Category (acres)[1,2]	Impacted Wetland I.D.	Wetland Buffer Impacts (acres)[1,3]
Federal Way Segment				
Preferred FW Enchanted Parkway	1.62	Category II: 1.56 Category III: 0.04 Category IV: 0.02	WFW-01, WFW-03, WFW-04, WFW-11, WFW-13, WFW-15, WFW-32	7.83
FW Enchanted Parkway with FW Design Option	1.65	Category II: 1.56 Category III: 0.07 Category IV: 0.02	WFW-01, WFW-03, WFW-04, WFW-07, WFW-11, WFW-13, WFW-15, WFW-32	7.50
South Federal Way Segment				
SF Enchanted Parkway	4.90	Category I: 0.59 Category II: 3.02 Category III: 1.27 Category IV: 0.03	WFW-05, WFW-17, WFW-18, WFW-19, WFW-24, WFW-25, WMI-01, WMI-02, WMI-03, WMI-06, WMI-07, WMI-08, WMI-09a, WMI-09c, WMI-09d, WPCFI-01, WPCFI-02, WPCMIFI-01	8.59
SF I-5	5.84	Category I: 0.59 Category II: 3.11 Category III: 2.12 Category IV: 0.03	WFW-17, WFW-18, WFW-19, WFW-20, WFW-21, WFW-22, WFW-24, WFW-25, WFW-26, WFW-27, WMI-01, WMI-02, WMI-03, WMI-06, WMI-07, WMI-08, WMI-09a, WMI-09c, WMI-09d, WPCFI-01, WPCFI-02, WPCMIFI-01	12.24
SF 99-West	4.71	Category I: 1.01 Category II: 3.53 Category III: 0.15 Category IV: 0.02	WFW-17, WFW-18, WFW-36, WFW-37, WFW-38, WFW-39, WFW-43, WFW-44, WFW-45, WFW-46, WFW-47, WFW-48, WMI-09a, WMI-09c, WMI-09d, WMI-10, WMI-11, WMI-12, WMI-13, WMI-14, WPCFI-01, WPCFI-02, WPCMIFI-01	12.61

Table 4.9-7 Potential Construction-Related Impacts on Wetlands by Alternative (continued)

Alternative	Total Wetland Impacts (acres)[1]	Wetland Impact by Ecology Category (acres)[1,2]	Impacted Wetland I.D.	Wetland Buffer Impacts (acres)[1,3]
SF 99-West with Porter Way Design Option	7.91	Category I: 2.33 Category II: 5.20 Category III: 0.38	WFW-17, WFW-18, WFW-36, WFW-37, WFW-38, WFW-39, WFW-43, WFW-44, WFW-45, WFW-46, WFW-47, WFW-48, WMI-07, WMI-08, WMI-09a, WMI-09b, WMI-09c, WMI-09d, WMI-11, WMI-12, WMI-13, WMIFW-01, WPCFI-01, WPCFI-02, WPCMIFI-01	16.12
SF 99-East	6.49	Category I: 2.18 Category II: 4.23 Category III: 0.06 Category IV: 0.03	WFW-17, WFW-18, WFW-34, WFW-36, WFW-37, WFW-38, WFW-39, WFW-43, WFW-44, WFW-45, WFW-46, WFW-47, WMI-09a, WMI-09c, WMI-09d, WMI-10, WMI-11, WMI-12, WMI-13, WMI-14, WMIFW-01, WPCFI-01, WPCFI-02, WPCMIFI-01	15.16
SF 99-East with Porter Way Design Option	9.92	Category I: 3.52 Category II: 6.11 Category III: 0.29	WFW-17, WFW-18, WFW-34, WFW-36, WFW-37, WFW-38, WFW-39, WFW-43, WFW-44, WFW-45, WFW-46, WFW-47, WMI-07, WMI-08, WMI-09a, WMI-09b, WMI-09c, WMI-09d, WMI-11, WMI-12, WMI-13, WMIFW-01, WPCFI-01, WPCFI-02, WPCMIFI-01	18.74
Fife Segment				
Fife Pacific Highway	1.31	Category II: 0.07 Category III: 1.24	WFI-03, WFI-04, WFI-06, WFI-08a, WFI-08b, WFI-08d, WFI-11, WFI-12, WFI-14a, WFI-16, WFI-17, WFI-18, WFI-21, WFI-22, WFI-24, WFI-25, WFI-26, WFI-30, WPCFI-02	5.16
Fife Pacific Highway and 54th Avenue Design Option	1.69	Category II: 0.07 Category III:1.61 Category IV: <0.01	WFI-03, WFI-04, WFI-06, WFI-08a, WFI-08b, WFI-08d, WFI-11, WFI-12, WFI-14a, WFI-14b, WFI-16, WFI-17, WFI-21, WFI-22, WFI-24, WFI-25, WFI-26, WFI-30, WPCFI-02	5.14
Fife Pacific Highway and 54th Span Design Option	1.84	Category II: 0.07 Category III: 1.76 Category IV: <0.01	WFI-03, WFI-04, WFI-06, WFI-08a, WFI-08b, WFI-08d, WFI-11, WFI-12, WFI-14a, WFI-14b, WFI-16, WFI-17, WFI-21, WFI-22, WFI-24, WFI-25, WFI-26, WFI-30, WFI-33, WPCFI-02	5.24
Fife Median	1.31	Category II: 0.07 Category III: 1.24	WFI-03, WFI-04, WFI-06, WFI-08a, WFI-08b, WFI-08d, WFI-11, WFI-12, WFI-14a, WFI-16, WFI-17, WFI-18, WFI-21, WFI-22, WFI-24, WFI-25, WFI-26, WFI-30, WPCFI-02	5.16
Fife Median and 54th Avenue Design Option	1.69	Category II: 0.07 Category III: 1.61	WFI-03, WFI-04, WFI-06, WFI-08a, WFI-08b, WFI-08d, WFI-11, WFI-12, WFI-14a, WFI-14b, WFI-16, WFI-17, WFI-21, WFI-22, WFI-24, WFI-25, WFI-26, WFI-30, WPCFI-02	5.14

Table 4.9-7 Potential Construction-Related Impacts on Wetlands by Alternative (continued)

Alternative	Total Wetland Impacts (acres)[1]	Wetland Impact by Ecology Category (acres)[1,2]	Impacted Wetland I.D.	Wetland Buffer Impacts (acres)[1,3]
Fife Median and 54th Span Design Option	1.69	Category II: 0.07 Category III: 1.62	WFI-03, WFI-04, WFI-06, WFI-08a, WFI-08b, WFI-08d, WFI-11, WFI-12, WFI-14a, WFI-14b, WFI-16, WFI-17, WFI-21, WFI-22, WFI-24, WFI-25, WFI-26, WFI-30, WFI-33, WPCFI-02	5.24
Fife I-5	4.99	Category II: 0.69 Category III: 4.31	WFI-02, WFI-03, WFI-05, WFI-06, WFI-07, WFI-08a, WFI-11, WFI-12, WFI-14a, WFI-16, WFI-17, WFI-18, WFI-21, WFI-22, WFI-24, WFI-25, WFI-26, WFI-30, WPCFI-02	7.93
Fife I-5 and 54th Avenue Design Option	5.43	Category II: 0.69 Category III: 4.74	WFI-02, WFI-03, WFI-05, WFI-06, WFI-07, WFI-08a, WFI-11, WFI-12, WFI-14a, WFI-14b, WFI-16, WFI-17, WFI-21, WFI-22, WFI-24, WFI-25, WFI-26, WFI-28, WFI-30, WPCFI-02	7.97
Fife I-5 and 54th Span Design Option	5.44	Category II: 0.69 Category III: 4.75	WFI-02, WFI-03, WFI-05, WFI-06, WFI-07, WFI-08a, WFI-12, WFI-14a, WFI-14b, WFI-16, WFI-17, WFI-21, WFI-22, WFI-24, WFI-25, WFI-26, WFI-30, WPCFI-02	8.07
Tacoma Segment				
Preferred Tacoma 25th Street-West	0.01	Category III: 0.01	WTA-01, WTA-04	0.08
Tacoma 25th Street-East	0.01	Category III: 0.01	WTA-01, WTA-04	0.08
Tacoma Close to Sounder	0.01	Category III: 0.01	WTA-01, WTA-04	0.13
Tacoma 26th Street	0.01	Category III: 0.01	WTA-01, WTA-04	0.05

Notes:

(1) Totals may vary from the sum of individual numbers due to rounding.

(2) Wetland ratings (Hruby and Yahnke 2023) are preliminary and subject to review by permit authorities.

(3) Wetland buffer impact values in this table represent all affected areas inside functional wetland buffers, including areas that overlap with stream buffers. Wetland areas and stream areas, defined by the OHWM, are excluded from wetland buffer areas.

Federal Way Segment

Aquatic Species and Habitats

Approximately 850 linear feet of East Fork Hylebos Creek Tributary 0016A would be temporarily impacted, as would approximately 5.2 acres of the stream's buffer. Impacts would include temporary loss of riparian habitat function and an elevated risk of water quality degradation due to construction-related activities, as described above in the discussion of impacts common to all alternatives.

The FW Design Option would temporarily impact approximately 100 linear feet more of East Fork Hylebos Creek Tributary 0016A and approximately 0.3 acre more of its buffer.

Vegetation, Wildlife, and Wildlife Habitat

The potential construction impacts to vegetation for alternatives in the Federal Way Segment are compared in Table 4.9-6. Approximately 4 acres of mature native forest habitat along I-5 south of S 336th Street would be temporarily impacted by all Federal Way Segment alternatives (Table 4.9-6). Although the affected areas would be replanted with native trees following construction, the ecosystem functions of mature forest would not be restored for several decades. The construction footprint for all of the alternatives would also overlap areas of other native forest and wetland/stream habitats. The return of pre-construction ecosystem functions in those areas would likely require several years.

The Preferred FW Enchanted Parkway Alternative and FW Design Option would temporarily affect similar amounts of the mature native forest and other native forest cover types, and the total extents of their temporary impact footprints would also be similar.

Wetlands

The potential construction impacts to wetlands and wetland buffers for alternatives in the Federal Way Segment are compared in Table 4.9-7. The Preferred FW Enchanted Parkway Alternative would have slightly fewer direct construction-related impacts to wetlands and wetland buffers than the FW Design Option because the Preferred Alternative would avoid impacts to Wetland WFW-07 and its buffer.

South Federal Way Segment

Aquatic Species and Habitats

The potential construction impacts to streams and stream buffers for alternatives in the South Federal Way Segment are shown in Table 4.9-5. The SF I-5 Alternative would affect more linear feet of streams than any of the other alternatives or design options, largely due to its impacts on East Fork Hylebos Creek Tributary 0016A. The SF Enchanted Parkway Alternative and the SF 99-West and SF 99-East alternatives (without the Porter Way Design Option) would affect approximately 1,000 fewer linear feet of stream than the SF I-5 Alternative, largely because they would avoid most segments of East Fork Hylebos Creek Tributary 0016A south of S 344th Street. The SF 99-West and SF 99-East alternatives with the Porter Way Design Option would affect about 100 fewer linear feet of streams overall, compared to the SF I-5 Alternative.

Although the SF I-5 Alternative would affect more linear feet of streams than the other alternatives, most of this alternative's impacts would affect a stream (East Fork Hylebos Creek Tributary 0016A) that is not known to currently support fish populations due to seasonal flow conditions and the presence of numerous fish passage barriers. In contrast, the SF 99-West and SF 99-East alternatives with the Porter Way Design Option would affect approximately 750 to 800 linear feet more of West Fork Hylebos Creek (a major salmonid stream that supports ESA-listed fish) compared to the other alternatives.

The SF I-5 Alternative and the SF 99-West and SF 99-East alternatives with the Porter Way Design Option would affect about 12 to 14 acres of stream buffers overall. Compared to the other alternatives, the SF I-5 Alternative would affect substantially more stream buffer habitat along East Fork Hylebos Creek Tributary 0016A (approximately 7 acres, compared to 2 to 3 acres), including areas with comparatively high-quality habitat, such as native forest and wetlands. The SF Enchanted Parkway Alternative and the SF 99-West and SF 99-East alternatives (without the Porter Way Design Option) would affect about 7 to 8 acres of stream

buffers overall. The Porter Way Design Option would affect approximately 6 more acres of stream buffer habitat associated with West Fork Hylebos Creek — including high-quality habitats such as mature native forest, compared to the other alternatives.

Vegetation, Wildlife, and Wildlife Habitat

The potential construction impacts to vegetation for alternatives in the South Federal Way Segment are compared in Table 4.9-6. The SF I-5 Alternative would have the most impacts to mature and other native forest (22 acres), and the SF 99-East Alternative would have the least (12 acres). Both the SF Enchanted Parkway Alternative and the SF I-5 Alternative would require clearing of approximately 1 acre of mature native forest habitat along West Fork Hylebos Creek; the SF 99-West and SF 99-East alternatives would avoid that patch of habitat. However, the Porter Way Design Option (under either the SF 99-West Alternative or the SF 99-East Alternative) would require clearing of approximately 2 acres of mature native forest near West Fork Hylebos Creek south of Birch Street.

The SF I-5 Alternative would also have the highest proportion of impacts to terrestrial habitats and sensitive wildlife species, and the SF 99-East Alternative would have the least (additional details provided in Appendix J4, Table J4.4-4). Under either the SF 99-West Alternative or the SF 99-East Alternative, the Porter Way Design Option would increase the total area of potential construction-related impacts by approximately 7 to 8 acres.

Wetlands

The potential construction impacts to wetlands and wetland buffers for alternatives in the South Federal Way Segment are compared in Table 4.9-7. The SF 99-West Alternative would have the fewest direct, construction-related impacts to wetlands, followed by the SF Enchanted Parkway Alternative, the SF I-5 Alternative, and the SF 99-East Alternative. Although the SF 99-West Alternative has fewer construction-related impacts than other alternatives, the SF 99-West impacts more area of high-quality wetlands (Category I and II wetlands). Under either of the SF 99 alternatives, the Porter Way Design Option would increase the number of construction-related impacts on wetlands by more than 3 acres compared to SF Enchanted Parkway and SF I-5 alternatives, in part because it crosses the West Fork Hylebos Creek and its associated wetlands twice.

The study area contains many large, complex wetlands associated with streams that provide high water quality, hydrologic, and habitat functions. Most of the wetland area affected by construction-related impacts under all alternatives would consist of Category II wetlands. All of the alternatives would also impact Category I wetlands; the most construction-related impacts to Category I wetlands would occur under the SF 99-East Alternative paired with Porter Way Design Option. Category I wetlands would occur under the SF 99-East Alternative paired with Porter Way Design Option.

Because the SF Enchanted Parkway Alternative is in highly developed areas that do not contain extensive vegetated buffer areas, it would have the fewest construction-related impacts to wetland buffers, followed by the SF I-5 Alternative. The SF 99-East with Porter Way Design Option would have the most wetland buffer impacts because there are many wetlands and vegetated buffers along this alternative alignment.

Fife Segment

Aquatic Species and Habitats

The potential construction impacts to streams and stream buffers for alternatives in the Fife Segment are shown in Table 4.9-5. The Fife I-5 Alternative would temporarily impact approximately 200 more linear feet of streams than the Fife Pacific Highway and Fife Median alternatives. This difference is attributable primarily to impacts on Fife Ditch. All alternatives would affect Fife Ditch near 52nd Ave E. The Fife I-5 Alternative would also cross Fife Ditch south of Pacific Highway E, resulting in additional construction-related impacts on that stream and its buffer. The 54th Avenue and 54th Span design options would have an additional 600 feet of temporary stream impacts (primarily Fife Ditch Tributary 1) than without the design options.

The Fife I-5 Alternative would temporarily impact about 0.5 acre more stream buffer habitat than would the Fife Pacific Highway and Fife Median alternatives. This difference arises from the Fife I-5 Alternative's impacts on native brush and scrub-shrub wetland habitat in the buffer on Wapato Creek immediately north of I-5. The construction footprints of the 54th Avenue and 54th Span design options do not include any stream buffer habitat. For this reason, the impacts of these design options on stream buffer habitat would not differ from the impacts of the alternatives without the design options.

Vegetation, Wildlife, and Wildlife Habitat

The potential construction impacts to vegetation for alternatives in the Fife Segment are compared in Table 4.9-6. The construction-related impacts of the alternatives in the Fife Segment on native forests would be similar, although the Fife Pacific Highway and Fife Median alternatives would require clearing of slightly more native forest habitat — approximately 0.4 acre — than the Fife I-5 Alternative.

The Fife I-5 Alternative would have a larger overall construction footprint than the Fife Pacific Highway and Fife Median alternatives. The potential for disturbance of sensitive wildlife species during construction would not necessarily be higher, however, because construction of the Fife I-5 Alternative would take place in areas adjacent to I-5 that are dominated by high levels of existing noise and human disturbance.

Wetlands

The potential construction impacts to wetlands and wetland buffers for alternatives in the Fife Segment are compared in Table 4.9-7. The Fife Pacific Highway and Fife Median Alternatives would have the same wetland impacts. These alternatives along Pacific Highway E would have substantially fewer construction-related impacts than the I-5 alternative, mainly stemming from fewer impacts on Wetland WFI-02, a Category III wetland. Of the two design options, the 54th Avenue Design Option would have fewer impacts than the 54th Span Design Option because it avoids impacting Wetland WFI-33, a Category III wetland. The Fife I-5 Alternative (with and without the two design options) would have greater than 3 acres of wetland buffer impacts than the Fife Pacific Highway and Fife Median alternatives.

Tacoma Segment

Aquatic Species and Habitats

The potential construction impacts to streams and stream buffers for alternatives in the Tacoma Segment are shown in Table 4.9-5. The construction-related impacts of the Tacoma Segment alternative alignments on aquatic resources would be the same (see Table J4.4-2). None of the alternatives would have any construction-related impacts on First Creek, which is enclosed in pipes through the study area.

Impacts to the Puyallup River would depend on whether a long-span or pier-supported bridge structure is used: a pier-supported crossing of the Puyallup River would have substantially greater construction-related impacts on aquatic areas and aquatic life compared to a long-span structure. Construction of a pier-supported structure would involve either the construction of temporary work trestles in the river or the assembly of one or more floating barge systems anchored to the shore and riverbed. In addition, cofferdams or steel casings would be installed in the river to allow the construction of in-water piers. In-water pile driving would be required for the construction of temporary work trestles and may be needed for construction of the in-water piers. Reinforcement or armoring of the in-water slopes of the levees near the bridge site may also be necessary. No in-water work would be required for construction of a long-span bridge.

If new piers are installed in the Puyallup River to support a bridge for the guideway, in-water work for pier installation and pile driving would carry the risk of potential adverse impacts on fish and marine mammals. Noise from in-water pile driving would generate potentially injurious levels of underwater sound pressure levels, disturbing and possibly harassing, injuring, or killing fish, marine mammals, and other aquatic species. Between 2015 and 2019, WSDOT installed temporary work trestles and in-water piers to support new bridges for I-5 over the Puyallup River in the study area. The environmental documentation for that project identified adverse impacts on aquatic resources, including the following:

- Mortality or injury of fish during implementation of in-water work area isolation measures (e.g., installation of coffer dams and steel casings around drilled shafts for support piers).
- Mortality or injury of fish exposed to potentially injurious underwater sound pressure levels associated with in-water pile driving.
- Shade from overwater work trestles.
- Temporary, localized increases in turbidity during installation and removal of in-water structures.

Similar impacts would be expected to result from in-water work for construction of a pier-supported bridge over the Puyallup River for TDLE. The extent and severity of impacts would depend upon the duration of in-water work, size of the piles, the type of piles, substrate type, currents, and other factors that affect the propagation of sound waves under water. It is likely that construction of in-water support piers for TDLE would adversely affect ESA-listed Chinook salmon, steelhead, and bull trout along with other fish species in the river. These and other project-related impacts (including effects on critical habitat, as appropriate[1]) would be analyzed in the biological assessment prepared to support consultation with NMFS and USFWS

[1] The bed and banks of the Puyallup River are owned by the Puyallup Tribe of Indians within the boundaries of the Puyallup Tribe of Indians Reservation and, as such, were excluded from the designations of critical habitat for Puget Sound Chinook salmon, Puget Sound steelhead, and bull trout.

during the Final EIS phase of this project. The assessment would also include a review of potential effects on essential fish habitat.

Underwater noise and in-water construction activities may also adversely affect marine mammals. Seals and sea lions forage in the Puyallup River near the existing highway bridges. Noise from pile driving and other in-water construction work could injure or cause harassment of marine mammals in the river. As required under the MMPA, Sound Transit would work with NMFS to prepare an incidental harassment authorization for work that has the potential to affect marine mammals. The terms of the authorization would include measures to minimize adverse effects on seals and sea lions during construction.

Vegetation, Wildlife, and Wildlife Habitat

The potential construction impacts to vegetation for alternatives in the Tacoma Segment are compared in Table 4.9-6. The construction-related impacts of the alternatives in the Tacoma Segment on native forests would be similar; none of the alternatives would affect more than 1 acre of this habitat type. Given the existing high levels of noise and human disturbance throughout the Tacoma Segment study area, the overall size of the alternatives' construction footprints would not appreciably affect their potential to disturb sensitive wildlife species.

Noise from pile driving for the installation of support structures for the guideway bridge over the Puyallup River may disturb sensitive wildlife species as much as 0.25 mile away from project activities. Big brown bat colonies and nesting birds on nearby bridges could be affected by construction noise. Such effects would be temporary and would not be expected to result in any long-term impacts on species that use habitats in the urban areas surrounding the project site.

Wetlands

The potential construction impacts to wetlands and wetland buffers for alternatives in the Tacoma Segment are compared in Table 4.9-7. All four alternatives in the Tacoma Segment would have similar construction-related impacts on wetlands. Construction would affect Wetlands WTA-01 and WTA-04, which are Category III wetlands associated with the Puyallup River.

4.9.3.4 Indirect Impacts

Indirect impacts include those effects that are related to the project but not part of it and that may occur separated by distance or time. Other sources of indirect effects may be related to changes in the pattern of land use, population density, or water quality in the areas affected by the project. Indirect impacts may also occur through the implementation of mitigation measures for other environmental impacts or through supporting projects that are not yet defined or considered part of the project alternatives.

For aquatic species and habitat, indirect impacts would be minimal because the surrounding areas are already heavily developed. TDLE is not expected to interfere with future projects that may provide habitat improvements, such as road projects that may improve fish passage, or projects that may enhance vegetated and wetland areas in the project corridor. TDLE would be designed to ensure that it would not preclude future culvert replacement(s) by WSDOT to provide fish passage. Facilities that provide water quality treatment could minimize long-term indirect impacts on water quality in streams that provide habitat for fish sensitive to the toxic effects of contaminants in stormwater runoff. However, as discussed in the analysis of long-term impacts, treated water discharged from such facilities and untreated water that bypasses those facilities during major storm events may contain contaminants that can harm fish and other

aquatic life. In addition, the presence of light rail structures near streams would limit options for riparian habitat restoration in the future.

Long-term indirect impacts on vegetation, wildlife, and wildlife habitat could include habitat loss or increased disturbance due to changes in land use patterns near the proposed station locations. Such impacts would be unlikely under any of the project alternatives, however, because all proposed station locations are in densely developed commercial and/or industrial areas.

If in-water work for a pier-supported bridge over the Puyallup River leads to detectable decreases in fish abundance in the Puget Sound, the availability of prey for Southern Resident killer whales could be reduced. The potential for this to occur, as well as any potential indirect impacts on Southern Resident killer whales, would be evaluated during ESA Section 7 consultation with NMFS.

If permittee-responsible compensatory mitigation for wetland or stream impacts is required, ground-disturbing work and human activity associated with mitigation project implementation could disturb wildlife or temporarily degrade habitat. Any such impacts would be short-lived and would be offset by long-term improvements in habitat conditions at the mitigation site.

Indirect impacts from TDLE may result in long-term wetland degradation from stormwater discharges and alterations in wetland hydrology. Hydrologic impacts would be minimized through the use of stormwater management facilities that meet the standards established by local, state, and federal agencies with regulatory authority. Facilities that provide water quality treatment could minimize long-term indirect impacts on water quality in wetlands. See the discussion of Impacts Common to All Alternatives for more details.

4.9.3.5 Avoidance and Minimization of Impacts

The avoidance and minimization of impacts on ecosystem resources was a guiding principle in the preliminary design of the project alternatives. The build alternatives for the proposed project would avoid or minimize potential impacts on ecosystem resources whenever practicable. For example, wetland and stream impacts have been avoided and minimized during the conceptual design process through elevating guideways, moving staging areas, and relocating project features wherever feasible.

Sound Transit would comply with standard specifications; BMPs; and applicable Tribal, federal, state, and local mitigation requirements during design, construction, and post-construction activities. Measures would be incorporated into construction plans as specifications, as applicable. Sound Transit would meet all regulatory requirements and continue to implement proactive avoidance and minimization measures related to these BMPs in adherence with Tribal, federal, state, and local regulations. This would include conducting work over and within stream channels only during the approved in-water work window for each watercourse. Conservation measures arising from ESA Section 7 consultation would also be implemented.

Any work within the OHWM of any streams or that may otherwise affect fish in the study area would be conducted in accordance with the terms of the HPA and other applicable permits and reviews (e.g., Clean Water Act Section 404 permit, Tribal permits, ESA Section 7 consultation, shoreline substantial development permits, and critical areas alteration approvals) for this project.

These strategies, along with others designed to avoid or minimize effects on other resources, would be implemented to effectively minimize the potential impacts on sensitive ecosystem resources. Examples of additional strategies include minimizing vegetation clearing, restoring

temporarily affected areas, and preparing and implementing a revegetation plan. Section 5.1 of the Ecosystem Resources Technical Report (Appendix J4) provides additional information about impact avoidance and minimization measures incorporated into the project design, as well as BMPs that may be implemented during construction.

4.9.4 Potential Mitigation Measures

Discussions in this subsection identify compensatory mitigation measures Sound Transit could implement, in addition to the avoidance and minimization measures described above.

For unavoidable long-term impacts on wetlands, streams, and their buffers, Sound Transit would develop a compensatory mitigation plan during the permitting phase in accordance with applicable Tribal, federal, state, and local requirements and guidelines. These include the federal Final Compensatory Mitigation Rule (40 CFR Part 230), interagency guidance (Wetland Mitigation in Washington State – Part 1: Agency Policies and Guidance; Ecology et al. 2021) or as updated, and the applicable Tribal and local critical areas ordinances and shoreline regulations. Mitigation would be coordinated with regulatory agencies, employing a watershed approach and the mitigation tools available to the project.

Mitigation for long-term, permanent impacts would include a combination of mitigation options. The federal mitigation hierarchy set by USACE gives highest priority to use of mitigation banks, next in-lieu fee programs, and finally other mitigation options proposed by the permittee using a watershed approach. The TDLE project lies within the service area of the Port of Tacoma's Upper Clear Creek Mitigation bank. This mitigation bank was certified in June 2020 and could be used to offset project impacts in the Hylebos Creek watershed if credits are available at the time of permitting. In addition, use of the King County In-Lieu Fee Program (Mitigation Reserves Program) or other approved in-lieu fee programs would be considered as an option for compensatory mitigation for wetlands and their buffers. However, the Tribes and local jurisdictions prefer mitigation to occur within the same watershed as the project impacts; therefore, off-site mitigation would also be explored and included in the compensatory mitigation package. Opportunities to compensate for permanent stream and river impacts may include restoration of in-stream habitat, stream daylighting, replacement of culverts blocking fish passage, creation of off-channel habitat, or purchase of salmon credits from an approved mitigation bank. Mitigation options would be developed with input from affected Tribes, local jurisdictions, resource agencies, and permit authorities.

Compensatory wetland mitigation would be provided for construction impacts lasting more than one growing season and for permanent conversion of wetlands from one vegetation type to another (e.g., forested wetland to emergent or scrub-shrub wetland) as well as for indirect impacts on wetlands. In areas where stream buffers and wetland buffers overlap, mitigation for impacts would be based on the local jurisdiction's requirements for mitigating impacts either on wetland buffers or stream buffers — whichever requirements are more stringent.

4.10 Energy

4.10.1 Introduction to Resource and Regulatory Requirements

This section presents the energy usage estimates for TDLE operation and construction activities, including:

- Vehicles operating within the study area, including project light rail, automobile, and other transit use.
- Parking facilities, traction power substations, and signal bungalows.
- Construction of the project.

Overall, the operation of TDLE is expected to shift the types of energy used but is not expected to result in a net increase in energy consumption.

There are no federal, state, or local laws that include regulatory significance thresholds for energy consumption in the transportation sector. Many state, local, and regional transportation plans and policies include goals for the efficient use of energy, and energy conservation and use reduction goals occur at all levels of government. Sound Transit's Sustainability Plan is described in further detail in Section 2.6, Environmental Practices and Commitments, in Chapter 2, Alternatives Considered. Sound Transit monitors its environmental impacts with an internationally certified (International Organization for Standardization [ISO] 140001) Environmental and Sustainability Management System.

4.10.2 Affected Environment

The study area for this analysis is the same as the study area for the regional transportation analysis (the PSRC four-county region, which includes King, Pierce, Snohomish, and Kitsap counties) because the regional travel model for VMT and vehicle hours traveled includes all four counties. This section discusses existing conditions and patterns related to energy use for both the state and the study area. Energy use is often expressed in terms of a standard measure known as the British thermal unit. According to the U.S. Energy Information Administration, Washington consumed 2,097 trillion British thermal units of energy in 2017 (EIA 2019a), which is enough to meet the energy needs of approximately 23 million households (United States Department of Energy 2020). Total energy use per capita in 2017 was 282 million British thermal units, which ranks 29th among all states in the country. Per capita energy use in general is declining (EIA 2019b), while the state's overall energy use is increasing (EIA 2019c). The general decline in per capita energy use since the 1990s has resulted from several factors, including the decline in industrial energy use, particularly the energy-intensive aluminum industry; generally higher energy prices between 2002 and 2014; and more aggressive federal and state codes, standards, and programs focusing on energy efficiency (Washington State Department of Commerce 2018). The state's overall energy use is expected to increase over the next several decades due to growth in population, jobs, and demand for vehicle travel (Washington State Department of Commerce 2011).

In 2017, transportation accounted for the majority of energy use in the state (32 percent), followed by the industrial (26 percent), residential (24 percent), and commercial (18 percent) sectors (EIA 2019a). While transportation energy use is the largest sector, the forecast growth rate is low due primarily to federal vehicle fuel-efficiency standards and anticipated fuel price increases (Washington State Department of Commerce 2011).

According to the PSRC travel demand model, which provided the base transportation data used in this analysis, most regional miles traveled are in passenger cars and trucks. Public transit accounts for less than 1 percent of the regional miles traveled. For the study area, Table 4.10-1 shows the daily VMT and energy use by transportation mode. According to the PSRC travel demand model (PSRC 2020) and the Sound Transit ridership model (Sound Transit 2020), the existing daily VMT for the study area is approximately 89 million miles. The associated daily energy use is approximately 620,000 million British thermal units.

Table 4.10-1 Existing Energy Consumption by Mode in King, Pierce, Kitsap, and Snohomish Counties

Vehicle Type	Energy Consumption Rate (British Thermal Units per mile)	Existing Conditions Daily Vehicle Miles Traveled	Existing Conditions Million British Thermal Units
Passenger vehicle	5,277	79,501,800	419,531
Heavy-duty truck	21,335	9,009,900	192,226
Transit bus	37,404	187,100	6,998
Streetcar	29,333	600	18
Light rail	25,129	10,600	266
Commuter rail	108,252	7,600	823
TOTAL	**Not Applicable**	**88,717,600**	**619,862**

Sources: Oak Ridge National Laboratory 2019; PSRC 2020; Roos 2019; Sound Transit 2020.

4.10.3 Environmental Impacts

This section discusses the direct long-term operational and short-term construction impacts of TDLE, including the No-Build Alternative, and the resulting demand on regional energy supply. The analysis applies to all build alternatives because their operation and ridership characteristics are similar.

The energy analysis evaluates operational energy use by TDLE and the demand on the regional energy supply. Estimated operation impacts are based on the VMT estimates by mode in the PSRC travel demand model (PSRC 2020). The regional total light rail VMT estimates were based on the projected operations plan for the regional Link light rail system. Regional VMT estimates separated passenger miles from heavy-truck miles to account for differences in energy consumption levels. Energy consumed was converted to British thermal units to provide a common measure among all energy sources. The energy consumption rate (British thermal units per vehicle mile) for each vehicle type was obtained from the Transportation Energy Data Book, Edition 37 (Oak Ridge National Laboratory 2019) and Sound Transit (2020).

Table 4.10-2 shows the energy consumption rate (British thermal units per mile), VMT, and total energy consumption for the No-Build and build alternatives.

Table 4.10-2 Energy Consumption by Mode for No-Build and Build Alternatives

Vehicle Type	Energy Consumption Rate in British Thermal Units per Mile	2042 No-Build Alternative Daily VMT[1]	2042 No-Build Alternative Million British Thermal Units	2042 Build Alternatives Daily VMT	2042 Build Alternatives Million British Thermal Units	Percent Change in Million British Thermal Units from No-Build Alternative
Passenger vehicle	5,277	85,415,900	450,740	85,182,400	449,508	-0.27
Heavy-duty truck	21,335	11,270,500	240,456	11,270,500	240,456	0
Transit bus	37,404	244,300	9,138	239,100	8,943	-2.13
Streetcar	29,333	3,200	94	3,200	94	0
Light rail	25,129	128,900	3,239	139,400	3,503	8.15
Commuter rail	108,252	15,200	1,645	15,200	1,645	0
TOTAL	**Not Applicable**	**97,078,000**	**705,312**	**96,849,800**	**704,149**	**-0.16%**

Sources: Oak Ridge National Laboratory 2019; PSRC 2020; Roos 2019; Sound Transit 2020.

Note:

(1) Light rail VMT for the No-Build Alternative includes light rail system extensions in the Sound Transit 3 Plan, including to Lynnwood in the north, Redmond Technology Station in the east, and Federal Way Downtown Station in the south, which are expected to be complete before TDLE.

4.10.3.1 No-Build Alternative

The No-Build Alternative includes projects, funding packages, and proposals in the central Puget Sound region that are planned to occur with or without TDLE, as described in Chapter 2 (Section 2.2). Under the No-Build Alternative, TDLE would not be constructed, and existing land uses within the study area would continue to consume electricity and natural gas to support annual operations. There would be no fuel consumption (e.g., gasoline, diesel) associated with construction or operation of TDLE.

The daily VMT for the study area is projected to increase from approximately 89 million miles under existing conditions (see Table 4.10-1) to approximately 97 million miles in 2042 (see Table 4.10-2). The No-Build Alternative would place additional demands on energy in the region because of increased passenger trips, greater levels of congestion, and slower speeds, which would also increase greenhouse gas emissions. However, the additional demand that TDLE would place on the electric grid would not occur.

4.10.3.2 Long-Term Impacts for the Build Alternatives

Impacts Common to All Alternatives

Because all build alternatives would be of similar length and ridership, direct impacts on the local electricity utilities would be similar for all alternatives. To power TDLE, Sound Transit would purchase electricity from PSE and Tacoma Power. Sound Transit is in ongoing

coordination with both PSE and Tacoma Power to analyze their existing systems and to determine whether improvements are required to support TDLE operations. Further design and analysis may identify upgrades to the existing power grids and substations needed to provide the required coverage to meet project demands. For example, a new circuit may be required at the existing substation at E 26th Street and East G Street in Tacoma to meet the energy demands and provide operational redundancy for TDLE. Section 4.15, Utilities, further discusses utilities in the project corridor.

In general, the project's long-term impacts would change energy consumption for transportation on roadways and by the public transit system. When compared with the No-Build Alternative, TDLE would slightly reduce regional passenger vehicle and transit bus VMT as people shift to riding light rail. The build alternatives would reduce miles traveled by cars and light trucks by about 233,500 miles per day but would increase light rail miles by about 10,500 miles per day (Table 4.10-2). Overall, TDLE would use approximately 0.16 percent less energy than the No-Build Alternative. This reduction is in addition to the reduction associated with the entire Sound Transit light rail system and planned expansion projects.

If TDLE is constructed in phases, the decrease in energy use would be less than shown in Table 4.10-2 for both the M.O.S. to the station in South Federal Way and M.O.S. to the station in Fife.

Sound Transit's *Sustainability Plan*, last updated in 2019, commits the agency to integrating efficient operating practices at existing and new facilities, using energy-saving equipment to reduce energy demand, and maximizing intermodal transit connections to reduce automobile VMT. The Sustainability Plan identifies a long-term energy target in which all fleets would deploy fuel-efficient, clean, and cost-effective vehicles to optimize the use of proven technologies. Implementing the plan involves tracking fuel and energy consumption annually, reporting on progress, and reevaluating targets regularly. Sound Transit's design standards for light rail also require designers to maximize the energy efficiency of transit facilities, buildings, and systems. Additionally, Sound Transit is committed to using carbon neutral electricity from the utilities serving TDLE. Washington State's Clean Energy Transformation Act requires all electrical utilities to be carbon neutral by 2030 and carbon free by 2045. Implementing the Sustainability Plan and Sound Transit's design standards could further reduce energy consumption during TDLE construction and operations. And, given that a utility could purchase additional electricity on the open market, if necessary, the overall TDLE operations is not expected to have a notable impact on the electrical utilities.

Potential Benefits

Compared with the No-Build Alternative, potential transit improvements would reduce motor vehicle use within the study area and would increase travel on Sound Transit's light rail network. As shown in Table 4.10-2, overall transportation-related energy consumption would be reduced compared to the No-Build Alternative.

4.10.3.3 Construction Impacts for the Build Alternatives

Energy-related impacts during construction of TDLE would be short term in nature and are not expected to be adverse. Construction materials produced and transported to the site and the operation and maintenance of construction equipment would consume energy. The energy analysis used the FTA Transit Greenhouse Gas Emissions Estimator tool to estimate construction impacts associated with the project (FTA 2022). The tool allows users to estimate

energy consumption for transit projects using limited data inputs, such as miles of new track and the number of new stations.

Impacts Common to All Alternatives

Table 4.10-3 presents the project inputs used to estimate construction-related energy consumption for TDLE.

Table 4.10-3 TDLE Energy Model Inputs

Input	Quantity
Number of structured parking spots	1,000
Miles of elevated track	9.27
Miles of at-grade track	0.6
Miles of catenary	11.6
Number of elevated stations	4

Table 4.10-4 shows the estimated energy that would be consumed during construction.

Table 4.10-4 Estimated Energy Consumed During Construction

Item	Consumption in Million British Thermal Units
Upstream energy[1] – materials	2,765,549
Direct energy – construction equipment	99,088
TOTAL	**2,864,637**

Note:
(1) Upstream energy is the energy related to the extraction, production, and transportation of construction materials.

Assuming a 4 to 5-year construction period, the average annual energy consumed by construction of TDLE would represent about 0.1 percent or less of the energy consumed in Washington State during that period.

Sound Transit's commitment to sustainability practices includes minimizing greenhouse gas emissions, which could be achieved by conserving energy during construction. Such practices could include, but would not be limited to, conserving fuel use through reductions in construction vehicle idling and setting minimum EPA-tier requirements for construction vehicles, providing for pre-demolition extraction of salvageable/reusable/recyclable materials, and reducing traffic for detours. Sound Transit would work with the contractor regarding the implementation of measures to avoid or minimize impacts.

If construction of TDLE parking facilities at both the South Federal Way and Fife stations is deferred up to three years after initial service opens, the same construction-related effects on energy would also apply at these two station locations at the time the parking facilities are constructed.

4.10.3.4 Avoidance and Minimization of Impacts

When developing TDLE alternatives, Sound Transit incorporated several measures to avoid or minimize potential impacts on energy use. For example, Sound Transit would implement its Sustainability Plan, which would minimize impacts on energy use from the project. In addition, Sound Transit's Design Criteria Manual — Chapter 30 (Sustainability) in particular — outlines specific measures around energy-efficient design at the station level to minimize impacts on energy use, adopting requirements in line with the United States Green Building Council Leadership in Energy and Environmental Design (LEED) transit rating system. Lastly, the project would pursue Envision certification, which includes elements of construction and operational reductions in energy consumption.

4.10.3.5 Indirect Impacts

No indirect impacts on energy would occur as a result of operating TDLE because the energy consumed during operations is considered a direct impact. Short-term indirect impacts related to the upstream energy consumption from the extraction, production, and transportation of construction materials for TDLE are included in energy consumed during construction identified in Table 4.10-4.

4.10.4 Potential Mitigation Measures

No mitigation beyond the avoidance and minimization measures described above would be anticipated.

4.11 Geology and Soils

4.11.1 Introduction to Resource and Regulatory Requirements

This section addresses topography, geology, soil characteristics, groundwater location, and geologic hazards impacts for TDLE. These considerations affect project design, the type of construction methods used for the project and, if not adequately considered during project design, could affect the long-term operations and safety of the light rail system. This section discusses the potential long-term as well as short-term geology and soils impacts of TDLE.

The regulatory requirements applicable to TDLE include the Washington State GMA (RCW 36.70A). Under the GMA, all cities and counties are required to identify critical areas within their jurisdictions and to formulate development regulations for their protection. The GMA defines geologically hazardous areas or critical areas as areas that are susceptible to erosion, sliding, earthquake, or other geological events. The hazards could affect the design, construction, and operation of TDLE and, if not considered appropriately, could pose a risk to public health and safety. Geology and soils considerations are closely related to groundwater conditions. This section includes general information on groundwater in the project vicinity, as related to the assessment of geologic hazards. More detailed information on groundwater locations, including sole source aquifers, and uses along each alternative is discussed in Section 4.8, Water Resources. Locations of possible contaminated soils and contaminated groundwater are identified and discussed in Section 4.12, Hazardous Materials.

4.11.2 Affected Environment

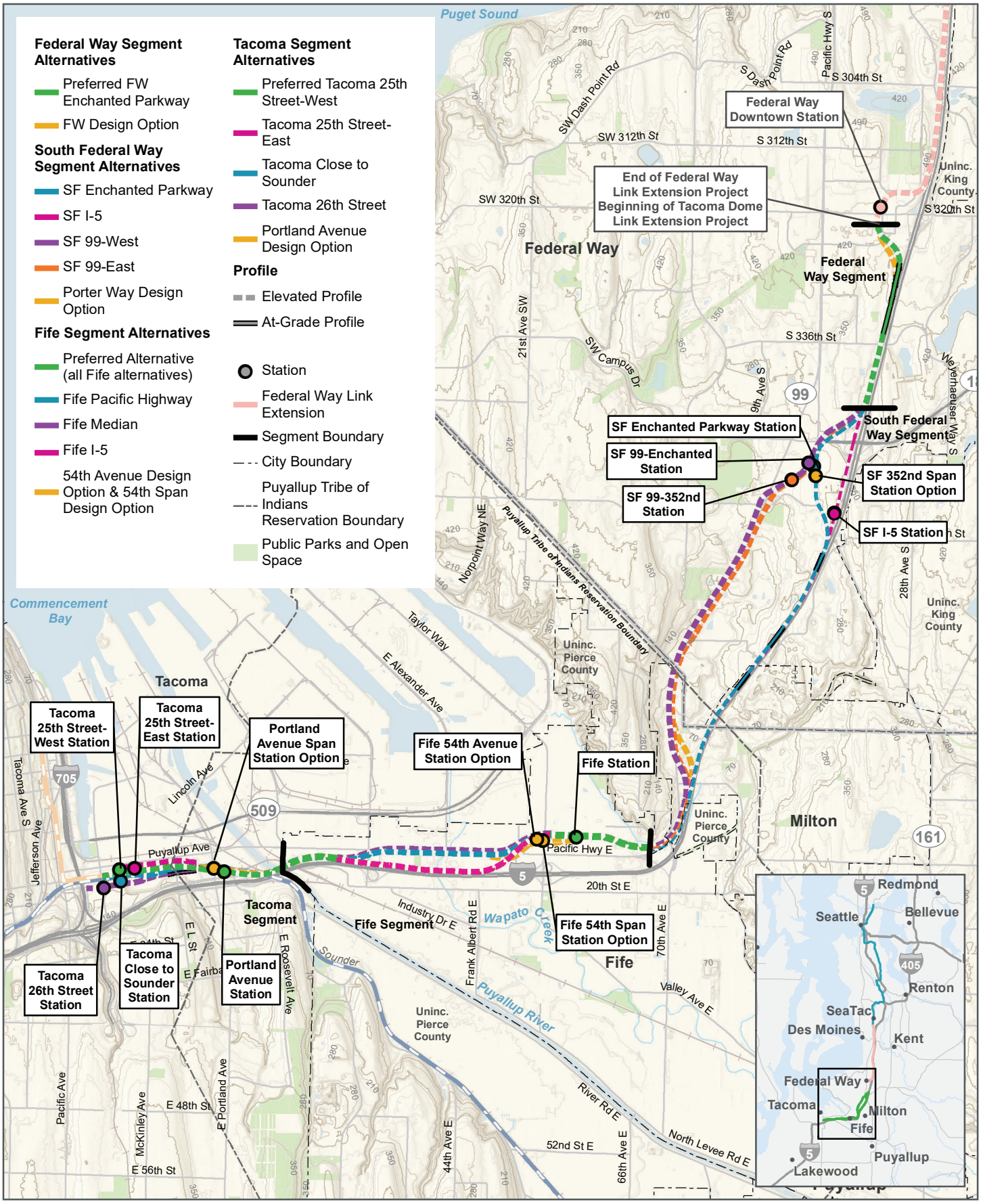
Existing geologic and hydrogeologic conditions, including topography, geology, soil characteristics, groundwater location, and geologic hazards, were reviewed within the study area. The study area includes resources within 100 feet of the construction limits. Figure 4.11-1 shows the topography in the study area and Appendix H6, Geology and Soils Background Information, includes maps showing surface geology and geologic hazards.

4.11.2.1 Regional Geology

The project is in the southern portion of the central Puget Lowland, a wide, low-lying area between the Cascade Range to the east and the Olympic Mountains and Washington coast to the west. Topography and geology local to the project have been largely shaped by Pleistocene glaciation. The regional geology includes glacially consolidated soils and sediments to a depth of over 1,200 feet in the northern portion of the study area and 1,800 feet in the southern end of the study area. The surface geology in the project has been heavily modified by construction of local highways, roads, and other development. Site geology described below is primarily a discussion of native geologic units.

4.11.2.2 Topography

TDLE extends from the upland area of Federal Way, with elevations of 400 to 450 feet above sea level to near sea level in the vicinity of Fife and Tacoma. Topographical features in the study area include various drainage systems, small water bodies, associated topographic features, and the Puyallup River delta and estuary.



Data Sources: USGS, King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).
Service Layer Credits: Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community

N

0 1 2 Miles

FIGURE 4.11-1
Topography

Tacoma Dome Link Extension

4.11.2.3 Seismicity

Earthquake hazards in the study area are primarily related to the convergent plate boundary of the North American continental plate and the Juan de Fuca oceanic crustal plate known as the Cascadia Subduction Zone. This subduction zone boundary has a long history of megathrust earthquakes with magnitudes exceeding 8 (Frankel and Peterson 2008), the most recent of which occurred on January 26, 1700, with an estimated 9.0 magnitude.

In addition to Cascadia Subduction Zone related quakes, intracrustal faults, such as the Seattle and Tacoma faults, have the potential for rupture, which can cause substantial ground displacement and shaking. The Seattle Fault lies approximately 15 miles to the north and would be unlikely to cause ground displacement in the study area. The Tacoma Fault Zone runs east-west through the study area and has the potential to produce a magnitude 6 or 7 earthquake with ground rupture (Gomberg et al. 2010). There is some evidence in sediments of major seismic activity on both the Seattle and Tacoma Faults approximately 1,100 years ago.

Hazards specific to the study area associated with seismic events are discussed in Section 4.11.2.6.

4.11.2.4 Site Geology and Groundwater Conditions

The study area is underlain by glacially consolidated soils, unconsolidated recessional outwash, peat deposits, and more recent alluvium (DNR 2020). Groundwater is typically found within 25 to 30 feet of the ground surface throughout the study area (Ecology 2020). Groundwater tends to be the deepest in the northern part of the study area in the vicinity of The Commons shopping center in the Federal Way Segment. The shallowest groundwater (less than 5 feet below ground surface) occurs in Fife, both in the vicinity of Hylebos Creek and near 51st Avenue E and in Tacoma west of the Puyallup River. The study area in the Tacoma Segment includes the EPA-designated Central Pierce County Sole Source Aquifer (EPA 2019). In addition, artesian conditions have been historically encountered in this area (WA Department of Conservation 1961). Section 4.8, Water Resources, provides a more in-depth discussion of sole source aquifers, critical aquifer recharge areas, and wellhead protection areas in the study area.

The build alternatives for each segment generally have similar geologic and groundwater conditions.

4.11.2.5 Soils

Soils within the study area have been heavily altered, particularly along transportation corridors such as I-5 and Pacific Highway. Where artificial fill has not been introduced, surface soils in the Federal Way and South Federal Way segments of the study area consist primarily of sandy loams and gravelly sandy loams, which tend to exhibit positive drainage characteristics (low to moderately low runoff potential and moderate infiltration rate). As the study area moves south, a discrete zone of peat is found near the King/Pierce County boundary.

In the Fife and Tacoma segments, sandy loams transition to silt loams and silty clay loams, which exhibit higher runoff potential and lower infiltration rates. An exception is sandy loams present along the Puyallup River, which have better drainage properties than surrounding soils (USDA NRCS 2024). Soil between the west bank of the Puyallup River and the TDLE terminus is described as low slope urban land (undifferentiated fill).

4.11.2.6 Geologic Hazards

Critical areas ordinances for the cities of Federal Way, Fife, Milton, and Tacoma, and for unincorporated Pierce County, all have defined geological hazards in their municipal codes. Appendix H6, Geology and Soils Background Information, includes maps showing geologic hazards. The following geological hazards defined in these codes found in the study area include:

- Erosion hazards – Soils that are particularly susceptible to erosion are present within the study area. These soils are primarily located in the South Federal Way Segment.
- Steep slopes – Slopes of over 40 percent increase the potential for erosion and slope failure during storm or seismic events. Steep slopes are present in the Federal Way, South Federal Way, and Tacoma segments.
- Landslide hazards – Areas with historical landslides or with susceptible soil types and steep slopes create an unstable environment. Mapped landslide hazards are present in the South Federal Way Segment along Pacific Highway E in the vicinity of 70th Avenue E.
- Seismic hazards – Ground displacement, shaking, and liquefaction have the potential to affect project-related construction elements. The Federal Way and South Federal Way segments generally exhibit the least susceptibility to seismic hazards (DNR 2020), with low liquefaction potential and amplification of ground shaking. The Fife and Tacoma segments exhibit a higher susceptibility, with high liquefaction potential. Soils in the Fife area include some peat deposits, which may require additional evaluation depending on extent.
- Tsunami hazards – Tsunami waves caused by seismic displacement of the earth's surface below the water's surface can cause inundation of developed areas and widespread destruction of natural and built environments. Modeled tsunami inundation impacts (DNR 2020) from seismic events on the Seattle Fault and the Tacoma Fault Zone indicate that both Tacoma and Fife segments could see inundation, with the most widespread impacts in Fife. The Federal Way and South Federal Way segments are outside the modeled area and are unlikely to experience impacts from a seismically generated tsunami.
- Volcanic – The proximity of Mount Rainier, an active stratovolcano located approximately 40 miles to the southeast, has produced substantial lahars (a mud or debris flow composed of water, debris, and pyroclastic material) in the Puyallup River Valley that have reached Puget Sound. Based on the historical extent of lahar deposits (DNR 2020), almost the entirety of the Tacoma and Fife segments and the southern reach of the South Federal Way Segment could be affected by a large lahar.

Soils with particular textures, pH, and salt contents can be corrosive to both concrete and uncoated steel. Although soils corrosive to concrete have not been identified in the study area, soils corrosive to steel have been. These soils have been identified in both the Federal Way and Fife segments of the study area (USDA 2020). Corrosive soils data were not available for the Tacoma Segment of the project.

The geologic and soil hazards described above are the same for each alternative within the Federal Way, South Federal Way, Fife, and Tacoma segments, respectively.

4.11.3 Environmental Impacts

This section identifies direct long-term operational and short-term construction impacts of the alternatives.

4.11.3.1 No-Build Alternative

The No-Build Alternative also includes projects, funding packages, and proposals in the central Puget Sound region that are planned to occur with or without TDLE, as described in Chapter 2 (Section 2.2). Under the No-Build Alternative, TDLE would not be constructed; consequently, there would be no impacts to existing geologic, soil, or groundwater resource conditions associated with the TDLE project.

4.11.3.2 Long-Term Impacts for the Build Alternatives

Impacts Common to All Alternatives

Proposed build alternatives for TDLE generally traverse highly urbanized land, and long-term effects on existing geologic and hydrogeologic conditions are likely to be limited. The following long-term effects related to the completion of the TDLE project could occur:

- Changes to local topography and drainage patterns could affect slope stability.
- Minor settlement could affect near-surface features.
- Corrosive soils could compromise steel structures (applicable soils data was not available for the Tacoma Segment).

If TDLE is constructed in phases, the M.O.S. to the station in South Federal Way and the M.O.S. to the station in Fife would have the same type of impacts to geologic, soil, and groundwater conditions, just in a smaller geographic area until the remaining phases were completed.

Potential Benefits

TDLE's engineered structures would be designed to withstand a major seismic event, as required by federal, state, and local design standards. In the event of a natural disaster, facilities designed to withstand major seismic events could promote transportation resiliency and support emergency response efforts.

4.11.3.3 Construction Impacts for the Build Alternatives

Discussion of construction impacts for the build alternatives are generally common to all alternatives within a project segment. Where impacts can be differentiated by alternative, details are provided.

Potential construction impacts for the build alternatives include:

- Temporary effects from earthquakes during construction of TDLE could include structure cracking, soil liquefaction and settling, and movement of soils on steep slopes.
- New structures constructed as part of TDLE could experience settling if not correctly mitigated. Soil settling and consolidation could occur throughout the study area where hydric, compressible soils or non-structural fill exists. Settling around structures and

stockpiles occurs as the load equilibrates to soil conditions over time. Settling can result in a variety of adverse effects, such as cracks in roadways and compromised foundations.

- Soil erosion could occur during construction of the project if not correctly mitigated. Construction activities could expose erosive soils to wind and stormwater. Adverse effects from soil erosion include:
  - Plugging of stormwater catch basins.
  - Deposition of soil surface water on roadways.
  - Diminished surface water quality in Hylebos Creek and the Puyallup River.
  - Potential to undermine existing roadway and structures.
- Construction of the project would expose soils to erosion during construction from excavation, fill, clearing, and grading.
- Reduction in slope stability in areas of steep soils and historical landslides due to excavation can result in slope and soil movement compromising existing structures.

Federal Way Segment

Construction impacts for the alternative and design option would be similar to those described for all build alternatives. Hydric soils that may create settlement, steep slope hazards, historical landslides, landslide hazards, and volcanic hazards are not mapped within the segment. The alternatives in the Federal Way Segment are less susceptible to hazards related to seismic events relative to the alternatives in the Fife and Tacoma segments, owing to their upland location.

Groundwater along the alternatives in the Federal Way Segment is expected to be 15 to 25 feet below the ground surface. In areas where groundwater is less than 20 feet below ground surface, the construction of retaining structures could potentially affect or be affected by shallow groundwater. These areas of shallower groundwater could also be affected by infiltration of stormwater due to the increased impervious surfaces associated with the project.

South Federal Way Segment

Construction impacts for the alternative and design option would be similar to those described for all build alternatives. Hydric soils that may create settlement, historical landslides, landslide hazards, and volcanic hazards are not mapped within the segment. All alternatives include a steep slope along Pacific Highway in the vicinity of 70th Avenue E. The alternatives in the South Federal Way Segment are less susceptible to hazards related to seismic events relative to the alternatives in the Fife and Tacoma segments, owing to their upland location.

Groundwater along the alternatives in the South Federal Way Segment is expected to be 15 to 25 feet below the ground surface. In areas where groundwater is less than 20 feet below ground surface, the construction of retaining structures could potentially affect or be affected by shallow groundwater. These areas of shallower groundwater could also be affected by infiltration of stormwater due to the increased impervious surfaces associated with the project.

Fife Segment

Construction impacts for the alternative and design option would be similar to those described for all build alternatives. Steep slope hazards, historical landslides, and landslide hazards are not identified within the segment. All alternatives in the Fife Segment would be constructed on soils that can be corrosive to steel and on hydric soils that may create settlement issues. Soils susceptible to compression (peat) are present in the northern end of the Fife Segment. Seismic hazards within the Fife Segment are more substantial than in the Federal Way and South Federal Way segments due to its location within the alluvial basin created by the Puyallup River and the relatively low elevation near sea level. A majority of the segment is located on top of alluvium, which results in a high liquefaction susceptibility and ground motion amplification. Modeled tsunami hazards based on a major seismic event on the Tacoma Fault Zone or the Seattle Fault could result in inundation of almost the entire study area within the Fife Segment. The lahar hazard from a major Mount Rainier eruption would also encompass the entirety of the Fife Segment.

Groundwater along the length of most of the Fife Segment is relatively shallow (between 5 and 15 feet below ground surface). Placement of retaining structures or infiltration of stormwater may affect the flow direction and gradient of shallow groundwater. In areas of particularly shallow groundwater in the Fife Segment (wetlands, floodplain areas, and in the vicinity of the Puyallup River), dewatering (also affecting shallow groundwater flow) may be necessary during project construction.

Tacoma Segment

Construction impacts for the alternative and design option would be similar to those described for all build alternatives. Steep slopes and landslide hazards are generally not present along the alternatives in the Tacoma Segment, with exception of near the west end of the Tacoma 26th Street Alternative just north of the Tacoma Dome. If the Tacoma 26th Street Alternative were constructed, preventive measures, as described in Section 4.11.3.5, would be in place to prevent the risk of a landslide or slope failure in this area. Data describing certain soil characteristics (corrosivity, hydric soils) were not available for the Tacoma Segment. Seismic hazards for the alternatives in the Tacoma Segment are generally identical to those of the Fife Segment. These alternatives would be on soils with a high liquefaction susceptibility and ground motion amplification as well as being within the inundation zone of a tsunami generated by a major seismic event on the Tacoma Fault Zone. The lahar hazard from a significant Mount Rainier eruption would also encompass the entirety of the Tacoma Segment.

Similar to the Fife Segment, groundwater in the Tacoma Segment study area is relatively shallow (less than 10 feet below ground surface). Similar considerations for retaining structures, stormwater infiltration, and dewatering (in floodplain areas and near the Puyallup River) would be considered for the alternatives in the Tacoma Segment. Additional information on groundwater is discussed in Section 4.8, Water Resources.

4.11.3.4 Indirect Impacts

Introducing light rail may contribute to increased development in the vicinity of the project (consistent with existing development regulations), leading to increased demands on municipal water supplies to serve an increased population. An increased demand on groundwater for potable water supply purposes could lead to an increase in pumping rates and a necessity for

an expansion in groundwater protection areas. As noted above, a more in-depth description and analysis of groundwater can be found in Section 4.8, Water Resources.

4.11.3.5 Avoidance and Minimization of Impacts

The potential impacts identified above could be avoided or minimized through engineering design standards and BMPs designed to address and control long-term impacts from TDLE. Examples of these practices include, but are not limited to, erosion control measures, dewatering, and groundwater injection methods. Design standards and BMPs would be derived from site-specific data and standard highway and rail construction practices. Measures would also be identified to meet state and federal design and construction codes for transportation projects. Construction standards and guidance used by Sound Transit, WSDOT, FTA, FHWA, and the American Association of State Highway and Transportation Officials would be followed to ensure that appropriate measures are employed.

Steep slopes in the Tacoma 26th Street Alternative at East G Street would require erosion control management practices to address erosion hazard in this location.

Project-specific construction-related measures to avoid or minimize impacts would be considered in subsequent geotechnical evaluations. In specific cases where geologic hazards are not avoidable in the study area, the impacts of these hazards would be controlled through the use of appropriate engineering controls and practices. If dewatering is required in the Fife or Tacoma segments, the potential for settlement of nearby structures and changes in flow direction resulting in the potential need to address contaminated groundwater would be considered during design. Methods could include localized dewatering and groundwater injection methods, using sheet-pile walls for horizontal groundwater containment, or underpinning nearby structures. Sound Transit would incorporate these measures into construction plans and specifications as applicable.

Specific impacts would be addressed through the evaluation of geotechnical and other subsurface data that would be collected in proposed project corridor during the final design process. The data would be collected and reported in a separate geotechnical report prepared during final design. The geotechnical report would more specifically address avoidance and minimization measures for short-term construction impacts for particular project elements to geologic, hydrogeologic, and soils conditions.

4.11.4 Potential Mitigation Measures

With appropriate use of engineering design standards and BMPs, as described above, no adverse geological or soils impacts are anticipated. Therefore, no mitigation is needed.

4.12 Hazardous Materials

4.12.1 Introduction to Resource and Regulatory Requirements

This section describes the hazardous materials analysis, which identified properties in proximity to the TDLE build alternatives that are recognized to have potential hazardous materials issues associated with current or historical site activities or that have documented releases to the environment. Hazardous materials or substances, hazardous wastes, petroleum products and wastes, and contaminated environmental media (including soils, sediments, surface water, and groundwater) associated with past land use could potentially result in impacts on human health and safety and the environment during construction activities or long-term operation activities. During construction, adverse impacts could include releasing contaminants to soil, groundwater, or surface water, uncovering contaminated materials that could directly expose workers or the public, or spreading contamination. Beneficial effects of the project could include the cleanup and mitigation of contamination on acquired properties that otherwise would remain in place or could potentially migrate.

Supporting information, including the guiding federal and state regulations, plans, and policies, as well as a summary of the methodology used and the complete list of regulatory sites found per alternative, is included in Appendix H7, Hazardous Materials Supporting Information.

4.12.2 Affected Environment

For the analysis of hazardous materials, the study area includes the area within 0.25 mile (1,320 feet) of either side of the project footprint and the area used for construction.

The affected environment within the project study area was assessed by reviewing the state, Tribal, and federal regulatory database records, as well as by reviewing relevant historical land uses within the study area. A visual windshield survey was conducted to identify properties where hazardous materials might be present and to confirm the locations of sites identified in database records. The identified sites were categorized based on the proximity to the study area, the type and number of databases in which the site was found, the known releases of hazardous materials or petroleum products, and the status of remediation or cleanup efforts at sites with known releases. Based on the information collected, sites were categorized into one of three site ranking categories: high, medium, and low. The purpose of the site ranking analysis is to prioritize sites to determine the need for avoidance, remediation, or mitigation while considering associated impacts. The risk levels are defined as follows (WSDOT 2017):

- **High.** Sites that may be substantially contaminated and would create a major liability either during construction or by virtue of acquiring all or a portion of the site. If the site has undergone a detailed investigation and a feasibility study, the impacts and remediation costs may already be estimated. Nonetheless, the site is identified as a high-risk site because of its potentially substantial impact or liability. In general, high-risk sites are properties that may have large volumes of contaminated soil, groundwater, or sediment, or properties that have multiple complex types of contaminants that require special handling and disposal that is expensive to manage. High-risk sites also include properties where the information necessary to predict remedial costs is lacking. High-risk sites that may be acquired have been evaluated through a Phase I Environmental Site Assessment to ascertain to the extent possible the potential need for remediation, the general magnitude of cost, and the impact on the project.

- **Medium.** Sites where the likelihood to impact the project is moderate because of the type or extent of contamination or because groundwater from the site is impacted and has a reasonable potential to impact the project footprint from off-site migration of groundwater (but there is no conclusive evidence).
- **Low.** Sites where the nature of potential contamination is known and the likelihood to impact the project is low because there was no evidence to suggest that groundwater from the site is impacted or off-site migration of contamination is not expected to impact the project during construction. Sites where hazardous materials may be or may have been present but had no or only very small, reported releases.

4.12.2.1 Current and Historical Land Use

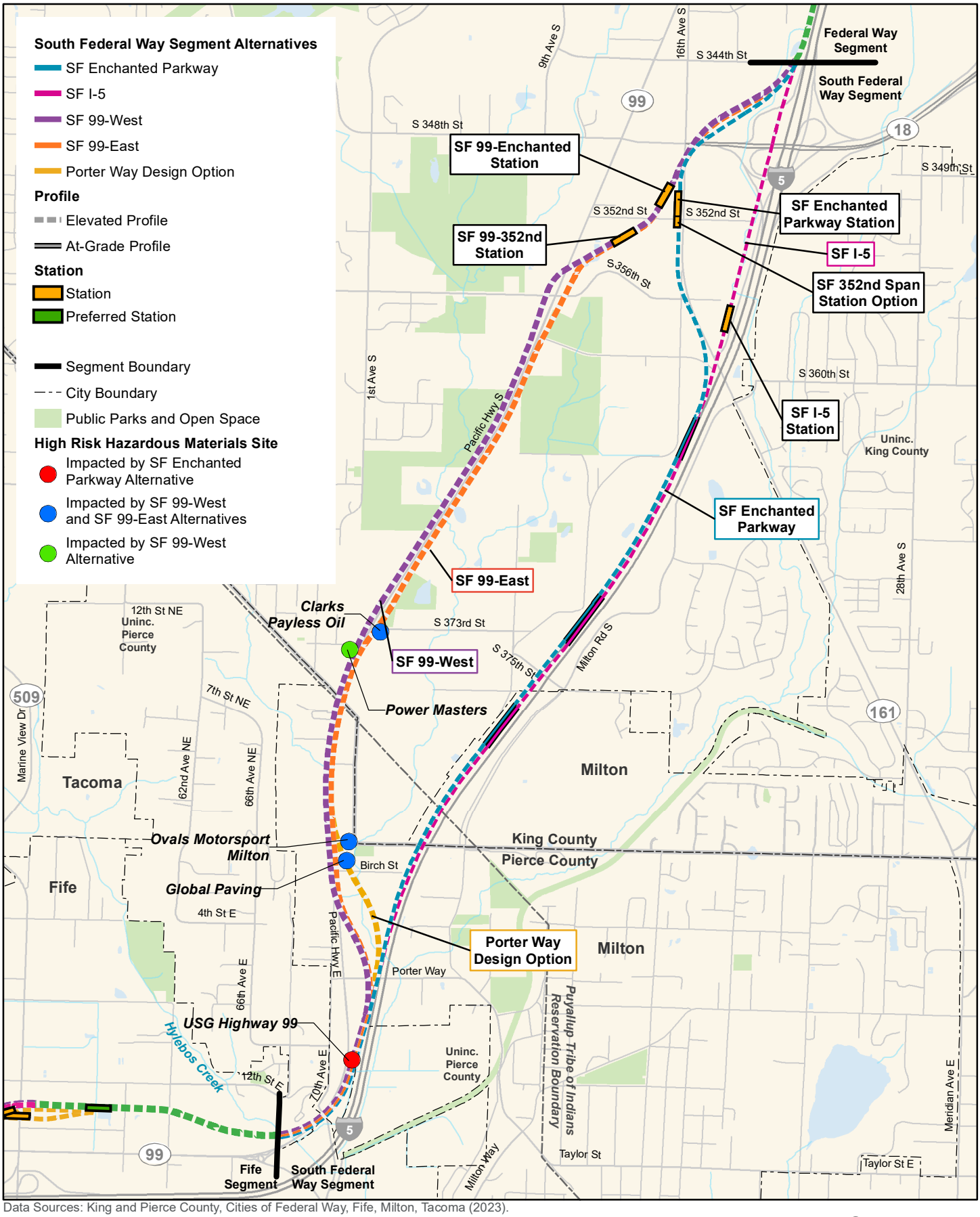
The TDLE corridor is in the vicinity of I-5 and Pacific Highway, traveling across ancestral and reservation lands of the Puyallup Tribe of Indians, as well as the cities of Federal Way, Fife, Milton, and Tacoma. Generally, the Federal Way and Milton portions of the corridor historically consisted of farmland, rural residential, and commercial properties along I-5, while the Fife and Tacoma portions have historically been commercial and industrial. The Union Pacific Railroad and BNSF railyard are present in the vicinity of the Tacoma Segment.

The Port of Tacoma, located north of the Fife and Tacoma segments, is a commercial seaport established in 1918 and part of the Commencement Bay, Nearshore/Tide Flats Superfund sites. The cleanup of the Commencement Bay Superfund Site and a number of restoration efforts to protect water quality and wildlife habitat have been implemented, which has included abatement of contaminated sediments and salmonid habitat enhancements (EPA 2005). The EPA placed the Commencement Bay Site on the Superfund National Priorities List in 1983 due to widespread contamination of the water, sediments, and upland areas (EPA 2021). Commencement Bay is managed as seven distinct clean-up sites; including the Asarco Smelter, Hylebos Waterway, and Thea Foss Waterway projects, which are in proximity to the project footprint. The largest contamination and cleanup involved the Commencement Bay Natural Resources Damage Assessment, which triggered remediation of PCBs, dioxins, and heavy metals in the Hylebos Waterway and seven other waterways. The assessment also led to the implementation of a series of restoration projects along the shores of Commencement Bay, near the study area adjacent to Hylebos Creek, and along the Puyallup River (NOAA 2020).

The study area for all TDLE build alternatives is located within the Asarco Tacoma smelter plume. Asarco Company was a copper smelter in Tacoma that operated from the late 1800s through 1985. Airborne particulates vented from the smelter settled on surface soils resulting in arsenic, lead, and other heavy metals in surface soil throughout the Puget Sound area. The TDLE corridor is within an area of the plume with estimated arsenic concentrations below 20 parts per million, the level considered as protective of both human health and the environment under the Washington State Model Toxics Control Act.

4.12.2.2 Description of High-Risk Hazardous Materials Sites

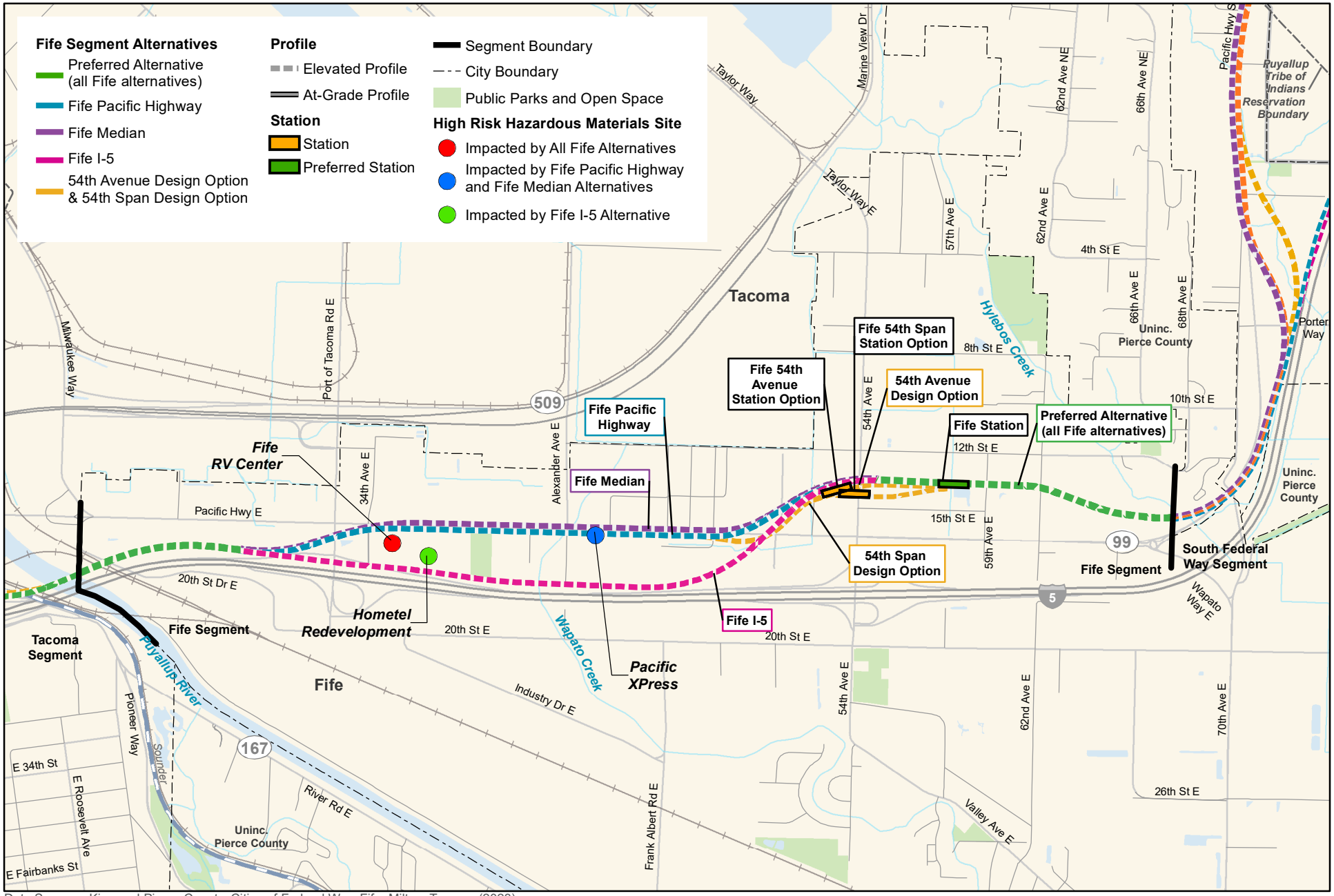
The following hazardous materials sites were identified as high risk. No high-risk sites were identified in the Federal Way Segment. The high-risk sites in the South Federal Way, Fife, and Tacoma segments are shown in Figures 4.12-1 through 4.12-3. None of these high-risk sites are federally regulated Superfund sites. All sites (high, medium, and low risk) for each of the alternatives are shown in Figures H7-1 to H7-9 in Appendix H7, Hazardous Materials Supporting Information.



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

FIGURE 4.12-1
High Risk Hazardous Materials Sites
South Federal Way Segment

Tacoma Dome Link Extension



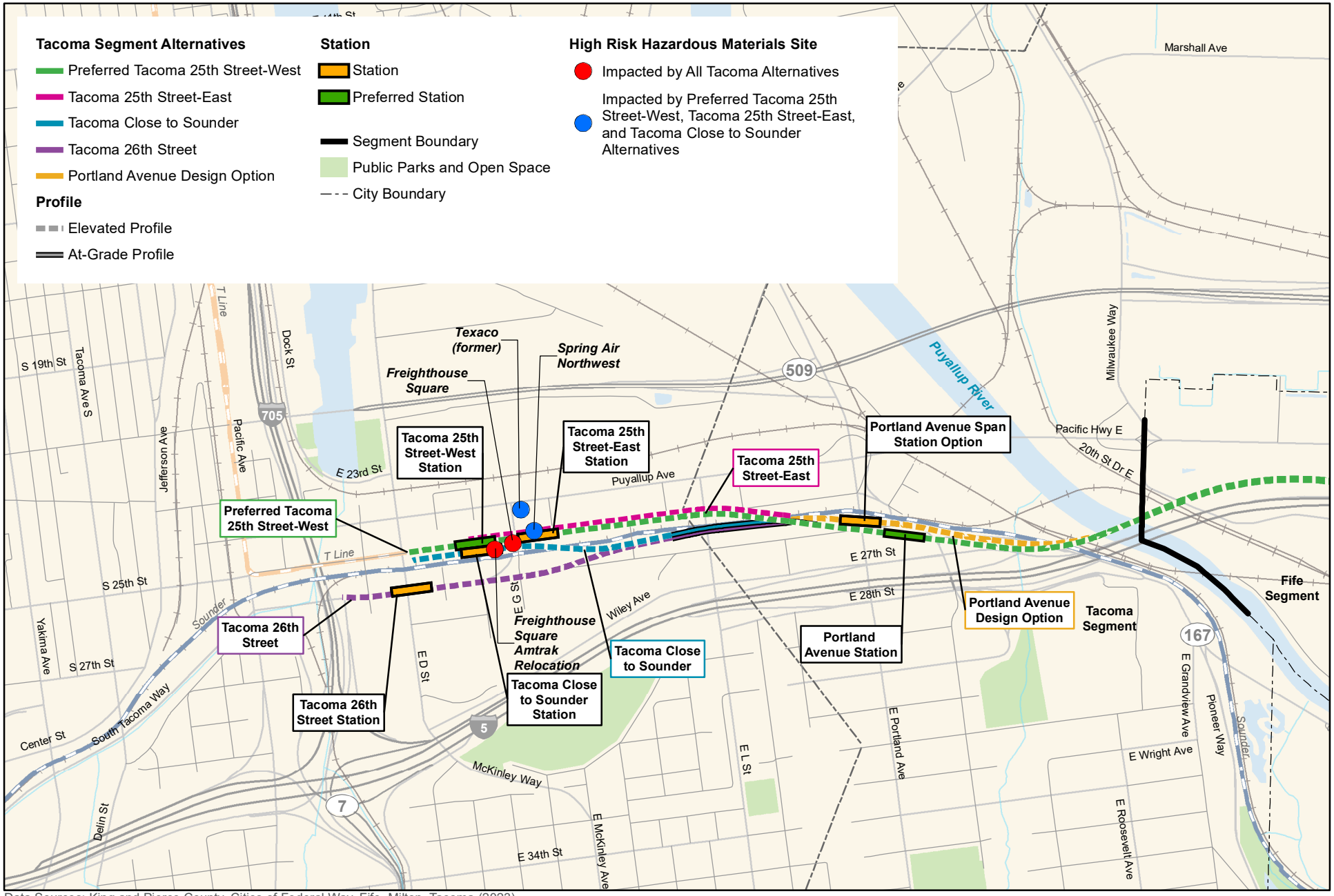
Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

0 0.5 1 Mile

FIGURE 4.12-2
High Risk Hazardous Materials Sites
Fife Segment

Tacoma Dome Link Extension



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

0 0.5 1 Mile

FIGURE 4.12-3
High Risk Hazardous Materials Sites
Tacoma Segment

Tacoma Dome Link Extension

South Federal Way Segment

Clarks Payless Oil

The Clarks Payless Oil site is an automotive repair facility and cleanup site with confirmed petroleum contamination in the soil from a leaking underground storage tank (LUST). Cleanup on the site has been started, according to Ecology, but has not been completed. No electronic documents with specific details on levels of contaminants, location of contaminated areas, or pursued remedial actions are available from the Ecology online database.

Power Masters

The Power Masters site is a cleanup site with suspected petroleum and metals in soil, groundwater, and surface water from on-site activities. There is no documentation of investigation at the site, and it is listed as awaiting cleanup.

Ovals Motorsport Milton

The Ovals Motorsport Milton site is a former automotive repair facility and cleanup site with confirmed arsenic contamination in the groundwater. The site is listed in the Voluntary Cleanup Site database, and cleanup is listed as started as of 2011. No additional information was found, and no documented interactions with Ecology were found after 2011.

Global Paving

The Global Paving site is a cleanup site with suspected petroleum, polychlorinated biphenyl (PCB), polycyclic aromatic hydrocarbon (PAH), and metal contamination in the soil from on-site activities, as well as fill material obtained from an unknown source. Some soil was removed from the wetland buffer zone on the site in August 2017; however, no analytical data, disposal documentation, or permits have been submitted to Ecology. Cleanup of this site is not complete.

Fife Segment

Fife RV Center (La Casa Real Drum)

The Fife RV Center is an active cleanup site undergoing quarterly groundwater monitoring for a documented historical release of petroleum hydrocarbons associated with the former Gasamet gasoline station that occupied the property from the 1960s to the 1980s. Remediation of soil and groundwater was performed, and the cleanup was determined to be complete. However, in 2014, further investigation was conducted on the site, and petroleum constituents were detected above screening levels in soil and groundwater, including total petroleum hydrocarbon gasoline in soil and benzene in soil and groundwater. Contaminated soil removal was completed in 2016; however, additional groundwater monitoring and further actions are required to delineate the extent of petroleum-related contamination (Aerotech 2018).

Hometel Redevelopment

Hometel Redevelopment, former location of the Hometel Inn, is a cleanup site with no official closure or No-Further Action Determination from a regulatory agency. It is adjacent to the Fife RV Center cleanup site detailed above. Confirmed contamination of groundwater and soil is documented, including metals and petroleum constituents. No electronic documents with specific details on levels of contaminants, location of contaminated areas, or pursued remedial actions are available from the Ecology online database.

Pacific Xpress

Pacific Xpress is an active gas station and cleanup site with localized contaminated soil and groundwater with petroleum constituents from a LUST discovered on site in 2018. Interim cleanup actions included removal and replacement of the LUST system, over-excavation of contaminated soil, and application of an oxidizing agent to the subsurface to support bioremediation of remaining impacts. Sampling of soil and groundwater after the interim cleanup actions indicated that soil and groundwater still exceed cleanup levels. The site has been entered into the Washington State Petroleum Technical Assistance Program and is being managed by the State's Pollution Liability Insurance Agency. Cleanup of this site is not complete. Additional remedial actions will be required for regulatory site closure.

USG Highway 99

The USG Highway 99 site was used as a disposal site for plant processing waste and baghouse dust from USG Interiors in Tacoma, which used ASARCO slag during production. The slag contained elevated concentrations of arsenic. Much of the slag was removed from the site in the 1980s. Due to arsenic detected above cleanup levels in soil and groundwater in 2007, USG is required by Ecology to further investigate and cleanup the site. Cleanup activities will include in-situ chemical stabilization of remaining soil hot spots with a cement-based mixture (solidification), removal of contaminated sediments from Hylebos Creek, and the installation of a permeable cap. Cleanup of this site is not complete.

Tacoma Segment

Freighthouse Square

The Freighthouse Square site is a three-block property bounded by E 25th Street to the north, East G Street to the east, East D Street to the west, and railroad tracks to the south. The site was historically used to store diesel fuel and heavy fuel oil. During redevelopment of the property in 1993, soil and groundwater contamination was found on the property. A limited amount of soil was removed, and the remainder of the contaminated soil and groundwater was left in place and covered by an asphalt cap. Remedial efforts include the installation of an asphalt cap and placement of an institutional control that restricts groundwater use or activities that would disturb the asphalt cap and subsurface soil. The site received a No Further Action determination in 2003, which included continuing the restrictive covenant and a commitment to 5-year periodic reviews. The last periodic review by Ecology was in 2017, and the site was given a determination that the cleanup and engineering and institutional controls are still protective of human health and the environment.

Freighthouse Square Amtrak Relocation

The Freighthouse Square Amtrak Relocation site is bounded by E 25th Street to the north, East G Street to the east, East D Street to the west, and railroad tracks to the south. Soil and groundwater contamination were found at this site during the Amtrak Relocation Project, which included soil borings and monitoring wells installed around the entire three-block property. Groundwater was found to be contaminated with arsenic and carcinogenic PAHs, and oil-range hydrocarbons were found in the soil, spanning multiple properties, and most likely associated with a larger contamination plume. This site is related to the Freighthouse Square site, as they are in the same geographic location, and the contamination found at both sites likely originated from a century of railroad and industrial activities in the area; however, they are currently considered by

Ecology to be different cleanup sites and are therefore treated as separate sites for the purposes of this analysis.

Spring Air Northwest

The Spring Air Northwest site is an industrial property with historical heating oil tanks and evidence of oil and varnish storage. The site is located to the south of the former Texaco service station (detailed below). Soil and groundwater contamination, including petroleum constituents and metals, are present on the property, and additional work has been proposed in a Remedial Investigation Workplan dated 2016 (ECI 2016). No documentation of remedial work was identified during the hazardous materials analysis.

Former Texaco Service Station

The former Texaco service station site is an active cleanup site with confirmed contamination from underground storage tanks associated with a former gasoline station on the property. The soil and groundwater are contaminated with petroleum constituents, and the site is currently in a Voluntary Cleanup Program agreement. According to a Remedial Investigation Report from 2017 (ECI 2017), additional characterization of the extent of contamination is needed, as is quarterly groundwater monitoring. This site is located adjacent to the north of the Spring Air Northwest site.

4.12.3 Environmental Impacts

This section discusses the direct long-term operational and short-term construction impacts of the No-Build Alternative build alternatives. Detailed maps are also included (in Appendix H7) as appropriate to facilitate the discussion and understanding. Sites categorized as high-risk are show in Figures 4.12-1 and 4.12-2.

4.12.3.1 No-Build Alternative

The No-Build Alternative also includes projects, funding packages, and proposals in the central Puget Sound region that are planned to occur with or without TDLE, as described in Chapter 2 (Section 2.2). The No-Build Alternative would avoid disturbance, removal, or cleanup of potentially hazardous materials, including contaminated soil and groundwater on the TDLE corridor. Changes may occur due to other planned projects in the vicinity. Any existing contamination would remain in place, and the potential uncontrolled migration of existing contaminants might continue except where active cleanup operations are underway (and unrelated to the project).

4.12.3.2 Long-Term Impacts for the Build Alternatives

Permanent property acquisition for the project could trigger hazardous materials impacts where any site requires additional investigation as well as possible cleanup and remediation before or during construction. These impacts are described in this section as long-term impacts, although some of the actions occur during construction. Long-term impacts can occur where hazardous materials might remain present on properties acquired for the project and could potentially impact humans or the environment after the project is constructed. Some of the activities involved, such as ongoing remediation, monitoring, and reporting on previously contaminated sites, could extend beyond completion of the project and would provide a positive benefit to the region as sites are cleaned up.

The following sections describe the potential impacts of the high-risk sites identified above relative to the proposed alternatives. High-risk sites proposed for full or partial acquisition are discussed because they have the greatest potential impact on project development. Long-term impacts of these high-risk sites on the project could be the continuation of cleanup responsibilities (for example, groundwater monitoring) even after the project is constructed. It is expected that environmental site assessments would be conducted for all acquisitions to further analyze the potential impacts of the hazardous materials sites on the project, in compliance with applicable regulations and procedures.

If TDLE is constructed in phases, the M.O.S. to the station in South Federal Way and the M.O.S. to the station in Fife would have the same type of impacts, just in a smaller geographic area, until the remaining phases were completed. Both M.O.S.s would avoid impacts to potential high-risk hazard sites in Fife (west of 54th Avenue East) and Tacoma.

Federal Way Segment

No high-risk hazardous materials sites were identified within the Federal Way Segment.

South Federal Way Segment

The high-risk hazardous materials sites in the South Federal Way Segment are located on parcels potentially affected by the project are identified in Table 4.12-1.

Table 4.12-1 High-Risk Hazardous Materials Sites, South Federal Way Segment

Alternative	Ovals Motorsport Milton	Clarks Payless Oil	Global Paving	Power Masters	USG Highway 99
SF Enchanted Parkway Alternative	Not Affected	Not Affected	Not Affected	Not Affected	Affected
SF I-5 Alternative	Not Affected	Not Affected	Not Affected	Not Affected	Affected
SF 99-West Alternative[1]	Affected	Affected	Affected	Affected	Affected
SF 99-East Alternative[1]	Affected	Affected	Affected	Not Affected	Affected

Note:
(1) Sites are the same with or without the Porter Way Design Option.

Ovals Motorsport Milton: Potential impacts include encountering groundwater contaminated with arsenic.

Clarks Payless Oil: Potential impacts include encountering soil and groundwater contaminated with petroleum products.

Global Paving: Potential impacts include encountering soil and groundwater contaminated with petroleum, PAHs, PCBs, and metals.

Power Masters: Potential impacts include encountering petroleum and metals contaminated soil, groundwater, and/or surface water.

USG Highway 99 Site: Potential impacts include encountering soil and groundwater contaminated primarily with arsenic.

Fife Segment

Impacts Common to All Alternatives in the Fife Segment

Although sediment contamination has not been documented in the immediate vicinity of the proposed bridge over the Puyallup River for the Fife Segment, based on the history of industry along the river and the documented sediment contamination in Commencement Bay, there is the possibility that the construction of a bridge with an in-water pier could mobilize existing contaminants. This could occur during construction or over the long term due to scouring caused by changes in river dynamics.

The high-risk hazardous materials sites in the Fife Segment on parcels potentially affected by the project are identified in Table 4.12-2.

Table 4.12-2 High-Risk Hazardous Materials Sites, Fife Segment

Alternative	Fife RV Center (La Casa Real Drum)	Pacific Xpress	Hometel Redevelopment
Fife Pacific Highway Alternative[1]	Affected	Affected	Not Affected
Fife Median Alternative[1]	Affected	Affected	Not Affected
Fife I-5 Alternative[1]	Affected	Not Affected	Affected

Note:
(1) Sites are the same with or without the 54th Avenue or 54th Span design options.

Fife RV Center (La Casa Real Drum): The Pacific Highway Alternative and the Fife Median Alternative would potentially affect three parcels associated with the site, and the Fife I-5 Alternative would potentially affect two parcels. Potential impacts include encountering soil and groundwater contaminated with petroleum hydrocarbons.

Pacific Xpress: Potential impacts include encountering soil and groundwater contaminated with petroleum products.

Hometel Redevelopment: Potential impacts include encountering soil and groundwater contaminated with petroleum products and metals.

All Fife Segment Alternatives impact the same number of high-risk sites. The Fife I-5 Alternative only affects two of the three tax lots that comprise the Fife RV Center (La Casa Real Drum) high-risk site, whereas the other two alternatives affect all three tax lots of this high-risk site.

Tacoma Segment

The high-risk hazardous materials sites in the Tacoma Segment on parcels potentially affected by the project are identified in Table 4.12-3.

Table 4.12-3 High-Risk Hazardous Materials Sites, Tacoma Segment

Alternative	Freighthouse Square Amtrak Relocation	Freighthouse Square	Spring Air Northwest	Former Texaco Service Station
Preferred Tacoma 25th Street-West Alternative	Affected	Affected	Affected	Affected
Tacoma 25th Street-East Alternative	Affected	Affected	Affected	Affected
Tacoma Close to Sounder Alternative	Affected	Affected	Affected	Affected
Tacoma 26th Street Alternative	Affected	Affected	Not Affected	Not Affected

Freighthouse Square Amtrak Relocation: The Preferred Tacoma 25th Street-West Alternative, Tacoma 25th Street-East Alternative, and Close to Sounder Alternative would affect three parcels associated with the site, and the Tacoma 26th Street Alternative would potentially affect two. Potential impacts include encountering soil contaminated with petroleum products and PAHs and groundwater contaminated with metals.

Freighthouse Square: The Tacoma 25th Street-West Alternative, the Tacoma 25th Street-East Alternative, and the Tacoma Close to Sounder Alternative would potentially affect three parcels associated with the site, and the Tacoma 26th Street Alternative would potentially affect two parcels. Potential impacts include encountering soil contaminated with petroleum products and PAHs and groundwater contaminated with arsenic and metals. Additionally, the restrictive covenant conditions and requirements must be met.

Spring Air Northwest: Potential impacts include encountering soil and groundwater contaminated with petroleum products and metals.

Former Texaco Service Station: Potential impacts include encountering soil and groundwater contaminated with petroleum products and metals.

The Tacoma 26th Street Alternative has the least number of high-risk sites, compared to the other alternatives in the Tacoma Segment.

4.12.3.3 Construction Impacts for the Build Alternatives

Impacts Common to All Alternatives

Although the acquisition (and associated cleanup) of high-priority hazardous materials sites would typically occur during construction, it is discussed above in Section 4.12.2.2 because it is related to the liability of right-of-way acquisition in the long term. The encountering of contaminated soil or groundwater during project construction and dewatering could result in project delays and mitigation costs.

Short-term adverse impacts from construction activities could occur from accidental spills and leaks that could affect soils and infiltrate to groundwater, run off with stormwater, or enter directly into surface waters. Construction activities, such as demolition, could expose workers, the public, and the environment to hazardous materials, including lead or asbestos. Sound Transit requires that the handling of such materials during construction or demolition be done according to regulatory protocols, which would minimize these risks. During construction, and particularly during excavation, contamination associated with hazardous materials or petroleum hydrocarbons could be exposed, particularly if dewatering is required in proximity to a location with contaminated groundwater.

Potential Benefits

Construction of the project could have beneficial impacts on the area. Contamination that would have otherwise been left in place could be discovered and addressed by the project, and cleanup of known sites may occur earlier than anticipated due to construction timelines. Contamination may also be prevented by identifying and removing existing sources, such as underground storage tanks and aboveground storage tanks, before they cause releases.

Avoidance and Minimization of Impacts

The potential impacts identified above could be avoided or minimized through the performance of environmental due diligence appropriate to the size and presumed past use at any properties

in the study area before they are acquired or before construction occurs (WSDOT 2019). As part of this Draft EIS, Phase I Environmental Site Assessments have been conducted for all high-risk properties that may be acquired. It is expected that Phase I Environmental Site Assessments would be completed for all acquisitions for the preferred alternative prior to the Final EIS. A subsequent Phase II Environmental Site Assessment may be necessary for sites where contamination has been identified or is suspected.

Sound Transit would be responsible for the remediation of contaminated soil and groundwater encountered during construction, including that which would be previously unknown. To the extent practicable, Sound Transit would also limit construction activities that might encounter contaminated groundwater or contaminated soil. Based on the due diligence process, mitigation, handling, and disposal plans for contaminated media and hazardous construction debris would be developed on a site-by-site basis in conjunction with the appropriate regulatory agencies.

Additionally, hazardous substances and petroleum products – such as fuels, paints, solvents, and other chemicals – used during construction would be managed and stored per the contractor's pollution control plan. BMPs would be followed in order to reduce the risk of spills, leaks, or other releases during construction activities. These BMPs would be incorporated into construction plans and specifications as applicable and may include:

- Fueling, maintenance, and cleaning in contained areas (berms, etc.).
- Minimization of the production or generation of hazardous materials.
- Appropriate labeling and storage of hazardous waste per federal regulations.
- Designated hazardous waste storage away from storm drains or surface water.
- Recycling of materials (used oil- and water-based paint) as appropriate.
- Handling any potential spills of hazardous materials in conformance with applicable Safety Data Sheets.

4.12.3.4 Indirect Impacts

Construction of TDLE has the potential to encourage redevelopment of the urban areas in which the project is planned. This redevelopment could result in the demolition of structures that may contain hazardous building materials and could also result in encountering existing subsurface contaminants in the soil and groundwater during excavation that may require special handling and remediation. Redevelopment of properties in the study area might result in cleanup of contamination earlier than might otherwise occur, which would be an indirect benefit of the project.

4.12.4 Potential Mitigation Measures

No mitigation beyond the avoidance and minimization measures described above would be anticipated.

4.13 Electromagnetic Fields

4.13.1 Introduction and Regulatory Requirements

This section evaluates the potential impacts TDLE may have on electric and magnetic fields, commonly referred to as electromagnetic fields (EMFs). Electric fields are created by electric charges, while magnetic fields are generated by the flow of electric current. Magnetic fields can also be generated by the movement of vehicles, such as cars, trucks, buses, and trains. EMFs are present around all electrical equipment and facilities, and higher electric charges and currents generate stronger EMFs. Additionally, EMFs can interfere with the operations of sensitive medical, high-technology manufacturing, and research equipment. However, EMFs and effects from associated interference decrease rapidly with increasing distance from the source (NIEHS and NIH 2002).

There are no federal, state, or local regulations or policies governing EMF exposure. However, the International Commission on Non-Ionizing Radiation Protection, the American Conference of Governmental Industrial Hygienists, and the Institute of Electrical and Electronics Engineers (IEEE) have developed exposure guidelines for workers and the public (ICNIRP 2009, 2010; ACGIH 2020; IEEE 2019). Using the minimum of these exposure levels for magnetic fields generated by direct current, which is used to power light rail, people should not be exposed to levels above 1,180 gauss (IEEE 2019).

Key Terms

A **volt** is the base unit of electrical force (or potential) that drives an electric current between two points. An **amp** is the base unit of electric current that flows between two points in an electric circuit.

Electric fields are measured in units of volts per meter and magnetic fields are measured in units of **gauss**. Electromagnetic wave frequency is measured in units of **hertz**, or cycles per second.

Direct-current power refers to current that flows in one direction (from higher to lower potential), so its wave frequency is 0 hertz.

Electric power is measured in units of **watts**. Electric work or energy is measured in units of **kilowatt-hours** (1 kilowatt of power expended for 1 hour).

4.13.2 Affected Environment

The widespread use of electricity in homes and businesses means that EMFs are present almost everywhere. Most people in the United States are exposed to low-level magnetic fields, although individual exposures vary (such as in the immediate area of appliances). Most people's EMF exposure at work comes from electrical appliances and tools and from the building's power supply. The surrounding communities throughout all alternatives are served by a combination of overhead and buried electric distribution lines providing power to the existing commercial, industrial, and residential uses in the areas. There are also two BPA high-voltage transmission lines (500 kV and 230 kV) located just south of The Commons in the northern portion of the Federal Way Segment.

Sound Transit reviewed existing and planned property uses where potential EMFs from light rail vehicles might interfere with normal operation and function of sensitive research or medical equipment. The study area for TDLE encompasses the area within 300 feet of the build alternatives, including station locations. This area captures locations that may be affected by EMFs generated by construction and operation of the project. Sound Transit did not identify any EMF-sensitive facilities, buildings, or land uses within the study area.

Four existing medical facilities were identified within 300 feet of the build alternatives: UW Medicine Neighborhood Clinic Federal Way, Seattle Children's South Clinic, Puyallup Tribal Integrative Medicine, and Occupational Medical Clinic of Tacoma. Sound Transit confirmed that

none of these facilities has EMF-sensitive equipment. The Portland Area Indian Health Services is planning to construct a new building adjacent to Puyallup Tribal Integrative Medicine that will house specialty care services. As of mid-2024, it is not currently known whether any EMF-sensitive equipment will be included in that expansion.

4.13.3 Environmental Impacts

4.13.3.1 No-Build Alternative

If TDLE is not built, the existing EMF environment along the TDLE corridor would not change. The No-Build Alternative also includes projects, funding packages, and proposals in the central Puget Sound region that are planned to occur with or without TDLE, as described in Chapter 2 (Section 2.2).

4.13.3.2 Long-Term Impacts for the Build Alternatives

Because the TDLE study area contains no sensitive facilities with equipment susceptible to EMF, environmental impacts are discussed together qualitatively for all the build alternatives.

If TDLE is constructed in phases, the M.O.S. to the station in South Federal Way and the M.O.S. to the station in Fife would have the same type of impacts, but in a smaller geographic area.

Impacts Common to All Alternatives

The build alternatives would not interfere with sensitive medical or electronic equipment because no sensitive equipment are present in the study area has been identified. Sound Transit would coordinate with the Portland Area Indian Health Services during development of their planned specialty care services facility adjacent to the Puyallup Tribal Integrative Medicine Building.

EMFs from project operation would include static magnetic fields generated by direct-current (0 hertz) electricity flowing from the traction power substations to the light rail vehicles; static magnetic field variations in the Earth's magnetic field generated by movement of the large metal trains; and radio frequency fields from wireless systems, such as communications, data transmission, and monitoring systems, on the light rail vehicles and along the corridor. Because the wireless systems would meet Federal Communications Commission requirements for intentional emitters (CFR Title 47 Part 15 and Office of Engineering and Technology Bulletin 65), EMFs generated by these systems would be considered part of the normal EMF environment and would not affect potentially sensitive equipment during normal operation.

Of these effects, the main source of EMFs from the light rail system would be the static magnetic fields generated by the traction power system, with direct-current electricity provided from the traction power substations to the light rail vehicles via overhead catenary wires and returning to the traction power substations via running rails. While it is possible for static EMFs to interfere with the normal operation of sensitive equipment, this would be unlikely beyond about 100 feet from the light rail line because EMFs rapidly decrease in strength with distance from their source (NIEHS and NIH 2002).

The electric current from the traction power substations carried by the catenary wires is a pulsating form of direct current, which can interfere with the radio waves of AM radio broadcasts. Other sources of electric charges, including high-voltage power lines, trolley wires

for electric buses, and hybrid cars, can also interfere with low-frequency radio waves. Such interference may annoy the listener but does not damage radio equipment.

In certain situations, with sufficiently high exposure, EMFs can also result in adverse effects on human health. The static magnetic field from light rail operation would not exceed 10 gauss, which is less than 1/100th of the exposure considered safe for human health by IEEE (2019). The light rail system would not be a notable source of static magnetic fields for human exposure.

All TDLE build alternatives would cross under BPA's 500 kV and 230kV high-voltage transmission lines that are just south of The Commons in the Federal Way Segment. These lines would be raised as part of the OMF South project if that site is located in Federal Way and constructed before TDLE. If OMF South is not built in Federal Way, these lines would need to be modified as part of TDLE to avoid interference with light rail operations. The lines would be raised to avoid potential EMF interference that could impact the light rail system. These modifications would include installation of new towers to shift the location of each line and raise the lines within BPA's existing right-of-way. Both electric and magnetic field levels are expected to be well below exposure guidelines at the approximate edge of the right-of-way for the modified segments of the lines.

Direct-current electricity flowing through the traction power system may produce stray currents that flow along conducting paths other than the running rails. These alternative paths may include water, the Earth, or metal structures, such as those providing utilities in the study area, which are discussed in more detail in Section 4.15, Utilities. If not sufficiently controlled, stray currents could cause corrosion over time to adjacent metal structures that are not sufficiently grounded and protected.

Avoidance and Minimization of Impacts

Sound Transit currently uses effective grounding and stray current protection practices on existing light rail lines and would coordinate with utility providers to identify appropriate practices to avoid or minimize corrosion. Best management practices appropriate for the circumstances would be selected to minimize or avoid the potential for stray current impacts. Typical design measures include:

- Installing cathodic protection systems in nearby utility lines to protect them from corrosion.
- Installing insulating unions to break the electrical conductivity of the utility line and force the stray current to take another path.
- Isolating the electrical rails from the ground.
- Installing stray-current-control track-fastening systems, where appropriate.

4.13.3.3 Construction Impacts for the Build Alternatives

Impacts Common to All Alternatives

EMFs would be generated by construction equipment and during construction and testing of the electrical systems for TDLE. However, construction equipment generates negligible amounts of EMFs. Because there are no existing facilities with EMF-sensitive equipment in the study area, no impacts from EMF are anticipated to these facilities during construction under any of the build alternatives. Sound Transit would coordinate with the Portland Area Indian Health Services during development of their planned specialty care services facility adjacent to the Puyallup Tribal Integrative Medicine Building.

4.13.3.4 Indirect Impacts

There is no potential for indirect impacts because there are no EMF-sensitive facilities or equipment in the study area.

4.13.4 Potential Mitigation Measures

No mitigation beyond the avoidance and minimization measures described above would be anticipated.

4.14 Public Services, Safety, and Security

4.14.1 Introduction to Resource and Regulatory Requirements

This section discusses the existing conditions and potential impacts on public services, safety, and security in the study area. Public services considered in this analysis are fire and emergency medical services, police services, schools (public and private), solid waste and recycling collections, and other public services (e.g., United States Postal Service). There are no relevant regulatory requirements related to public services.

4.14.2 Affected Environment

This section discusses the existing public services in the TDLE corridor. The study area is defined as the area within 0.5 mile of the project footprint and each of the potential TDLE stations. Figures 4.14-1 through 4.14-4 show the locations of those facilities in the study area.

4.14.2.1 Fire and Emergency Medical Services

Federal Way Segment
South King Fire & Rescue (South King Fire) provides emergency response services covering approximately 41 square miles, including the cities of Des Moines and Federal Way and a portion of unincorporated King County. Facilities include seven fire stations and one training and maintenance station. The department employs 180 personnel, of whom 157 are uniformed personnel, with a minimum of 27 firefighters and emergency medical technicians on duty 24 hours a day, 7 days a week (South King Fire 2022).

South King Fire is teamed with King County's Medic One program and Valley Communications Center, which provides 911 dispatch services. South King Fire is also partnered with the City of Federal Way Emergency Management for emergency response to larger-scale emergency alerts, such as earthquakes or floods.

No fire stations are within the study area in the Federal Way Segment. South King Fire stations 62 and 64 are the closest stations to project alternatives, Station 64 is less than a mile east of I-5, and Station 62 is over a mile northeast of the study area.

South Federal Way Segment

The majority of the South Federal Way Segment is served by South King Fire, as described above. It is also served by East Pierce Fire and Rescue in the southeast portion of the segment in the vicinity of Milton.

East Pierce Fire and Rescue provides emergency management services covering approximately 153 square miles, including the cities of Bonney Lake, Sumner, Lake Tapps, the Ridge Communities, South Prairie, Tehaleh, Edgewood, and Milton, as well as a portion of unincorporated Pierce County. East Pierce Fire and Rescue facilities include a total of nine stations: six staffed and two volunteer, with a facility on Lake Tapps for marine rescue. The department employs approximately 146 personnel, of which 141 are uniformed personnel and 5 are volunteers. East Pierce Fire and Rescue has an Emergency Management Division that works closely with other agencies (e.g., local law enforcement, schools) on emergency response to larger-scale emergency alerts, such as earthquakes or floods. South Sound 911 provides dispatch services.

Located in the City of Milton, East Pierce Fire and Rescue volunteer-staffed Station 124 is within the study area of the SF Enchanted Parkway, SF I-5, and Porter Way Design Option alternatives (City of Milton 2019). South King Fire Station 61, although outside the study area, is less than a mile east of I-5, making it less than 1 mile from the SF Enchanted Way Parkway and SF I-5 alternatives, and about 1.5 miles to the SF 99-East and SF 99-West alternatives.

South King Fire owns and operates a station fleet and facilities maintenance facility at 1351 S 351st Street and a logistics building at 35100 Pacific Highway S. Both facilities are within the study area for all South Federal Way Segment alternatives. Future facilities expansion includes the construction of a response station at the same location of the logistics building (South King Fire 2022).

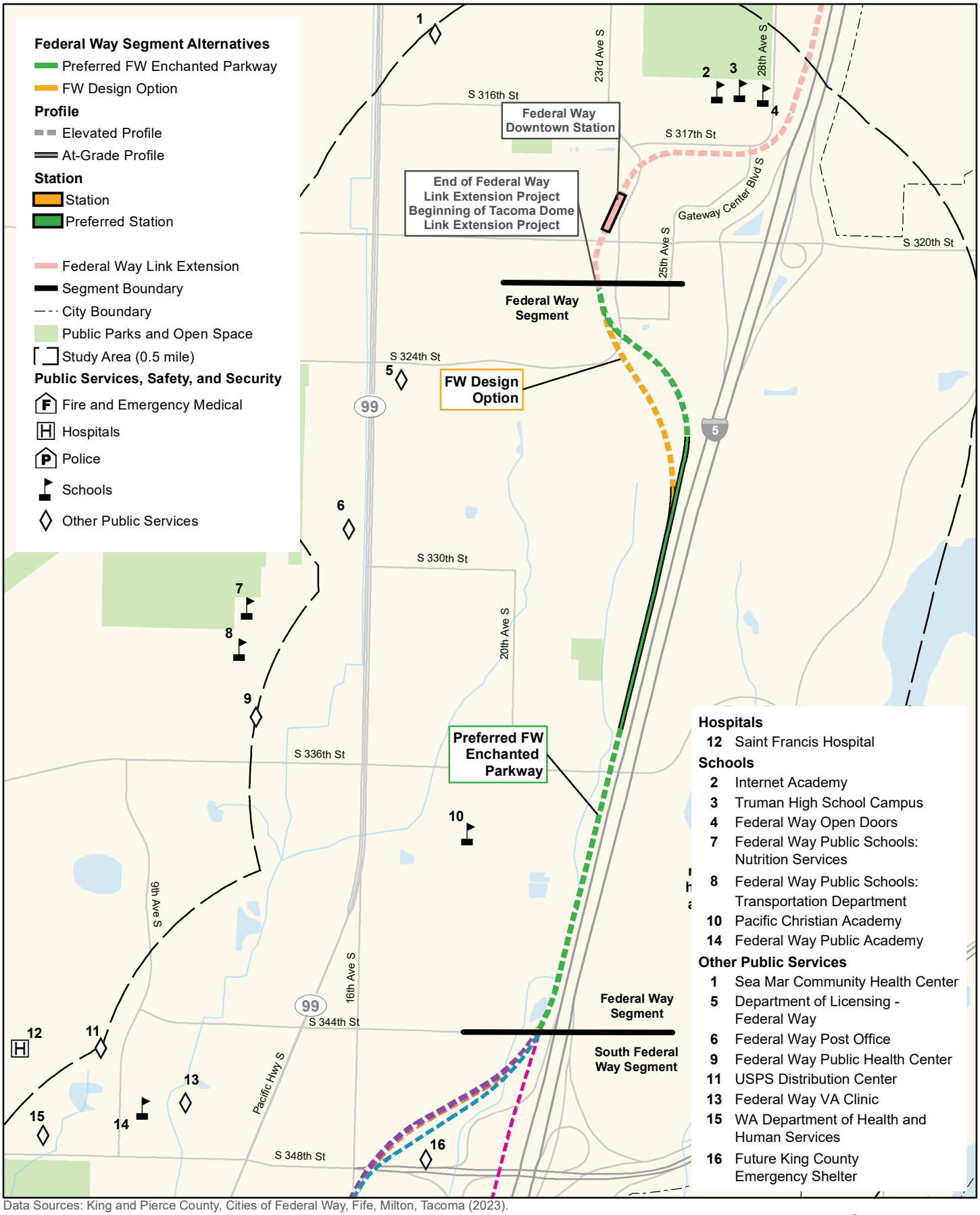
Fife and Tacoma Segments

The Fife and Tacoma segments are both served by East Pierce Fire and Rescue, which is described above. There are no East Pierce Fire and Rescue stations within the study area, but volunteer-staffed Station 124 is just outside the study area in the City of Milton (City of Milton 2019). South Sound 911 provides dispatch services. East Pierce Fire and Rescue has an Emergency Management Division that works closely with other agencies (e.g., local law enforcement, schools) on emergency response to larger-scale emergency alerts, such as earthquakes or floods.

The Tacoma Fire Department provides emergency response services within the City of Tacoma and contracts with the cities of Fife and Fircrest, as well as Pierce County Fire District No. 10, covering approximately 72.1 square miles and including 17 stations. The department employs 489 personnel, of which 392 are uniformed personnel. A minimum of 83 firefighters and EMTs are on duty daily, 24 hours a day, 7 days a week.

Tacoma Fire Department Station 12 is in the study area of the Fife Segment, approximately 0.4 mile south of the project footprint. The Tacoma Fire Department's Hazardous Materials Team, a special operations unit, reports from this station. No fire stations are within the study area of the Tacoma Segment. Tacoma Fire Communications Center provides dispatch services.

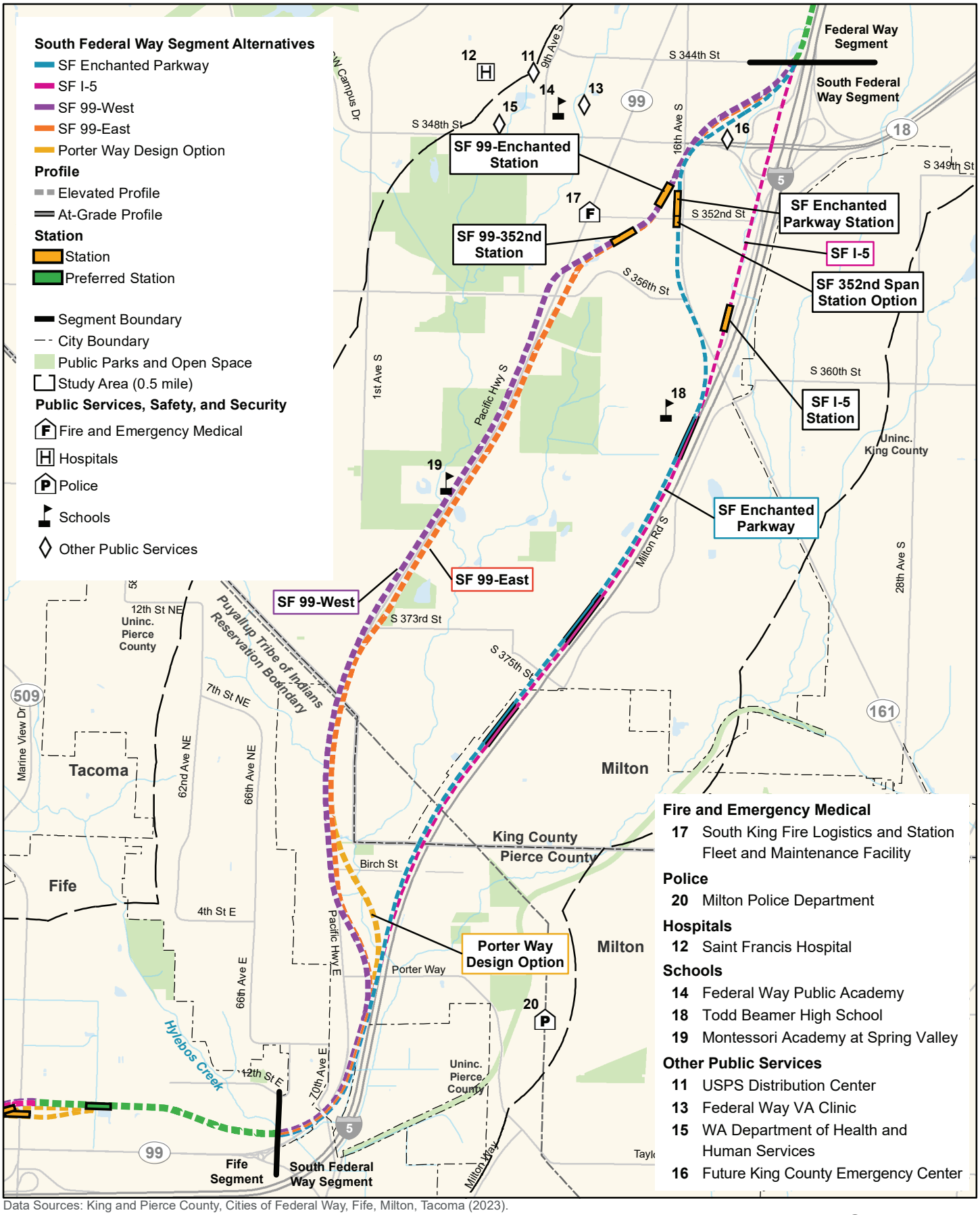
The Tacoma Fire Department also operates an Emergency Management Division that works closely with other agencies (e.g., local law enforcement, schools) for emergency response to larger-scale emergency alerts, such as earthquakes or floods. Emergency management for the City of Fife and unincorporated areas is contracted with Pierce County Department of Emergency Management.



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

FIGURE 4.14-1
Public Services, Safety, and Security within ½ Mile of Project Alternatives
Federal Way Segment

Tacoma Dome Link Extension



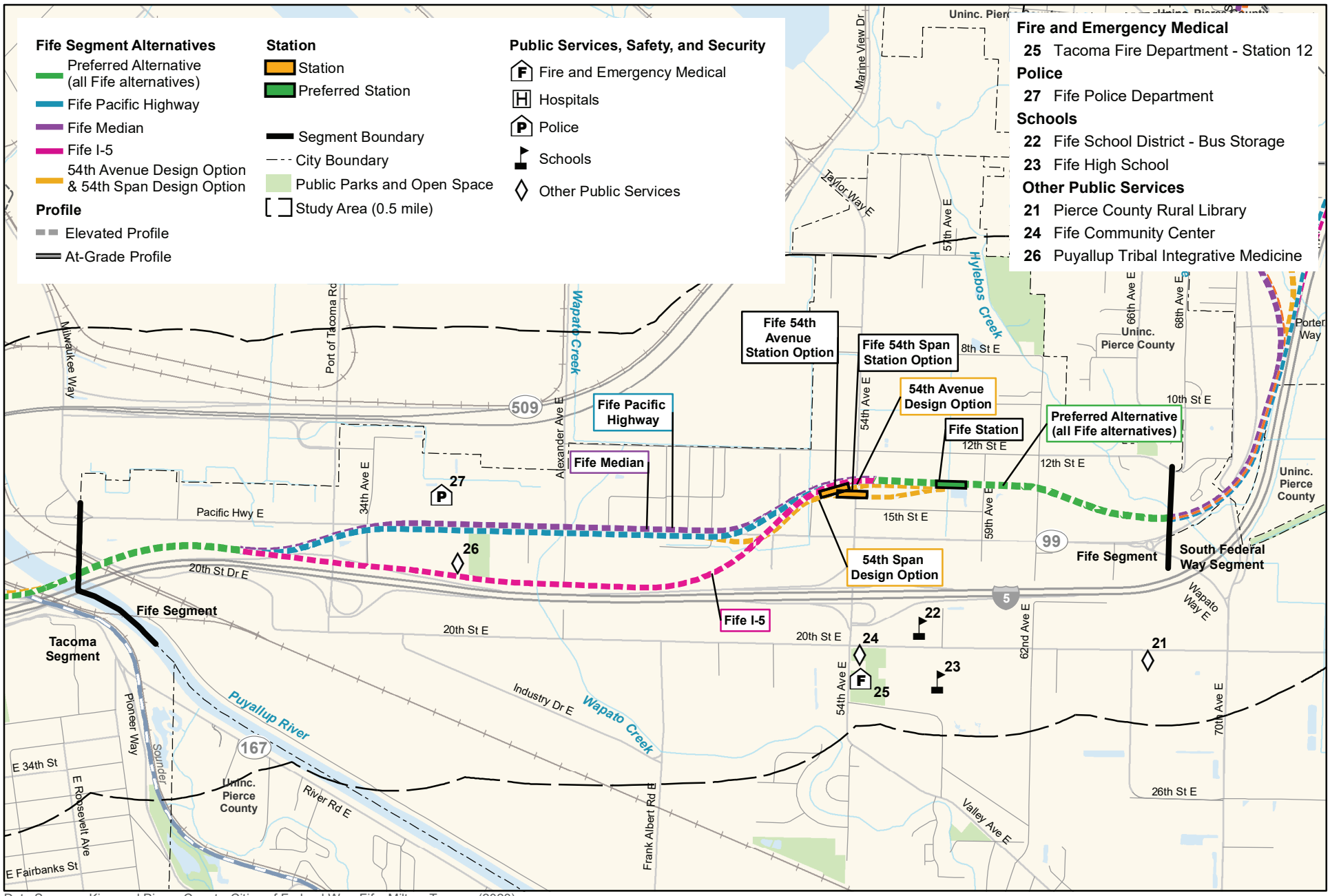
Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

0 0.5 1 Mile

FIGURE 4.14-2
Public Services, Safety, and Security within ½ Mile of Project Alternatives
South Federal Way Segment

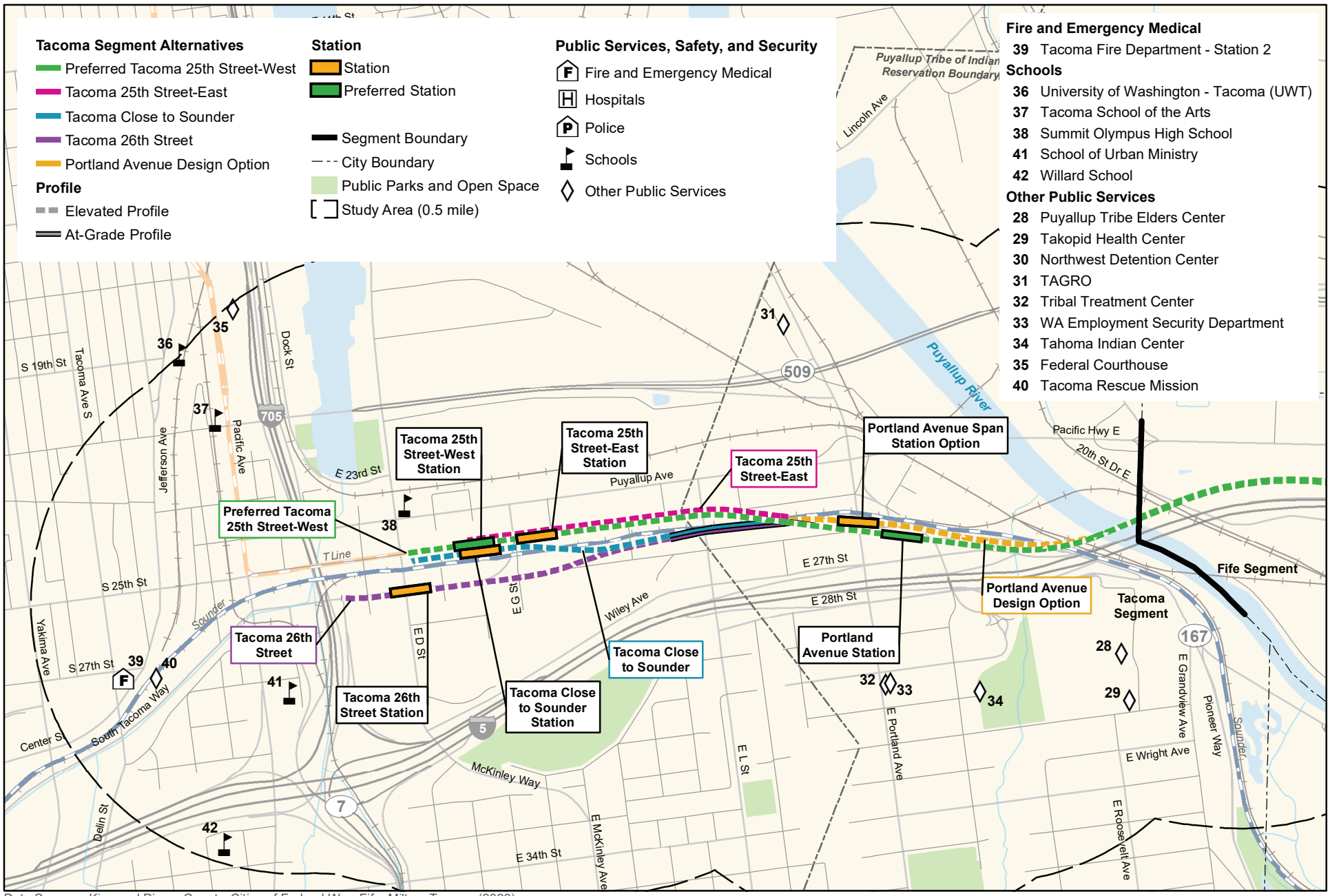
Tacoma Dome Link Extension



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

FIGURE 4.14-3
Public Services, Safety, and Security within ½ Mile of Project Alternatives
Fife Segment

Tacoma Dome Link Extension



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

0 0.5 1 Mile

FIGURE 4.14-4
Public Services, Safety, and Security within ½ Mile of Project Alternatives
Tacoma Segment

Tacoma Dome Link Extension

4.14.2.2 Hospitals

Federal Way Segment

Saint Francis Hospital is west of SR 99 (Pacific Highway) with access via S 348th Street or 9th Avenue S, just outside the study area. Saint Francis Hospital is a full-service hospital that provides diagnostic imaging and radiology; emergency services; a full range of women's health services, including a birth center; and radiation oncology. Although it is outside the study area, it is included in this assessment because emergency vehicles regularly travel to and from the facility.

South Federal Way Segment

See discussion for Federal Way Segment.

Fife Segment

No hospitals are within the study area in the Fife Segment.

Tacoma Segment

No hospitals are within the study area in the Tacoma Segment.

4.14.2.3 Police

Sound Transit compared crime data for the cities of Federal Way, Milton, Fife, and Tacoma with crime data for all of Washington state to show the relative crime rates at local and statewide levels. The crime reporting program provides statistics for violent crimes (e.g., murder, sexual assault, robbery, and aggravated assaults) and property crimes (e.g., burglary, theft, and arson). Table 4.14-1 lists the numbers of offenses and crime rates by jurisdiction in 2020, based on available data obtained from the United States Federal Bureau of Investigation (FBI 2020). Compared to data generated for all of Washington State, which includes rural areas, the local jurisdictions that would be served by TDLE have higher crime rates.

Table 4.14-1 Violent and Property Crime Rates by Jurisdiction in 2020

Jurisdiction	Violent and Property Crimes[1]	Violent Crime Rate (per 1,000 population)[1,2]	Property Crime Rate (per 1,000 population)[1,2]
City of Federal Way	2,921	3.4	25.5
City of Milton	276	2.6	29.1
City of Fife	1,067	13.2	83.8
City of Tacoma	14,522	8.7	57.5
Washington State	239,394	2.9	28.1

Sources:
(1) Federal Bureau of Investigation (FBI) 2020.
(2) United States Census Bureau 2020.

Several King County Metro, Pierce Transit, and Sound Transit facilities were assessed for criminal activity near the proposed TDLE stations. Table 4.14-2 shows the number of violent and property crimes reported within 0.5 mile of these facilities between June 1 and December 31, 2022; most criminal activity is related to property crime.

The City of Federal Way is served by the Washington State Patrol Field Operations Bureau District 2, which comprises all of King County. The cities of Milton, Fife, and Tacoma are served by Washington State Patrol Field Operations Bureau District 1, which comprises all of Pierce County. Both districts patrol interstate and state highways within the county, including I-5 and SR 99. The Field Operations Bureau is responsible for traffic law enforcement, collision investigation, criminal interdiction, terrorism prevention, and motorist assistance (Washington State Patrol 2022).

Table 4.14-2 Crime near Transit Facilities between June and December 2022

Segment/Transit Agency	Transit Facility Locations	Number of Violent Crimes[3]	Number of Property Crimes[4]
Federal Way/Sound Transit[1]	Federal Way Transit Center with park-and-ride – 23rd Avenue S	29	342
South Federal Way/Sound Transit[1]	Federal Way park-and-ride – 320th Street	19	238
Fife/Pierce Transit[1]	Bus stop at 6006 Pacific Highway E within walkshed of proposed transit station	23	155
Tacoma/Sound Transit[2]	Tacoma Dome Station – E 25th Street	21	125

Sources and Notes:

(1) LexisNexis Risk Solutions Inc. 2023.

(2) City of Tacoma 2023.

(3) Violent crime includes homicide, sexual assault, robbery, aggravated assault. Data for City of Tacoma do not contain sexual-related offenses.

(4) Property crime includes burglary (residential, commercial), theft (does not include shoplifting, includes motor vehicle theft), and arson.

The following sections describe the local jurisdictions' law enforcement by TDLE project segment. The cities of Milton and Fife and the Puyallup Tribe of Indians are the only jurisdictions with police stations in the study area.

Federal Way Segment

The Federal Way Police Department provides law enforcement within the city limits of Federal Way. The department has 136 uniformed officers and 32 civilian staff (Washington Association of Sheriffs & Police Chiefs 2022). In Federal Way, the closest police station to the proposed alternatives is at 33325 8th Avenue S, about a mile west of the study area.

South Federal Way Segment

Federal Way

The Federal Way Police Department provides law enforcement within the city limits of Federal Way as described for the Federal Way Segment.

Milton

The Milton Police Department provides law enforcement within the city limits of Milton. The department has 13 uniformed officers and one civilian employee (Washington Association of Sheriffs & Police Chiefs 2022). The City of Milton police station located at 1000 Laurel Street is within the study area of the Enchanted Parkway, I-5, and Porter Way Design Option alternatives (City of Milton 2019).

Fife Segment

The Fife Police Department provides law enforcement within the city limits of Fife. The department has 29 uniformed officers and 8 civilian staff (Washington Association of Sheriffs & Police Chiefs 2022). The Fife Police Station is within the study area at 3737 Pacific Highway E, just north of the highway. A Local Law Enforcement Mutual Aid Agreement is established between the Puyallup Tribal Police Department and the City of Fife to have the authority to maintain law and order within the Puyallup Tribal Police Department's jurisdiction (Sound Transit 2019).

The Fife Municipal Court is also in the same building as the Fife Police Station and hears criminal and gross misdemeanors, infractions, and parking and photo infraction violations that occur within the jurisdictional boundaries of Fife.

Tacoma Segment

The Tacoma Police Department and the Puyallup Tribal Police both provide law enforcement within the Tacoma Segment of the study area.

Tacoma

The Tacoma Police Department provides law enforcement within the city limits of Tacoma. The department has 324 uniformed officers and 39 civilian staff (Washington Association of Sheriffs & Police Chiefs 2022). There are no Tacoma Police Department stations within the study area of any of the alternatives in the Tacoma Segment.

Puyallup Tribe of Indians

In partnership with the cities of Tacoma, Fife, and Milton and Pierce County, the Puyallup Tribal Police Department provides law enforcement within the jurisdictional boundaries of the Puyallup Tribe of Indians, which encompasses both the Fife and Tacoma segments of TDLE. If a police incident occurs on Tribal trust property, the Puyallup Tribal Police would be the primary responding agency, followed by the Federal Bureau of Investigation. If the incident on Tribal trust property is a life safety issue, other agencies may respond to assist and contain the incident, with Puyallup Tribal Police acting as lead. The department has 18 uniformed officers and 20 civilian staff (Washington Association of Sheriffs & Police Chiefs 2022). The Puyallup Tribal Police Department is at 1640 E 30th Street, approximately 0.25 mile south of I-5 and the alternatives in the Tacoma Segment.

4.14.2.4 Solid Waste and Recycling

Federal Way Segment

Garbage collection within the Federal Way Segment study area is largely provided by a city-contracted hauler, Waste Management. All nonhazardous solid waste collected in the Federal Way Segment study area is taken directly to King County's Cedar Hills Landfill in Maple Valley or a nearby solid waste transfer station (the nearest transfer station is the Algona Transfer Station in Algona, Washington). No solid waste management facilities are in the Federal Way Segment study area.

South Federal Way Segment

Garbage collection within the City of Federal Way is the same as described for the Federal Way Segment.

Garbage collection for the southern portion of the study area in Pierce County is provided by Murrey's Disposal Company. All nonhazardous solid waste collected in the study area by Murrey's Disposal Company is taken directly to Pierce County's Landfill in Graham, Washington, or a nearby solid waste transfer station, Prairie Ridge Transfer Station, in unincorporated Prairie Ridge, Washington (both operated by Land Recovery, Inc.). No solid waste management facilities are within the South Federal Way Segment study area.

Fife Segment

Garbage collection within the Fife Segment study area is largely collected by a city contracted hauler, Murrey's Disposal Company. All nonhazardous solid waste collected in the Fife Segment study area is taken directly to Pierce County's Landfill in Graham, Washington, or a nearby solid waste transfer station, Prairie Ridge Transfer Station, in unincorporated Prairie Ridge, Washington (both operated by Land Recovery, Inc.). No solid waste management facilities are within the Fife Segment study area.

Tacoma Segment

Garbage collection within the Tacoma Segment study area is largely collected by the City of Tacoma for occupied commercial and residential properties. All nonhazardous solid waste collected in the Tacoma Segment study area is taken directly to Pierce County's LRI Landfill in Graham, Washington, or to the nearby Tacoma Recovery and Transfer Center.

TAGRO, short for "Tacoma Grow," is north of the project alternatives at 2101 Cleveland Way. This facility processes and distributes biosolids to both residential and commercial customers.

4.14.2.5 Schools and School Districts

Table 4.14-3 lists the schools and school administrative buildings in the study area.

Table 4.14-3 Schools and Administrative Buildings in the TDLE Study Area

Facility Name (Address)	Enrollment[1]
Federal Way Segment	
Federal Way Open Doors (31455 28th Avenue S, Federal Way)	171 students in 2023-2024
Internet Academy (31455 28th Avenue S, Federal Way)	393 students in 2023-2024
Career Academy at Truman High School (31455 28th Avenue S, Federal Way)	72 students in 2023-2024
Federal Way Public Schools: Nutrition Services (1214 S 332nd Street, Federal Way)	Not applicable
Federal Way Public Schools: Transportation Department (1211 S 332nd Street, Federal Way)	Not applicable
Pacific Christian Academy[2] (33645 20th Avenue S, Federal Way)	279 students in 2023-2024
South Federal Way Segment	
Federal Way Public Academy (34620 9th Avenue S, Federal Way)	303 students in 2023-2024
Montessori Academy at Spring Valley[2] (36605 Pacific Highway S, Federal Way)	63 students in 2023-2024
Todd Beamer High School (Federal Way School District) (35999 16th Avenue S, Federal Way)	1,421 students in 2023-2024
Illahee Middle School (Federal Way School District) (36001 1st Avenue S, Federal Way)	622 students in 2023-2024
Fife Segment	
Fife High School (5616 20th Street E, Fife)	874 students in 2023-2024
School facility for bus storage (5601 20th Street E, Fife)	Not applicable
Tacoma Segment	
School of Urban Ministry (college) (106 S 28th Street, Tacoma)	No enrollment data
Willard Learning Center (Tacoma School District No. 10) (328 S Wright Street, Tacoma)	30 students in 2023-2024
Tacoma School of the Arts office space (School District No. 10) (1950 Pacific Avenue, Tacoma)	Not applicable
Summit Olympus High School (Summit Public Schools) (409 Puyallup Avenue, Tacoma)	149 students in 2023-2024
University of Washington, Tacoma[3] (1900 Commerce Street, Tacoma)	4,790 students in fall quarter 2023

Sources:
(1) Available public school enrollment provided by Washington Office of Superintendent of Public Instruction (OSPI 2023).
(2) Public School Review 2023.
(3) University of Washington Tacoma 2023.

4.14.2.6 Other Public Services

Other public service providers within the study area are included in Table 4.14-4.

Table 4.14-4 Other Public Service Providers in the TDLE Study Area

Provider or Service Name (Address)	Type
Federal Way Segment	
Federal Way Department of Licensing (1617 S 324th Street, Federal Way)	State vehicle and vessel licensing office
Federal Way Public Health Center (33431 13th Place S, Federal Way)	Health Care Services: Provides care for children with special needs, family planning, health insurance enrollment, HIV screening, pregnancy testing, teen services, and Women, Infants, and Children services
Sea Mar Community Health Center (31405 18th Avenue S, Federal Way)	Health Care Services: Provides family medicine and dentistry, behavioral health, maternity support, and a pharmacy. It is a community-based organization focused on health and social services to underserved communities
United States Postal Service (32829 Pacific Highway S, Federal Way)	Government Facility
South Federal Way Segment	
Federal Way Veterans Affairs Clinic (Valor Healthcare) (4617 11th Avenue S, Federal Way)	Health Care Services: Provides primary care, mental health services, nursing, and social work to veterans of the armed services
Washington Department of Health and Human Services (616 S 348th Street, Federal Way)	Health Care Services: Provides public social and health services to those in need, including but not limited to the provision of food, financial assistance, medical, housing, and child-care assistance
United States Postal Service distribution center (34301 9th Avenue S, Federal Way)	Government Facility
Future King County Emergency Shelter (1688 S 348th Street, Federal Way)	King County Housing Authority
Fife Segment	
Fife Community Center/Fife Senior Citizen Activity Center (2111 54th Avenue E, Fife)	Community Center: A public event space that provides senior programming, including swimming, tai chi, lunches several days a week, painting, and bridge/pinochle
Fife Library (6622 20th Street E, Fife)	Pierce County Library System
Puyallup Tribal Integrative Medicine (3700 Pacific Highway E, Fife)	Health Care Services: Includes the Salish Cancer Center, which provides treatment to both Tribal and non-Tribal patients
United States Post Office Warehouse – Fife Carrier Annex (1421 52nd Avenue E, Fife)	Government Facility
Fife Department of Licensing (4905 Pacific Highway E Suite 2A, Fife)	State vehicle and vessel licensing office

Table 4.14-4 Other Public Service Providers in the TDLE Study Area (continued)

Provider or Service Name (Address)	Type
Tacoma Segment	
Takopid Health Center (2209 E 32nd Street, Tacoma)	Health Care Services: Puyallup Tribal Health Authority-operated health center provides primary care, lab work, dental care, health services, physical therapy, podiatry, and radiology to eligible American Indians and Alaska Native individuals
Puyallup Tribe Elders Center (3010 Duct Cho Road, Tacoma)	Tribal Services: Provides support services to Puyallup Tribe Elders, including assisted living, caregiver programs, home-delivered meals, transportation, and other services
Tribal Treatment Center (3009 E Portland Avenue, Tacoma)	Tribal Services: The center provides drug and adult treatment services for drug, alcohol, mental health, and problem gambling for eligible American Indians/Alaska Native individuals
Tahoma Indian Center (1809 E 31st Street, Tacoma)	Tribal Services: This organization provides basic needs of low-income and homeless urban native individuals, including meals, resources such as laundry and computer access, and social and cultural referrals, and serves as a gathering space for native cultural and spiritual ceremonies and activities
Federal Courthouse (1717 Pacific Avenue, Tacoma)	Government Facility
Washington Employment Security Department (3017 E Portland Avenue, Tacoma)	Government Facility: The department provides unemployment services to Washington residents
Northwest Detention Center (1656 East J Street, Tacoma)	Government Facility: It functions as an immigration detention center, with a capacity of 1,575 detainees
Tacoma Rescue Mission (425 S Tacoma Way, Tacoma)	Social Services: Provides emergency services, including shelter and food, and other programs and resources to help those in need

4.14.3 Environmental Impacts

Factors evaluated for public services, safety, and security include the following:

- Medical, police, and fire protection access and emergency response times.
- Solid waste pickup and disposal (e.g., substantially delaying or altering pickup or routes), especially during construction.
- School bus and walk/bike routes.
- Displacement of, or change in access to, other government facilities, such as post offices and detention centers.
- Demand for public services.

This section also provides a qualitative assessment of safety and security trends and other measures that would minimize the impacts on public services, safety, and security.

Other environmental conditions identified through parallel technical analyses and reports for TDLE (e.g., utilities; transportation; energy; and acquisitions, displacements, and relocations) were also used to analyze potential impacts on public services.

4.14.3.1 No-Build Alternative

The No-Build Alternative includes projects, funding packages, and proposals in the central Puget Sound region that are planned to occur with or without TDLE, as described in Chapter 2 (Section 2.2). Under the No-Build Alternative, the proposed project would not be constructed and public services in the study area would presumably continue to operate as they do currently, but with increased traffic congestion that would likely affect emergency service response times. Schools, medical facilities, and other public facilities within the alternative study areas would not benefit from improved transit operations.

It is possible that response time for emergency services in Federal Way may increase under the No-Build Alternative if the 344th Street site for OMF South is selected to be built, which would require the closure of 20th Avenue S starting 300 feet south of S 336th Street. At a maximum, the change in response times is expected to result in a 36 second increase for South King Fire and Rescue Station 61 during peak hour traffic (FTA and Sound Transit 2024).

4.14.3.2 Long-Term Impacts for the Build Alternatives

Impacts Common to All Alternatives

All the build alternatives would have similar impacts on public services, safety, and security. Increased demand for police services is not anticipated because security measures for all the stations would be similar to other Sound Transit stations in the region, which include on-site security personnel that reduce demands on local law enforcement. The Fire/Life Safety Committee and other Sound Transit safety and security specialists would address public service issues throughout design, construction, and operation.

If TDLE is constructed in phases, the M.O.S. to the station in South Federal Way and, to a lesser degree, the M.O.S. to the station in Fife would have the same type of impacts to public services, just in a smaller geographic area until the remaining phases were completed.

Fire and Emergency Medical Services

Sound Transit design criteria seek to avoid conflicts with vehicular, bicycle, and pedestrian traffic for several reasons, including public safety. Sound Transit would prepare a TDLE-specific safety and security management plan. The plan would address integration of safety and security during all stages of the project: design, construction, and operation.

TDLE would operate in its own (exclusive) right-of-way and would not conflict with vehicular traffic, bicycles, and pedestrians. Because light rail train operations would not cross surface streets at grade, light rail operations would not directly affect emergency and incident response routes or times.

The increase in traffic volumes, transit movements, pedestrians, and bicyclists near each of the stations could increase the risk of traffic conflicts and conflicts among travel modes necessitating involvement from emergency and incident response. Chapter 3, Transportation Environment and Consequences, identifies locations where traffic congestion and delays and conflicts among travel modes could occur and identifies potential traffic mitigation measures.

All jurisdictions along the project corridor currently operate emergency vehicle preemption programs that give emergency vehicles priority through signalized intersections. Sound Transit would work with the jurisdictions to identify emergency vehicle preemption needs around stations.

Sound Transit would maintain access to fire hydrants, fire lanes, and fire response access points in or adjacent to the TDLE facilities, where possible. Where it is not possible, Sound Transit would coordinate with the appropriate agencies and jurisdictions to redesign access. Sound Transit would also provide a fire command center and emergency responder equipment room at each station. Fire department regulations and procedures prohibit placing fire hoses over active railroad tracks, so light rail operations could be temporarily shut down during fire emergencies.

Fires associated with the TDLE operation of rail and equipment would be unlikely because the guideway and stations would be made primarily of concrete and steel. The vehicles are electrically powered and do not use combustible fuels. First responders and fire and emergency service vehicles would use different methods, and in some cases equipment, for incidents occurring on different profile types. Emergency service providers and Sound Transit personnel would be trained to respond to emergencies on elevated guideways or in trenches and restricted areas in WSDOT right-of-way.

Design for guideway emergency access and evacuation would conform with state and local codes and with National Fire Protection Association (NFPA) 130: Standard for Fixed Guideway Transit Systems, with emergency vehicle access about every 0.5 mile (2,500 feet). Where necessary, Sound Transit would extend existing cul-de-sacs or dead ends of streets to the guideway for emergency access. However, these streets would not be open to general-purpose traffic. Trains on the adjacent track could provide access to trains on elevated and trenched guideways. When a second train is not practical, Sound Transit would follow state and local fire codes and NFPA 130. Local fire departments in the study area would respond to incidents on elevated structures using ladder trucks. Sound Transit would form a Fire/Life Safety Committee to review safety requirements and develop solutions regarding access to the light rail system, emergency routes, water and fire hydrant needs, training, costs, and other design features. Sound Transit would obtain concurrence from local authorities that have jurisdiction and would continue to consult with local jurisdictions throughout TDLE design to minimize impacts on emergency response times. Implementing the project-specific safety and security management plan would minimize impacts on fire and emergency medical services during TDLE operation. Sound Transit regularly conducts all-hazard emergency drills and exercises in coordination with local emergency response agencies to ensure timely and effective responses to light rail-related incidents.

Police

Increases in traffic volumes, transit movements, pedestrians, and bicyclists near each of the stations could increase the risk of traffic conflicts and conflicts among travel modes that necessitate police involvement. Chapter 3, Transportation Environment and Consequences, identifies locations where traffic congestion and delays and conflicts among travel modes could occur and identifies potential traffic mitigation measures. Like fire and emergency medical response, light rail operations would not directly affect emergency and incident response routes or times because light rail train operations would not cross surface streets at grade. Police emergencies on the trains are handled by the train operator by traveling to the nearest station to meet the police. Emergency access to the elevated guideway would be provided consistent with applicable safety requirements. At-grade guideways are fenced off for safety.

All build alternatives include facilities where police and security staff would be needed to monitor stations, parking facilities, and other areas to protect people and property. Sound Transit operates its own security force at its facilities. This includes Sound Transit-contracted security personnel and/or contracted law enforcement officers who function as transit police and monitor all stations. Security personnel are stationed at some facilities throughout the day, and some roam and patrol transit facilities and respond to incidents in coordination with local law enforcement. Although an

increase in crime at transit facilities is not anticipated, research from other transit systems shows that some petty crimes could occur at transit stations or park-and-ride lots. Studies have consistently found that crime at transit facilities, such as stations, generally reflects crime rates in the surrounding neighborhoods (Billings et al. 2011; City of Seattle 1999; Loukaitou-Sideris et al. 2002). Quality-of-life crimes (for example, vandalism, drunkenness, and panhandling) and property crimes account for more than 90 percent of crimes at transit facilities. Crimes are more likely to occur at a station than on a light rail vehicle, and at stations with park-and-ride lots rather than at stations without parking. Station access (stairs, escalators, or elevators) does not appear to influence criminal activity, but access design and location can be a factor if facilities provide places where criminals can act without being observed by others.

During the preliminary design phase, Sound Transit's Agency Safety and Security Management Plan calls for conducting a Threat and Vulnerability Assessment for all new transit facilities. This work includes reviewing existing crime data in proposed station locations and interviewing local law enforcement to help identify potential security threats and risks. Measures are identified and incorporated to address such risks, using "crime prevention through environmental design" principles. For example, to deter criminal activity and generally make light rail stations and parking facilities more secure, stations would be spacious, well lit, and uncluttered, and would provide open access. The design would consider lines of sight and visibility, and eliminate or minimize corners, dark or hidden areas, and opaque shelter screens. Patrons, police, and Sound Transit security personnel would easily be able to see public waiting areas, including station platforms. Sound Transit would also implement security features, such as video surveillance systems on Sound Transit vehicles and within Sound Transit stations that are connected to the Link Control Center and the 24/7 Sound Transit Security Operations Center, passenger emergency telephones, sealed ticket vending machines, controlled exits, and security personnel.

Sound Transit would work with local law-enforcement agencies and emergency service providers to further develop strategies to prevent and respond to potential threats to public safety throughout design, construction, and operation.

Solid Waste

Operating TDLE would not adversely impact solid waste collection and disposal. It would not acquire any property currently used by recycling, composting, and solid waste facilities or operating bases. The project would not affect collection routes, and minor changes in the existing roadways would not cause delays. TDLE would not cause a noticeable increase in demand for solid waste services.

Schools

The build alternatives do not intersect with any at-grade crossings on roadways that have signed grade-school crossing zones. No adverse impacts related to school transportation are anticipated. Chapter 3 explains that overall transit travel times would improve, which would improve the commute times for students and school staff commuting by transit.

Other Government Facilities

Chapter 3 explains that overall transit travel times would improve, which would improve the commute times for patrons and staff commuting by transit.

Potential Benefits

TDLE would provide benefits to public services by:

- Reducing traffic congestion, which could improve response times for emergency services and provide greater efficiencies for other public services, including postal delivery and solid waste collection.
- Providing an alternative transportation mode for commutes to schools, community centers, and public health centers.

Federal Way Segment

The Preferred FW Enchanted Parkway would require partial acquisition of a soccer field on Christian Faith Center-owned property (Parcel No. 2121049003). Also, the presence of an above-grade rail would be visible from portions of the property where a private school operates. However, it would be about 1,000 feet from the school building and would not affect school uses or school operations.

South Federal Way Segment

The SF Enchanted Parkway Alternative would have the most impacts to public services compared to the other alternatives. The following narrative discusses all long-term effects, including those related to the future King County emergency shelter, Todd Beamer High School, and the Montessori Academy; and improved walkability and commuter opportunities.

The SF Enchanted Parkway alternative would require full acquisition of the 3-acre King County-owned property (former hotel) that is currently being adapted for use as an emergency shelter. Consequently, under this alternative, the site would not be operational as an emergency shelter under future conditions. The SF 99-West and SF 99-East alternatives would impact the west side of the property for the guideway and the east side of the property for a stormwater pond. The future shelter would still be operational under the SF 99-West and SF 99-East alternatives, but project elements would be visible from the facility and future residents. Transit-generated noise impacts are projected in this location and mitigation would occur as shown in Section 4.7, Noise and Vibration, and Appendix J2, Noise and Vibration Technical Report.

Todd Beamer High School is within 500 feet of both the SF Enchanted Parkway Alternative and the SF I-5 Alternative. Although no direct impacts would be experienced, the presence of an at-grade and above-grade rail portions of these alternatives would be visible from portions of the school property, but at about 500 feet from school buildings, this would not affect school uses or school operations. The SF 99-West or the SF 99-East alternatives would not be visible from the high school.

The Montessori Academy at Spring Valley is west of SR 99, with the closest building about 125 feet from the roadway and the schoolyard less than 40 feet from the roadway. The SF 99-West Alternative would partially acquire the eastern portion of the project, which would impact the schoolyard, point of ingress and egress, and vegetation along the western perimeter of the property. For both the SF 99-West and SF 99-East alternatives, the presence of the above-grade rail would be visible from portions of the school property, with the SF 99-East Alternative having less of an impact since it would be to the east of SR 99. The SF Enchanted Parkway or the SF I-5 alternatives would not be visible from the Montessori Academy.

Potential Benefits

Walkability (within 0.5-mile walkshed) to the proposed light rail station for the SF Enchanted Parkway, SF 99-East, and SF 99-West alternatives would improve commuter transit opportunities for patrons and employees of the following:

- Federal Way VA Clinic.
- Federal Way Public Academy.
- Todd Beamer High School.

The 0.5-mile walkshed for public facilities under the SF I-5 Alternative is limited to Todd Beamer High School.

Fife Segment

Of the three alternatives, the Fife Pacific Highway and Fife Pacific Highway Median (Fife Median) alternatives would have slightly more impacts due to the size of the permanent easement on a portion of the Puyallup Tribal Integrative Medicine.

The Fife Pacific Highway and Fife Median alternatives would require approximately 0.2 acres along Pacific Highway E on the Puyallup Tribal Integrative Medicine property, which is owned by the Puyallup Tribe of Indians. It would impact a 20-foot-wide strip of landscaping, parking, and ingress and egress. The Fife I-5 Alternative would require about 0.35 acre directly adjacent to I-5. In addition, the Puyallup Tribal Integrative Medical building is identified as a location where vibration mitigation measures are proposed for all alternatives.

Walkability (within 0.5-mile walkshed) to the proposed light rail station would improve commuter transit opportunities; however, there are no public facilities currently identified within 0.5 mile that are walkable. In Fife, facilities that include public services south of I-5 are just over 0.5 mile from the station, and the Puyallup Tribal Integrative Medicine is over 1 mile west of the station.

Tacoma Segment

Of the four alternatives, there is no discernable difference in effects on public services and facilities.

Walkability (within 0.5-mile walkshed) to the proposed light rail stations for this segment would improve commuter transit opportunities for patrons and employees of the following:

- Tribal Treatment Center.
- Washington Employment Security Department.
- TAGRO.
- School of Urban Ministry.
- Summit Olympus High School.
- Tacoma Rescue Mission (Tacoma 26th Street Station only).

4.14.3.3 Construction Impacts for the Build Alternatives

Impacts Common to All Alternatives

Implementation of any of the build alternatives would temporarily affect the roadways in the study area and vicinity, resulting in short-term impacts on all public services. Construction

activities would result in short-term increased traffic congestion due to added construction vehicles. Lane or road closures and detours would be needed for activities such as utility relocations and guideway placement. These would require traffic control plans and approval by the local jurisdiction and/or WSDOT. If TDLE parking facilities at stations in both South Federal Way and Fife are constructed 3 years after initial service opens, the same short-term construction-related effects on adjacent roadways would apply at these station locations at the time the parking facilities are constructed.

More detailed information on road closures, lane closures, and detours is provided in Chapter 3, Transportation Environment and Consequences.

Federal Way Segment

Construction impacts would be the same for the alternative and design option in the Federal Way Segment.

A temporary construction easement of approximately 6 acres would be required from the Christian Faith Center-owned property. This parcel, east of the center, functions as additional parking for the school and provides for recreational uses (soccer field). The use of the site is temporary and would not impede most functions of school operations. Depending on the OMF South site selected, this property may be acquired for the OMF South project.

South Federal Way Segment

The SF 99-West, SF 99-East, and SF I-5 alternatives would temporarily impact the future site of the emergency shelter owned by King County (former hotel). Under the SF 99-West and SF 99-East alternatives, the project would temporarily impact east side of the property for construction staging. The SF I-5 alternative would temporarily impact a slightly larger portion of the east side of the property for staging and the construction of an underground stormwater vault. The future shelter will still be operational under all three alternatives, but these activities would be visible from the shelter and future residents would experience construction-related noise.

The SF 99-West Alternative would involve approximately 1 acre of temporary construction easement and the SF 99-East Alternative would involve approximately 300 square feet of temporary construction easement on the Montessori Academy at Spring Valley property. Property access and parking would be maintained, and the facility could remain operational for either alternative.

Fife Segment

Of the alternatives, the Fife I-5 Alternative would have slightly more impacts to public services due to the greater area needed on the Puyallup Tribal Integrative Medicine property for construction.

The Fife Pacific Highway and Fife Median alternatives would involve approximately 0.75 acres of temporary construction easement along Pacific Highway E on the north end of Puyallup Tribal Integrative Medicine property. There would be some temporary parking loss during construction. The Fife I-5 Alternative would have a temporary construction easement of approximately 1.2 acres along the south end of the Puyallup Tribal Integrative Medicine property. All alternatives would maintain property access and parking.

Construction of a station over 54th Avenue E with the Fife 54th Span Design Option would cause traffic restriction on 54th Avenue E to be in place for a longer period of time and

additional temporary closures compared to the other station locations, which has the potential to have greater impacts to emergency services response times under this option.

Tacoma Segment

Sound Transit does not anticipate any construction impacts related to public services that are unique to the Tacoma Segment. Impacts on the Tacoma Segment would be the same as impacts common to all alternatives.

Avoidance and Minimization of Impacts

To avoid or minimize potential impacts on public services during construction, Sound Transit would incorporate the following BMPs into construction plans and specifications:

- Provide regular updates to schools, emergency service providers, local agencies, solid waste utilities, and postal services during construction activity.
- Coordinate with public service providers before and during construction to maintain reliable emergency access and alternative plans or routes to minimize delays in response times.
- Coordinate with solid waste and recycling companies and schools should any rerouting of collection or school bus routes need to occur.
- Maintain postal collection and delivery and solid waste and recycling collection at all addresses.
- Work with local law-enforcement agencies and emergency service providers to further develop strategies to prevent and respond to potential threats to public safety during final design.
- Prepare a TDLE-specific safety and security management plan.
- Use Sound Transit security personnel and law enforcement to reduce demands on local law enforcement.
- Maintain access to fire hydrants, fire lanes, and fire response access.
- Provide for emergency access and evacuation for the guideway and stations.
- Conduct all-hazard emergency drills and exercises.

4.14.3.4 Indirect Impacts

TDLE would not lead to unplanned or induced population growth in south King County and north Pierce County, so it would not require additional public services beyond those already planned, consistent with local and regional comprehensive plans as discussed in Section 4.2, Land Use. Some population and employment growth may be redistributed by focusing growth in the station areas, which is consistent with local and regional plans. Service providers in the study area would adapt to such a redistribution.

4.14.4 Potential Mitigation Measures

No mitigation beyond the avoidance and minimization measures described above and the mitigation measures described in Chapter 3, Transportation, would be anticipated.

4.15 Utilities

4.15.1 Introduction to Resource and Regulatory Requirements

This section evaluates the potential long-term and construction impacts of TDLE to both public and private utilities that provide electricity, water, wastewater conveyance, stormwater collection, natural gas, fuel oil, and telecommunications services to communities along the project alignment. Additional information is included in Appendix H8, Utilities Background Materials.

State and local regulations and permitting processes regulate the relationship between transportation projects and utilities in the project corridor. The cities of Federal Way, Fife, Milton, and Tacoma, as well as Pierce County, administer local policies and procedures, and WAC 468-34 and WSDOT policies regulate procedures in WSDOT right-of-way. This project also crosses the Puyallup Tribe of Indians Reservation, where the Puyallup Tribe of Indians has jurisdiction and their own code regulating utility work on Tribal lands.

4.15.2 Affected Environment

The study area used to evaluate the utility impacts related to TDLE is within 100 feet of the project construction footprint. Sound Transit identified existing and planned utilities in the study area through database research and analysis, communication with local governing agencies and utility districts, and private franchise utility system maps. These utilities include water, sanitary sewer, storm sewer, electrical power (overhead and underground), natural gas, telephone and communications infrastructure (overhead and underground), and petroleum products pipelines. Table 4.15-1 summarizes the utility providers in each jurisdiction in the study area.

The utility providers identified in Table 4.15-1 anticipate typical maintenance and replacement of their existing systems, but no large-scale expansion projects are currently in the planning process. As this planning work typically does not take place this far in advance of construction, Sound Transit would continue to coordinate with all utility providers in the study area through final design regarding the interaction between TDLE and any potential future projects to minimize effects.

Table 4.15-1 Summary of Existing Utility Providers

Utility	Federal Way	Milton	Unincorporated Pierce County	Fife	Tacoma
Natural Gas	PSE	PSE	PSE	PSE	PSE
Electricity	PSE Bonneville Power Administration	City of Milton Public Works	City of Milton Public Works[1] Tacoma Public Utilities – Power[2]	Tacoma Public Utilities – Power	Tacoma Public Utilities – Power
Water	Lakehaven Water and Sewer District	City of Milton Public Works	City of Milton Public Works	City of Fife Public Works	Tacoma Public Utilities – Water
Sanitary Sewer	Lakehaven Water and Sewer District	Pierce County Public Works	Pierce County Public Works	City of Fife Public Works	City of Tacoma Environmental Services – Sewer Division
Stormwater	WSDOT City of Federal Way Public Works	WSDOT City of Milton Public Works	WSDOT City of Milton Public Works[3] City of Fife Public Works[4]	WSDOT City of Fife Public Works	WSDOT City of Tacoma Public Works

Table 4.15-1 Summary of Existing Utility Providers (continued)

Utility	Federal Way	Milton	Unincorporated Pierce County	Fife	Tacoma
Communications	Lumen, Comcast, Zayo	Lumen, Comcast, Zayo	Lumen, Comcast, Zayo	Lumen, Comcast, Zayo	AT&T, Lumen, Click! Network, Comcast, Lightcurve, Zayo
Petroleum	None	None	None	McChord Pipeline Co.	British Petroleum

Notes:
PSE: Puget Sound Energy.
(1) City of Milton provides power for area east of I-5.
(2) Tacoma Public Utilities – Power provides power for area west of I-5.
(3) City of Milton provides stormwater collection for area east of I-5.
(4) City of Fife provides stormwater collection for area west of I-5.

4.15.3 Environmental Impacts

4.15.3.1 No-Build Alternative

Under the No-Build Alternative, TDLE would not be constructed and would not impact utilities in the study area. The No-Build Alternative also includes projects, funding packages, and proposals in the central Puget Sound region that are planned to occur with or without TDLE, as described in Chapter 2 (Section 2.2).

If the OMF South Preferred Alternative is constructed as planned, the BPA 500 kV and 230 kV high-voltage transmission lines near The Commons Mall (S 324th Street) would be modified. These modifications would include installation of new towers to shift the location of each line and raise the lines within BPA's existing right-of-way.

4.15.3.2 Long-Term Impacts for the Build Alternatives

Impacts during operation would include the utility demands of operating the light rail system. The primary impacts on utilities would occur during construction, as described in Section 4.15.3.3 and Appendix H8, rather than from operations as described in the sections below.

Impacts Common to All Alternatives

Long-term impacts are similar for all build alternatives. Operating TDLE would increase electricity usage in the study area through:

- Operation of trains with up to four cars using direct-current power taken from 12.5 kV electric distribution facilities, including traction power substations and signal bungalows.
- Increased demand at station locations due to station operational requirements (such as functional circulation, HVAC systems, mechanical piping, intelligent transportation systems, and visual message boards), including supplemental parking features.
- General safety lighting along the alignments, in parking areas (garage or surface), and at stations and other light rail facilities.

PSE and Tacoma Public Utilities-Power (Tacoma Power) would provide the electricity to operate the TDLE light rail vehicles, stations, and other project facilities such as signal bungalows. Traction power substations placed approximately every 2 miles would distribute power to the overhead catenary system. Traction power substations would be powered by 12.5 kilovolt

ampere electric lines connecting to the nearest power pole. In some cases, additional distribution lines may be needed.

The loading demands produced by TDLE are relatively small compared with both overall system power generation and other typical developmental growth needs; however, the service location of the new demands, combined with the routing of the TDLE alignment through less dense urban areas than prior Sound Transit extensions, could create a potential issue for the providers. Since Federal Way, Milton, and Fife are less densely developed, the existing system infrastructure of both PSE and Tacoma Power is less robust through these areas, with fewer circuits available to support the traction power substations. Planning and coordination with providers would resolve potential issues.

TDLE and anticipated growth in the area may result in the need to upgrade both the existing power grids and the substations to provide the required coverage and operational redundancy. For example, a new circuit may be required at the existing substation at E 26th Street and East G Street in Tacoma to meet the energy demands and provide operational redundancy for TDLE. Sound Transit is in ongoing coordination with both PSE and Tacoma Power to perform the analysis on their existing system, determine whether upgrades are required and, if so, where the upgrades are needed. Sound Transit would continue working with PSE and Tacoma Power as the project design develops. Section 4.10, Energy, describes energy consumption rates.

Underground utilities in or adjacent to the project footprint, including communications, gas, sewer, water, storm drainage, and electric lines, could be susceptible to corrosion from stray electrical currents traveling from the traction power substations to overhead catenary system poles. The current TDLE design avoids trenched and retained cut configurations that typically produce the most stray current but impacts to utilities near at-grade guideway sections, overhead catenary wires, and traction power substation supply systems would still be impacted by stray current. Section 4.13, Electromagnetic Fields, provides additional discussion of the effects on utilities of stray currents from light rail vehicles.

Major service disruptions to utility customers during light rail operations are unlikely. All other potential long-term operational impacts on utilities, such as power demand, corrosive generating electromagnetic fields, and changes to accessibility are the same for all build alternatives.

If TDLE is constructed in phases, the M.O.S. to the station in South Federal Way and, to a lesser degree, the M.O.S. to the station in Fife would have the same type of long-term utility impacts, just in a smaller geographic area, until the remaining phases were completed.

Federal Way Segment

All Federal Way Segment build alternatives would have two additional long-term impacts on utilities beyond those noted in the preceding section:

1. Relocation of a cell tower located near I-5, off of Oakland Hills Boulevard in Belmor; and
2. Raising of existing BPA power lines and construction of new towers. The new towers would be replaced by BPA prior to construction of TDLE and would be adjacent to their existing location (BPA 2020).

South Federal Way Segment

In addition to the long-term impacts on utilities identified above for all build alternatives, all South Federal Way Segment alternatives would come into close range with an existing cell phone tower near Porter Way. The tower would need to be relocated so that the guideway would not block or interfere with cell tower transmission waves.

Fife Segment

Long-term operational impacts on utilities located in the Fife Segment are the same as those described above for all build alternatives.

Tacoma Segment

There are no long-term operational impacts on utilities anticipated in the Tacoma Segment beyond those that are common to all build alternatives. However, one variation for a bus layover space on E 26th Street and East G Street associated with one of the six bus transit options has the potential to impact the existing Tacoma Power substation.

All utilities associated with the TDLE guideway and the overhead catenary system are outside the flight path to Joint Base Lewis McChord (FAA 2020).

4.15.3.3 Construction Impacts for the Build Alternatives

Most of the TDLE impacts related to utilities are short-term construction impacts involving the relocation of utilities. Sound Transit identified utility conflicts for each alternative in the study area by determining where underground or overhead utilities were located within the project limits and would intersect with proposed light rail infrastructure. Those utility conflicts were then designated as major or minor. Major utility conflicts are those conflicts that are more difficult to resolve based on several factors, such as size (constructability and availability), service criticality (outages and long lead items), and danger (hazardous or explosiveness). Sound Transit considers a conflict with the following types of utilities as major utility conflicts:

- Water mains of 16-inch diameter or greater.
- Stormwater drains and sanitary sewers of 36-inch diameter or greater.
- Sanitary sewer force mains of 24-inch diameter or greater.
- 115 kilovolt (kV) and greater electrical transmission lines.
- High-pressure gas mains of any diameter.
- Intermediate-pressure gas lines with an 8-inch diameter or greater.
- Telephone and fiber-optic ducts with three or more conduits.
- Petroleum product pipelines.

A summary of major utility conflicts is summarized in Table 4.15-2 below and shown in Figures H8-1, H8-2, H8-3, and H8-4 in Appendix H8.

Additionally, TDLE would have several minor utility conflicts, which are easier to resolve. Where known, these conflicts were also identified and include utilities such as 8-inch water mains, 15-inch sewer mains, and small ducts with only one or two conduits per duct.

The goals for Sound Transit to identify utility conflicts as part of preliminary engineering and environmental review are:

- Plan for relocating the utilities during construction to remove conflicts with TDLE.
- Keep the project elements (i.e., guideways with overhead catenary wires, stations, and potential parking garages) clear of the minimum required distance of overhead utilities.

By identifying utility conflicts early, Sound Transit can discuss strategies for mitigating construction impacts with both public and private utility owners.

Appendix F, Conceptual Design Drawings, shows the locations of major utilities.

Table 4.15-2 Summary of Major Utility Conflicts
(Approximate Length of Relocations and Number of Crossings)

Alternative	Power Line	Water Line	Sanitary Sewer Line	Natural Gas/Petroleum Line	Stormwater Drainage Line	Telecom Systems
Federal Way Segment						
Preferred FW Enchanted Parkway Alternative	1,100 feet 3 crossings	100 feet	400 feet 1 crossing	Not Applicable	350 feet 1 crossing	1,100 feet 3 crossings
Preferred FW Enchanted Parkway Alternative with Design Option	1,100 feet 3 crossings	100 feet	300 feet 1 crossing	Not Applicable	350 feet 1 crossing	1,100 feet 3 crossings
South Federal Way Segment						
SF Enchanted Parkway Alternative[1]	1,750 feet 6 crossings	Not Applicable	100 feet 1 crossing	Not Applicable	200 feet	4,800 feet 2 crossings
SF I-5 Alternative	2,300 feet 6 crossings	100 feet	1 crossing	Not Applicable	Not Applicable	3,600 feet 2 crossings
SF 99-West[2]	4,050 feet relocated 1,700 feet raised 14 crossings	500 feet	300 feet	Not Applicable	Not Applicable	6,050 feet 12 crossings
SF 99-East[2]	12,550 feet relocated 700 feet raised 14 crossings	500 feet	550 feet gravity main 400 feet force main	Not Applicable	Not Applicable	14,550 feet 12 crossings
Fife Segment						
Fife Segment (portion common to all alternatives)	500 feet 3 crossings	Not Applicable	Not Applicable	Not Applicable	Not Applicable	500 feet 2 crossings
Fife Pacific Highway Alternative[3]	5 crossings	Not Applicable	Not Applicable	1 petroleum line crossing	100 feet 1 crossing	800 feet 4 crossings
Fife Median Alternative[3]	5 crossings	Not Applicable	Not Applicable	1 petroleum line crossing	100 feet	400 feet 4 crossings
Fife I-5 Alternative[3]	5 crossings	Not Applicable	Not Applicable	1 petroleum line crossing	200 feet	4 crossings

Table 4.15-2 Summary of Major Utility Conflicts (continued)
(Approximate Length of Relocations and Number of Crossings)

Alternative	Power Line	Water Line	Sanitary Sewer Line	Natural Gas/Petroleum Line	Stormwater Drainage Line	Telecom Systems
Tacoma Segment						
Preferred Tacoma 25th Street-West Alternative	6,400 feet 2 crossings	Not Applicable	Not Applicable	3,200 feet 2 natural gas line crossings 1 petroleum line crossing	1 crossing	6,400 feet 1 crossing
Tacoma 25th Street-East Alternative	5,000 feet 2 crossings	Not Applicable	Not Applicable	2,500 feet 2 natural gas line crossings 1 petroleum line crossing	200 feet	5,000 feet 1 crossing
Tacoma Close to Sounder Alternative	1 crossing	Not Applicable	Not Applicable	1 natural gas line crossing 1 petroleum line crossing	Not Applicable	1,200 feet 1 crossing
Tacoma 26th Street Alternative	2,800 feet 2 crossings	1,500 feet	Not Applicable	1 natural gas line crossings 1 petroleum line crossing	50 feet	1,400 feet 2 crossings

Notes:
(1) Major conflicts would be the same with SF 352nd Station Option.
(2) Major conflicts would be the same with Porter Way Design Option.
(3) Major conflicts would be the same for the alternatives with either the 54th Avenue Design Option or 54th Span Design Option.

Impacts Common to All Alternatives

Aboveground utilities on poles could be relocated to taller or different types of poles. TDLE could affect maintenance activities and access to underground utilities, such as sewer manholes or vaults, requiring relocation of access points. Relocating water lines could also affect access to and use of fire hydrants. Sound Transit could also consider establishing parallel water lines on either side of a retained cut or at-grade guideway section to split an existing piping system, forming two new looped distribution systems and avoiding utility lines crossing under the guideway.

Underground utilities, most of which are within approximately 6 feet of the surface along the alternative alignments, could be impacted by grading and excavation during construction or by the weight of light rail vehicles traveling above. As a result, Sound Transit would relocate or protect underground utilities during construction to minimize potential impacts. If needed, Sound Transit and utility providers would move underground utilities that are in public road rights-of-way and adjacent to or under TDLE to a different location in the same right-of-way. Utilities located in private parcels may remain on private property if relocation becomes necessary pending an agreement or extension of an agreement between the utility provider and parcel owner.

Trench construction, a method of opening ground for installation of infrastructure that involves a long, deep opening in the soil, would impact the most underground utilities, followed by at-grade construction; the current design of TDLE has minimal trench construction and a limited number of at-grade sections. These types of subsurface and surface construction would require the relocation of more underground pipes and aboveground utility poles than elevated alignments. In most cases where an at-grade profile would cross an underground utility, a split casing could be installed. For this application, a split casing refers to a steel pipe that serves as a casing around the utility line or pipe that allows the utility company to remove or install utilities at that

location in the future without disturbing light rail infrastructure while it is in operation. In order to install the split casing, a portion of the existing pipe may also have to be removed and replaced in its existing alignment to ensure good material condition in the existing main. Partial removal and replacement during installation of a split casing can also be helpful in some scenarios where constructability is limited.

Conflicts with overhead electric lines could occur where the elevated guideway passes directly underneath the lines, which would require raising the lines to be a minimum of approximately 35 feet from the top of rail for 115 kV lines and 37 feet for 230 kV lines.

Temporary connections to utility customers would typically be established before relocations to minimize service disruptions. However, inadvertent damage to underground utilities could occur if utility locations are uncertain or misidentified.

The city codes of Federal Way, Fife, and Tacoma require that existing overhead utilities (power and communications) requiring relocation be placed underground when possible. The policies would not apply to 115 kV or other high-voltage transmission lines.

Some utility service providers may be impacted by relocation costs incurred, staff time and resources required to facilitate the relocation, and the temporary loss of access to utilities. Sound Transit would evaluate relocation approaches and associated costs on a case-by-case basis. In general, it would evaluate the terms of a private utility's franchise agreement to determine the rights of the private utility within the public right-of-way and the responsibility for relocation costs.

Federal Way Segment

In the Federal Way Segment, the Preferred FW Enchanted Parkway Alternative would impact both underground and overhead utilities located throughout the corridor, including a conflict with BPA transmission lines that would need to be raised. The Preferred FW Enchanted Parkway Alternative would have similar utility impacts both with and without the FW Design Option, but at slightly different locations.

South Federal Way Segment

All of the alternatives in the South Federal Way Segment would impact both underground and overhead utilities located throughout the corridor by both support column foundations or vertical conflicts at overhead intersecting locations. The SF I-5 Alternative would avoid some of the potential vertical conflicts caused by the other alternatives.

All of the alternatives in the South Federal Way Segment would impact existing overhead electrical distribution and telecom lines, along with their support poles, which would need to be relocated and possibly converted to an underground system; several lines would need to be raised. More relocation of electrical and telecom lines would be required for the SF Enchanted Parkway, SF 99-West, and SF 99-East alternatives than the SF I-5 Alternative.

Both the SF Enchanted Parkway Alternative and the SF I-5 Alternative would relocate access to a sewer main near Todd Beamer High School. This impact would be greater with the SF Enchanted Parkway Alternative because the aerial guideway supporting column foundations are closer to the existing sewer main for this alignment alternative, creating more impact.

Fife Segment

In the Fife Segment, potential impacts to utilities are related to conflicts with support column foundations or vertical conflicts at overhead intersecting locations. Relocation of overhead distribution electrical lines and possible underground conversion would be required for all of the

alternatives, and several lines would need to be raised. All of the alternatives in the Fife Segment would need to avoid a pipeline that provides jet fuel to Joint Base Lewis-McChord, where the alternatives cross the end of the I-5 southbound on-ramp from Port of Tacoma Road. All of the alternatives in the Fife Segment would conflict with the same Tacoma Power 115 kV overhead transmission electrical lines, which would have to be raised to provide the required separation from TDLE. All large impacts on utilities for the Fife Median Alternative would be the same as the conflicts for the Fife Pacific Highway Alternative but the impacts for the Fife Median Alternative would occur approximately 70 feet north of the Fife Pacific Highway Alternative. All of the Fife Segment alternatives would have similar utility impacts with the 54th Avenue and 54th Span design options, but at slightly different locations due to the station location.

Tacoma Segment

All Tacoma Segment build alternatives would have three large impacts on existing utility infrastructure: potential conflict with the existing British Petroleum Olympic pipeline located near the east bank of the Puyallup River; potential conflict with an existing 16-inch high-pressure gas main in E Bay Street that would need to be relocated; and a vertical conflict between the aerial guideway and overhead distribution electrical and telecom lines at the E Portland Avenue and E 26th Street intersection. Sound Transit would try to avoid these impacts to the extent possible.

The Preferred Tacoma 25th Street-West Alternative and the Tacoma 25th Street-West Alternative would impact the most utilities within the Tacoma Segment. In addition to the impacts common to all of the alternatives in the Tacoma Segment, the Preferred Tacoma 25th Street-West Alternative would also conflict with both a 115 kV overhead transmission line and overhead distribution electrical and telecom lines, which would need to be relocated, raised, or possibly converted to underground infrastructure. A gas line and associated gas line facility would need to be relocated, and three large telecom ducts would need to be consolidated and relocated, if possible.

The Tacoma Close to Sounder Alternative would have the fewest impacts to existing utilities because it runs adjacent to the existing Sounder tracks for a long stretch of the alignment where there are limited utilities. This alternative would travel close to an existing Tacoma Power substation, which would be protected in place during construction.

Similar to the Tacoma Close to Sounder Alternative, the Tacoma 26th Street Alternative would also have fewer impacts than either the Preferred Tacoma 25th Street-West or Tacoma 25th Street-East alternatives because it also travels adjacent to the Sounder tracks for a portion of the alignment where there are limited existing utilities. However, the Tacoma 26th Street Alternative would generate more impacts than the Tacoma Close to Sounder Alternative due to the impacts it would have on E 26th Street.

4.15.3.4 Avoidance and Minimization of Impacts

Sound Transit would develop agreements, where applicable, with utility providers to address construction and long-term impacts. When developing alternatives, Sound Transit used several measures to avoid and minimize potential utility impacts. For example, where feasible, columns for elevated guideways would avoid impacts to underground utilities. Sound Transit would also design the light rail alignment to maintain access to utilities for maintenance and repair per the utility owner's requirements. In some cases, that would require Sound Transit to relocate sewer manholes, pipes, vaults, or other access points as part of TDLE construction. Sound Transit would work closely with utility providers to maintain required access to these utilities and any relocated sewer manholes and vaults, utility mains, fire hydrants, and other features. To minimize potential impacts due to service disruptions, Sound Transit would perform potholing

and preconstruction surveys to identify utility locations as well as communicate with customers to inform them of planned or potential service disruptions.

To avoid or minimize potential corrosion impacts, Sound Transit would coordinate with utility providers to identify appropriate control measures. Typical design measures include:

- Installing cathodic protection systems.
- Installing insulating unions to break the electrical conductivity of the utility.
- Isolating electrical rails from the ground.
- Installing stray-current-control track fastening systems, where appropriate.

To avoid or minimize consumption and demand on utilities, such as energy and water, Sound Transit would integrate efficient operating practices at existing and new facilities that require the use of energy- and water-saving equipment and related design strategies.

4.15.3.5 Indirect Impacts

The improved transit access from light rail service availability would support planned development or redevelopment near TDLE stations. This would likely increase demand for utility services in certain locations. Local governments have planned for increased development in their adopted local land use plans and policies, consistent with regional plans. The project corridor is within the urban growth boundaries of the cities of Federal Way, Fife, and Tacoma, and development near TDLE would not be denser than that allowed in those cities' adopted land use plans. Indirect impacts on utilities are not expected to be greater with or without TDLE. See Section 5.4.3, Land Use, for more details on the indirect impacts related to land use development.

4.15.4 Potential Mitigation Measures

No additional mitigation measures beyond the avoidance and minimization measures described above would be anticipated.

4.16 Historic and Archaeological Resources

Below is a brief consideration of regulatory requirements and affected environment, including previously identified cultural (archaeological and built-environment) resources. The Historical and Archaeological Resources Technical Report(Appendix J5) describes in more detail the environmental and cultural context of the TDLE study area, with additional information about federal, state, and local regulations affecting historic properties and the resources inventoried as part of the archaeological and built-environment surveys. A draft Section 106 Programmatic Agreement is also included in Appendix J5.13.

4.16.1 Introduction to Resources and Regulatory Requirements

The two main federal laws pertaining to archaeological and built-environment resources are the National Historic Preservation Act (NHPA) and NEPA. Section 106 of the NHPA requires federal agencies to identify historic properties within the area of potential effects (APE) and to consider a project's potential effects on those historic properties. The APE is defined as "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties" (36 CFR 800.16(d)). Historic properties are defined as "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior," and can also include traditional cultural properties (36 CFR 800.16(l)(1)). Under Section 106 of the NHPA, historic properties (those listed or eligible for listing in the National Register of Historic Places [NRHP]) are identified and evaluated by the lead federal agency in consultation with Tribes with jurisdiction or interest, SHPO at the Washington State Department of Archaeology and Historic Preservation (DAHP), local jurisdictions, and other consulting parties, as appropriate. Archaeological and built-environment resources must also be given consideration under NEPA. In NEPA, "cultural resources" encompass a wide range of resources including, but not limited to, sacred sites, archaeological and built-environment resources not eligible for the NRHP, archaeological and built-environment resources eligible for the NRHP, and archaeological collections (CEQ and ACHP 2013:4). In addition, for U.S. Department of Transportation (including FTA) projects, Section 4(f) of the U.S. Department of Transportation Act includes protections for NRHP-eligible properties. Section 4(f) applies to properties that are listed in or eligible for listing in the NRHP. This includes built-environment resources, archaeological sites that warrant preservation, and traditional cultural properties (TCPs). A draft Programmatic Agreement outlining procedures for post-ROD investigations, NRHP evaluations, adverse effects determination and resolution of adverse effects is included in Appendix J5.13.

In addition, the Native American Graves Protection and Repatriation Act (NAGPRA) applies to this project. NAGPRA (Public Law 101-601; 25 U.S.C. §§ 3001-3013) is concerned with the protection, disposition, and repatriation of Native American human remains, funerary objects, sacred objects, and objects of cultural patrimony on federal or Tribal lands and recognizes that these human remains and objects belong to the lineal descendants. NAGPRA also requires that American Indian Tribes or Native Hawaiian organizations be consulted whenever archaeological investigations encounter, or are expected to encounter, Native American cultural items or when such items are unexpectedly discovered on federal or Tribal lands. A portion of the TDLE project extends across ancestral and reservation lands of the Puyallup Tribe of Indians, and FTA has been in government-to-government consultation with the Tribe (see Section 4.16.2). FTA and Sound Transit are coordinating with the Puyallup Tribe of Indians, particularly in relation to a portion of TDLE that is in the vicinity of Saint (St.) George's Cemetery. Staff from the Puyallup Tribe of

Indians were present during portions of the fieldwork conducted for this Draft EIS, including during some of the cultural resource investigations conducted in the vicinity of the cemetery.

Applicable state laws and authorities include SEPA and regulations relating to archaeological and built-environment resources guiding the Washington Heritage Register (WHR) program administered by DAHP. Under state law, Revised Code of Washington (RCW) 27.53, Archaeological Sites and Resources, any alteration to an archaeological site requires a permit from DAHP. State law, RCW 27.44 Indian Graves and Records, also protects Native American burial sites.

In addition to federal and state laws, ordinances and regulations are in place at county and municipal levels. King County, Pierce County, and the City of Tacoma each has a designated Historic Preservation Program under the guidance of a landmarks commission. Other municipalities, including the cities of Federal Way, have joined these programs and adopted appropriate ordinances and regulations for their jurisdictions.

4.16.2 Tribal Consultation and Additional Consulting Parties

The FTA is conducting government-to-government consultation with the Puyallup Tribe of the Puyallup Reservation (Puyallup Tribe of Indians), Muckleshoot Indian Tribe, Nisqually Indian Tribe, and the Confederated Tribes and Bands of the Yakama Nation (Yakama Nation).

In addition, certain organizations with a demonstrated interest in the project are allowed to participate as consulting parties due to the nature of their legal or economic relation to the undertaking or affected properties, or their concern with the undertaking's effects on historic properties (36 CFR 800.2). FTA has coordinated with the following additional consulting parties regarding the project findings and determinations: King County Historic Preservation Officer, Pierce County Historic Preservation Commission, Tacoma Historic Preservation Officer, City of Fife Planning Department, and Washington Trust for Historic Preservation. FTA and Sound Transit have also developed and implemented a focused outreach to other organizations who have an interest in historic resources. These organizations include Culture Development Authority, Historical Society of Federal Way, Fife Historical Society, Tacoma Historical Society, and Historic Tacoma. Public participation and input will also be solicited as it is an important component of the Section 106 consultation process.

4.16.3 Affected Environment

The APE for TDLE generally extends from the project elements (e.g., guideway, station locations, construction staging areas) to the nearest tax parcel or a maximum of 200 feet where large tax parcels are adjacent elements. The APE was widened at Belmor; Gethsemane Cemetery; St. George's Cemetery; the area between Pacific Highway E and 12th Street E, bounded on the west by Alexander Avenue E and 46th Avenue E on the east; and the area extending north from the anticipated bridge location over the Puyallup River to Lincoln Avenue, as shown on Figure 4.16-1. The study area used for the literature review is a 1-mile radius of the APE. This is larger than the APE to provide context for the types of cultural resources that may be encountered within the APE. A file search of DAHP's Washington Information System for Architectural and Archaeological Records Data (WISAARD) database was used to identify the archaeological sensitivity for the APE (Appendix J5). Other background information, including ethnographic data, historic maps, and geologic data, were also used to inform an understanding of archaeological sensitivity. In general, sections in the central portion of the South Federal Way Segment and all of the Fife and Tacoma segments have high archaeological sensitivity. The other portions of the Federal Way and South Federal Way segments generally have low to moderate sensitivity.

Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

0 1 2 Miles

FIGURE 4.16-1
Tacoma Dome Link Extension
Area of Potential Effect (APE)
Tacoma Dome Link Extension

The literature review performed for the project identified 26 previously documented cultural resources within the APE. Seventeen are precontact or historic archaeological sites, two of which (precontact sites 45PI488 and 45PI1327) have been determined eligible for listing in the NRHP; six are built-environment resources that have been determined eligible for or are listed in the NRHP, the WHR, and/or the Tacoma Landmarks Register (including one that has since been demolished); and two are cemeteries.

St. George's Indian School operated from 1888 to 1937, near the modern location of Gethsemane Cemetery and the documented St. George's Cemetery. The buildings of the former St George's Indian School were demolished as part of the development of the Gethsemane Cemetery in the early 1970s (Boswell and Rinck 2017).

4.16.3.1 Archaeological Resources

Of the 17 previously documented archaeological sites within the APE, three date to the precontact period, and 14 date to the historical period of Euro-American exploration and settlement in the Puget Sound region. Table 4.16-1 provides information about these 17 archaeological sites present within the Federal Way, South Federal Way, Fife, and Tacoma Segments of the APE.

Table 4.16-1 Previously Documented Archaeological Sites within the APE from North to South

Segment/ Alternative	Resource ID	Period	Description	Reference	NRHP Status	Location[1]
Federal Way Segment						
Federal Way- All alternatives	45KI719	Historic	Stone foundation	Luttrell (2005)	Determined Not Eligible	Within Area of Potential Ground Disturbance
Federal Way- All alternatives	45KI1662	Historic	Historic Road	Warren (2022)	Determined Not Eligible	Within Area of Potential Ground Disturbance
South Federal Way Segment						
South Federal Way- SF 99-West and SF 99-East alternatives	45KI1021	Historic	Historic Commercial Property	McWilliams (2011)	Unevaluated	Within Area of Potential Ground Disturbance
South Federal Way- SF 99-West and SF 99-East alternatives	45PI1177	Precontact	Lithic Isolate	Boersema (2010)	Unevaluated	Within APE, outside of Area of Potential Ground Disturbance
Fife Segment						
Fife- All alternatives	45PI488	Precontact	Campsite, varied artifacts	Luttrell (2001)	Determined Eligible	Within APE, outside of Area of Potential Ground Disturbance
Fife- All alternatives	45PI724	Historic	Debris scatter	Cooper (2005)	Determined Not Eligible	Within APE, outside of Area of Potential Ground Disturbance

Table 4.16-1 Previously Documented Archaeological Sites within the APE from North to South (continued)

Segment/ Alternative	Resource ID	Period	Description	Reference	NRHP Status	Location[1]
Tacoma Segment						
Tacoma- All alternatives	45PI1563	Historic	Debris scatter	Berry (2021)	Unevaluated	Within APE, outside of Area of Potential Ground Disturbance
Tacoma- All alternatives	45PI1542	Historic	Concrete foundation	Morris (2020)	Determined Not Eligible	Within Area of Potential Ground Disturbance
Tacoma- All alternatives	45PI1463	Historic	Bay Street road segments	Luttrell (2019)	Determined Not Eligible	Within Area of Potential Ground Disturbance
Tacoma- All alternatives	45PI1460	Historic	Structural elements	Garrison (2018)	Unevaluated	Within Area of Potential Ground Disturbance
Tacoma- 25th East and 25th West	45PI1459	Historic	Railroad track segment	Garrison (2018)	Unevaluated	Within Area of Potential Ground Disturbance
Tacoma- 25th East and 25th West	45PI1458	Historic	Historic Road	Garrison (2018)	Determined Not Eligible	Within Area of Potential Ground Disturbance
Tacoma- 26th Street, and Close to Sounder	45PI1457	Historic	Railroad segment	Garrison (2018)	Unevaluated	Within Area of Potential Ground Disturbance
Tacoma- 26th Street, and Close to Sounder	45PI1456	Historic	Debris scatter	Stevenson (2018)	Unevaluated	Within Area of Potential Ground Disturbance
Tacoma- All alternatives	45PI1327	Precontact	Artifacts and ecofacts	Stevenson (2013)	Determined Eligible	Within Area of Potential Ground Disturbance
Tacoma- All alternatives	45PI1290	Historic	Isolate, pipe valve fragment	Tierney (2012)	Determined Not Eligible	Within Area of Potential Ground Disturbance
Tacoma- 25th East, 25th West, and 26th Street	45PI743	Historic	Tunnel	Piston (2006)	Determined Not Eligible	Within Area of Potential Ground Disturbance

Note:
(1) In the Location column, APE denotes a location that is within the APE and outside of the Areal of Potential Ground Disturbance.

4.16.3.2 Historic Buildings and Structures

The background research discussed above identified six built-environment resources within the APE either listed in or determined eligible for listing in the NRHP or Washington Heritage Register (WHR), although one of them has since been demolished (Table 4.16-2; Appendix J5).

Table 4.16-2 NRHP- and/or WHR-Eligible or Listed Built-Environment Resources

Segment/ Alternative	Resource ID	Name/Address	Year Built	NRHP/WHR Listing Status and Criteria	Reference	Location
Tacoma- All alternatives	31231	Milwaukee Railroad-Puyallup River Bridge, Tacoma (railroad crossing)	1910	Determined NRHP-eligible under Criteria A and C	FHWA 2009	APE
Tacoma- All alternatives	31786	Puyallup River Bridge, Tacoma (Pacific Highway E crossing)	1927	Determined NRHP-eligible, criteria undefined	FHWA 2013	APE
Tacoma- All alternatives	90499	East 21st Street Bridge, Tacoma (Lincoln Avenue crossing)	1929	Determined NRHP-eligible, criteria undefined	FHWA 2008	APE
None (demolished)	31669	Chicago, Milwaukee, St. Paul, and Pacific S-Turn Trestle (demolished)	1908	Determined NRHP-eligible under Criteria A and C; demolished 2017	FTA 2014	APE
Tacoma- 26th Street	31673	Engine House 4 – Tacoma Fire Station No. 4, 220-224 E 26th Street, Tacoma	1912	Listed in the WHR and NRHP in 1984	DAHP 2020	APE

Note:
(1) Additional information on these resources can be found in Appendix J5, Historical and Archaeological Resources Technical Report.

In addition to the five extant built-environment resources that have been found eligible for or listed in the WHR and NRHP, there are two resources within the APE that are listed in the Tacoma Register of Historic Places, the Carman Manufacturing Building and the Trecento Block (City of Tacoma 2020; DAHP 2012).

One additional building should be noted. Freighthouse Square, a large, well-known former rail depot, now a commercial operation, is also located within the APE. It has not been listed in the Tacoma Register of Historic Places, however, and was determined not eligible for listing in the NRHP by FTA in 2014.

4.16.3.3 Cemeteries

There are two cemeteries located within the APE: Gethsemane and St. George's (45KI866 and 45KI867). They are adjacent to each other between West Hylebos Creek and I-5 at the boundary of the South Federal Way and Fife segments.

4.16.3.4 Traditional Cultural Properties

FTA is conducting government-to-government consultation with the Puyallup Tribe of Indians, Muckleshoot Indian Tribe, Nisqually Indian Tribe, and Yakama Nation about the project and its potential effects on cultural resources, including TCPs. Through consultation the potential for TCPs within the APE has been identified.

4.16.4 Survey and Inventory Methods and Results

Within the APE, field survey and inventory were conducted. Pedestrian archaeological survey and subsurface archaeological investigations included shovel probes, hand auger cores, and deep archaeological bores. The survey and inventory documented previously unsurveyed built-environment resources constructed in 1980 or earlier.

4.16.4.1 Archaeology Survey Results

Archaeologists conducted field survey between December 2020 and March 2021 and between May and July 2023. The field survey consisted of a pedestrian archaeological survey and excavation of a combined 664 shovel probes and hand auger cores (see Appendix J5).

The archaeological survey identified eight previously undocumented archaeological resources. The resources consist of six archaeological sites and two archaeological isolates, which are listed in Table 4.16-3.

Table 4.16-3 Archaeology Survey Results and NRHP Status

Segment/ Alternative	Resource Type	Resource Description	Resource Age	NRHP Status
Federal Way Segment				
Federal Way- All alternatives	Historic period isolate	Historic period bottle (45KI1583)	1966	Determined Not Eligible
South Federal Way Segment				
South Federal Way- All alternatives	Historic period site	Debris scatter (45KI1584)	ca. 1950	Determined Not Eligible
South Federal Way- All alternatives	Historic period site	Debris scatter (45KI1585)	ca. 1960s	Determined Not Eligible
South Federal Way- All alternatives	Historic period site	Debris scatter (45KI1586)	ca. 1940 to 1960s	Eligible
South Federal Way- All alternatives	Historic period site	Debris scatter (45KI1587)	ca. 1930s to 1966	Determined Not Eligible
South Federal Way- All alternatives	Historic period isolate	Historic period bottle (45KI1588)	1945	Determined Not Eligible
Fife Segment				
Fife- All alternatives	Historic period site	Debris scatter (45PI1555)	ca. 1940	Undetermined
Tacoma Segment				
Tacoma-26th Street and Close to Sounder	Historic period site	Foundation and debris scatter (45PI1556)	Historic period to modern	Determined Not Eligible

4.16.4.2 Archaeological Monitoring of Geotechnical Work

As part of the geotechnical investigations for TDLE, 26 geotechnical bores were monitored by archaeologists between November 30, 2020, and March 21, 2021. Samples with visible archaeological materials were screened.

Archaeological materials were found during review of sediments extracted at one boring location. This bore encountered a deposit of organically enriched sediment containing fragmented mussel shell and other bivalves at a depth of 9.1 to 9.6 meters (30 to 31.5 feet) below surface that were interpreted to represent a shell midden (Stevenson 2020). The deposit was designated archaeological resource 45PI1557.

Site 45PI1557 is anticipated to be older than 50 years old, based on its depth and geologic setting. The site constitutes a previously undocumented Native American-associated archaeological deposit. To date, the age of the deposit is not known, and the nature of the site the midden comes from is not understood. Archaeological site 45PI1557 has been determined eligible for listing in the National Register of Historic Places.

4.16.4.3 Archaeology Deep Testing Survey Results

Archaeologists conducted deep testing of sediments within the APE using mechanically excavated bores and hand-excavated shovel probes. The bores and shovel probes were analyzed by a geoarchaeologist to reconstruct the depositional setting of the APE through time and to identify potential buried archaeological resources or sedimentary deposits with a high probability to contain archaeological materials. In total, 20 bores were mechanically extracted using sonic and push-coring methods, ranging in depth from 8.5 to 48.8 meters (28 to 160 feet) below ground surface. Additionally, six shovel probes were excavated and analyzed for their geoarchaeological properties. The deep testing fieldwork occurred between January 4 and March 4, 2021.

No archaeological resources were encountered during the deep testing and geoarchaeological analysis of cores. Multiple buried soils, former shoreline sediments, and other deposits with a moderate to high likelihood for containing archaeological resources were identified. Some of these high probability deposits were found in close proximity to previously recorded archaeological sites, including near 45PI1327 and 45PI930.

4.16.4.4 Built-Environment Resources Survey Results

Architectural historians conducted field survey and prepared historic property inventory forms between December 2019 and August 2023 for 233 built-environment resources within the APE. One additional resource, the Milwaukee, St. Paul and Pacific Railroad, was recommended not eligible and then determined NRHP-eligible by a different agency for a different project while reporting for TDLE was underway. It is assessed for potential effects along with other eligible and listed resources. FTA has determined, in consultation with Tribes, SHPO, and additional consulting parties, that 21 built-environmental resources are eligible for listing in the NRHP; see Table 4.16-4 and Figures 4.16-2 and 4.16-3. Built-environment resources that are eligible for the NRHP are automatically eligible for listing in the WHR. The levees on either side of the Puyallup River bridge in the Fife and Tacoma segments comprise one built-environment resource.

Table 4.16-4 Built-Environment Resources Eligible for the NRHP for TDLE[1]

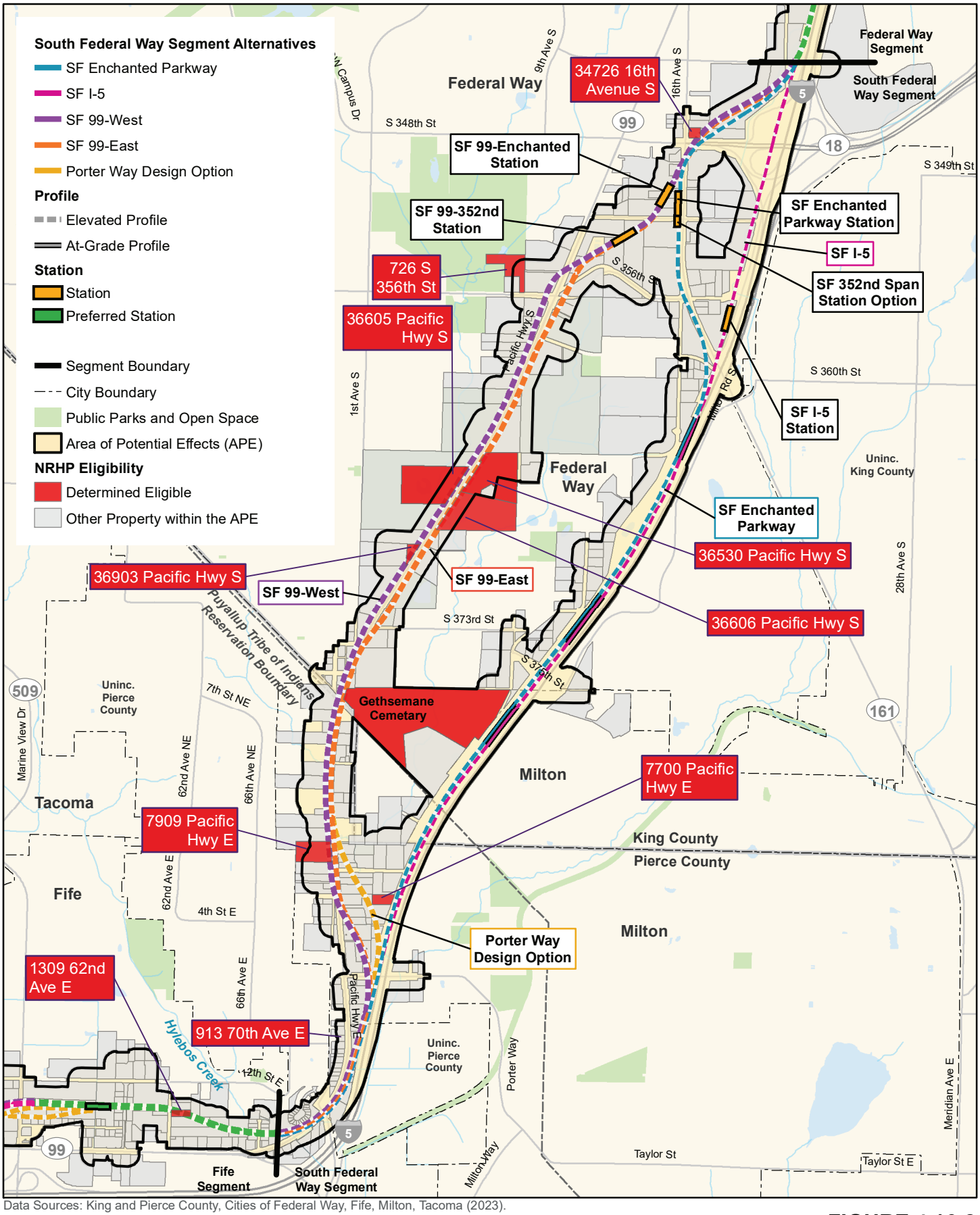
Segment/ Alternative	Resource ID	Name/Use	Year Built	NRHP Eligibility and Criteria	Location/ Address
South Federal Way Segment					
South Federal Way: SF 99-West, SF 99-East, and SF Enchanted Parkway alternatives	731955	Denny's Restaurant	1978	Determined Eligible: Criterion C	34726 16th Avenue S, Federal Way
South Federal Way: SF 99-West and SF99-East alternatives	731975	Brooklake Community Center	ca. 1929	Determined Eligible: Criteria A and C	726 S 356th Street, Federal Way
South Federal Way: SF 99-West and SF 99-East alternatives	731992, 731994, 731995, 731996, 731998, 731999, 732000, 732001	Montessori Academy at Spring Valley School	ca. 1943	Determined Eligible: Criteria A, B, and C	36605 Pacific Highway S, Federal Way
South Federal Way: SF 99-West and SF 99-East alternatives	396993	K.C.J. Stables	ca. 1900	Determined Eligible: Criteria A and B	36530A Pacific Highway S, Federal Way

Table 4.16-4 Built-Environment Survey Results for TDLE (continued)

Segment/ Alternative	Resource ID	Name/Use	Year Built	NRHP Eligibility and Criteria	Location/ Address
South Federal Way: SF 99-West and SF 99-East alternatives	395115	Residence	1947	Determined Eligible: Criterion C	36606 Pacific Highway S, Federal Way
South Federal Way: SF 99-West and SF 99-East alternatives	395874	Residence	1921	Determined Eligible: Criterion C	36903 Pacific Highway S, Federal Way
South Federal Way: SF 99-West and SF 99-East alternatives	537584/ 725425	Gethsemane Cemetery and Mortuary	1974	Determined Eligible: Criteria A and C	37600 Pacific Highway S, Federal Way
South Federal Way: SF 99-West and SF 99-East alternatives	731901	Daffodil Motel	ca. 1948	Determined Eligible: Criterion C	7909 Pacific Highway E, Milton
South Federal Way: SF Enchanted Parkway and SF I-5 alternatives, and Porter Design Option	731933	Commercial Building	1978	Determined Eligible: Criterion C	7700 Pacific Highway E, Milton
Fife Segment					
Fife: All alternatives	31927	Residence	1900	Determined Eligible: Criteria A and/or B or C	1309 62nd Avenue E, Fife
Fife: All alternatives	29547	Pick-Quick Drive In	1950	Determined Eligible: Criteria A and C	4306 Pacific Highway E, Fife
Tacoma Segment					
Tacoma: All alternatives	722131	Northern Pacific Railway/BNSF	1873	Determined Eligible: Criterion A	APE-specific
Tacoma: All alternatives	536705	Residence	1914	Determined Eligible: Criterion C	1320 E 26th Street, Tacoma
Tacoma: Close to Sounder and 26th Street	721797	Residence	1903	Determined Eligible: Criterion C	1112 E 26th Street, Tacoma
Tacoma: Close to Sounder and 26th Street	516320	Residence	1903	Determined Eligible: Criterion C	1106 E 26th Street, Tacoma
Tacoma: 25th-West and 25th-East	32815	BNSF Freight Warehouse	1950	Determined Eligible: Criteria A and C	603-605 Puyallup Avenue, Tacoma
Tacoma: All alternatives	722117	Puyallup River Levees	1950	Determined Eligible: Criterion A	Puyallup River Levees
Tacoma: Tacoma 26th Street	31674	Commercial	1909	Determined Eligible: Criteria A and C	101 E 26th Street, Tacoma
Tacoma: Tacoma 26th Street	536748	Commercial	1937	Determined Eligible: Criteria A and C	102 S 26th Street, Tacoma
Tacoma: Tacoma 26th Street	536754	Commercial	1920	Determined Eligible: Criteria A and C	110 E 26th Street, Tacoma
Tacoma: Tacoma 26th Street	722335	Commercial	1962	Determined Eligible: Criteria A and C	102 E 26th Street, Tacoma

Notes:

(1) This table includes only resources identified by the TDLE built-environment survey that are determined eligible for listing in the NRHP.



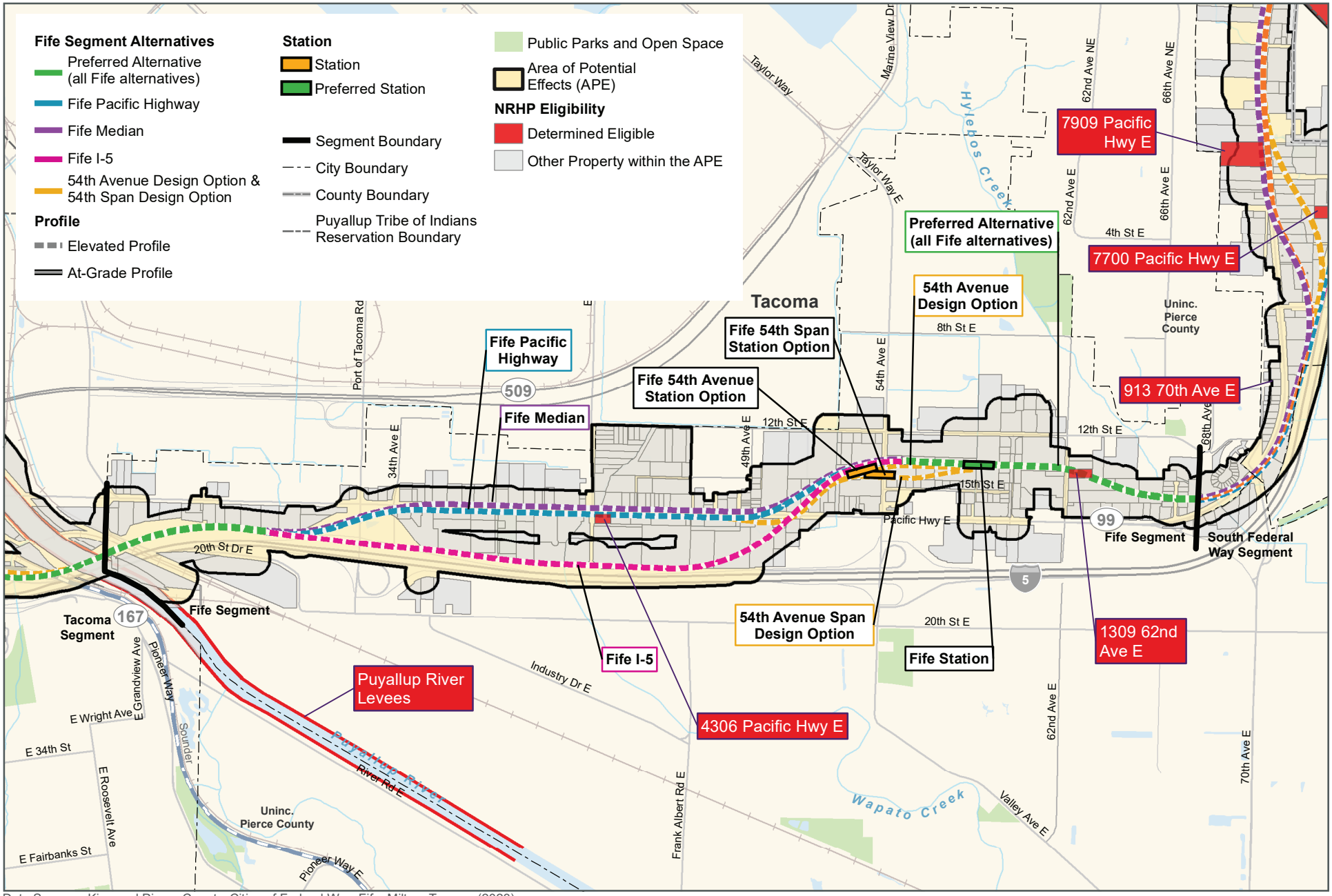
Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

0 0.5 1 Mile

FIGURE 4.16-2
Built-Environment Resources in the South Federal Way Segment

Tacoma Dome Link Extension



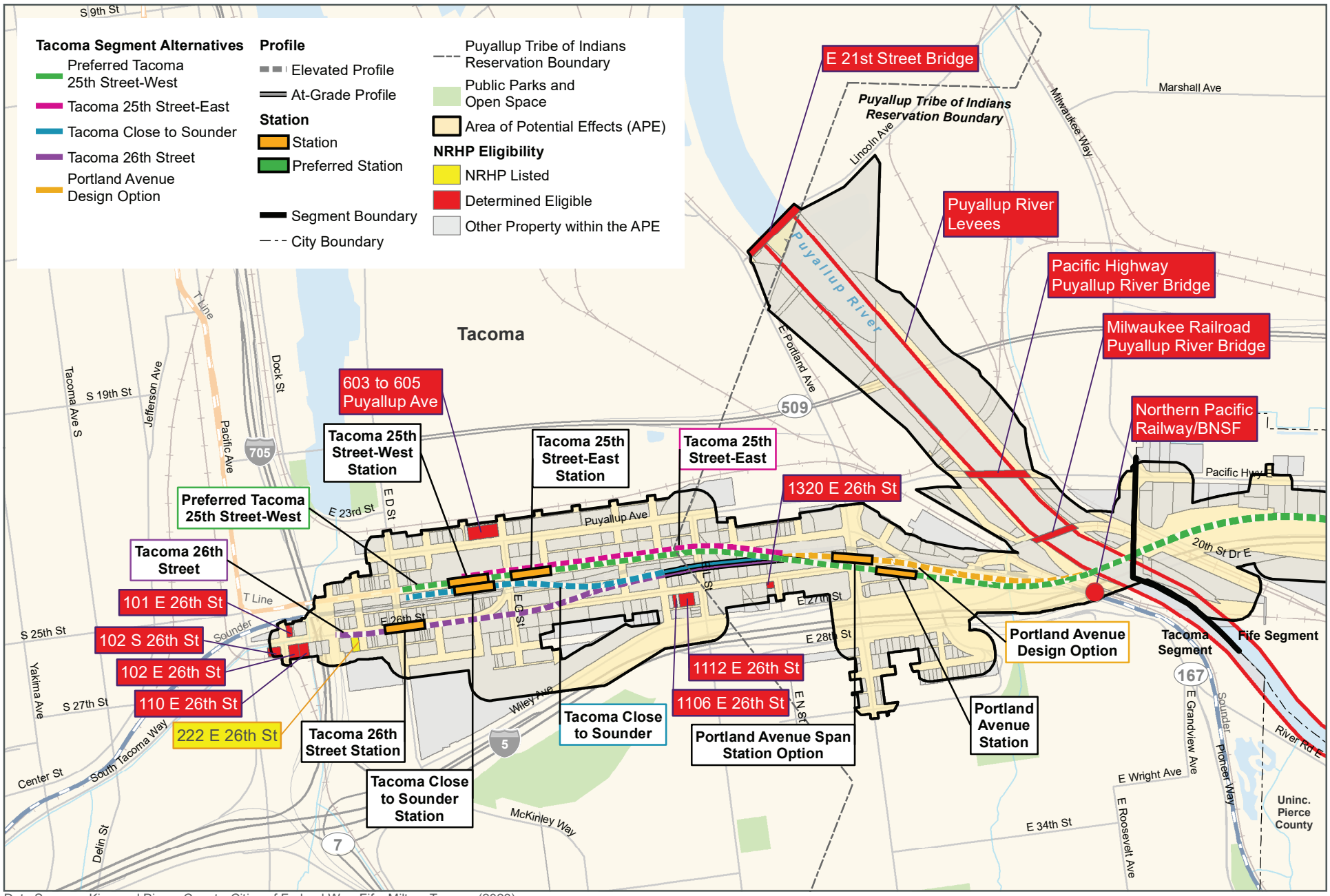
Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

0 0.5 1 Mile

FIGURE 4.16-3
Built-Environment Resources in the Fife Segment

Tacoma Dome Link Extension



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

FIGURE 4.16-4
Built-Environment Resources in the Tacoma Segment

Tacoma Dome Link Extension

4.16.5 Environmental Impacts

This section discusses long-term operational and short-term construction impacts of the alternatives. These impacts are specifically focused on NRHP-eligible and listed resources.

Section 106 regulations allow three findings for effects on cultural resources:

- No Historic Properties Affected.
- No Adverse Effect.
- Adverse Effect.

As the lead agency, FTA makes the final determination of effect for each NRHP-eligible or listed resource in the APE. FTA also makes an overall finding of effect for the undertaking and requests SHPO's concurrence. The Section 106 process is used to determine a historic site's NRHP eligibility and whether it is a Section 4(f) resource. The Section 4(f) Evaluation for TDLE is summarized in Section 4.18 and included in Appendix D of this Draft EIS.

4.16.5.1 Impact Evaluation Methods

After a cultural resource is identified and found NRHP-eligible, the next step is assessing whether the undertaking will adversely affect the resource by applying the Criteria of Adverse Effect (36 CFR 800.5). An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Adverse effects may include, for instance, the demolition of an NRHP-eligible building or physical encroachment upon an NRHP-eligible archaeological site (36 CFR 800.5).

FTA has identified impacts to NRHP-eligible properties for the Preferred Alternative, where identified, and effects determinations have been made for properties adversely impacted by the Preferred Alternative or all build alternatives. FTA will continue to consult on effects to historic properties following publication of the Draft EIS and Sound Transit Board identification of a Preferred Alternative for all segments of the TDLE project.

In addition to the 17 previously recorded archaeological resources in the APE, the TDLE survey identified eight additional archaeological sites and the TDLE geotechnical monitoring identified one additional archaeological resource within the APE. At this early stage of design, it is not possible to identify all archaeological resources that could be affected by the project because the extent of ground disturbance is not fully known and not all areas are accessible for testing. It is possible that one or more archaeological sites exist beneath the ground surface in areas where project excavation would take place. The TDLE project, as currently designed, may impact three NRHP-eligible precontact archaeological resources, sites 45PI488, 45PI1327, and 45PI1557; and one additional historic-period archaeological resource, site 45PI1555, not formally evaluated.

At this stage of design, TDLE has the potential to directly and/or indirectly affect 26 historic (NRHP-listed or eligible) built-environment properties, which includes five extant resources either previously listed or determined eligible and 21 resources surveyed and determined NRHP-eligible for TDLE.

4.16.5.2 No-Build Alternative

The No-Build Alternative includes projects, funding packages, and proposals in the central Puget Sound region that are planned to occur with or without TDLE, as described in Chapter 2 (Section 2.2). The No-Build Alternative would not affect any known archaeological or built-environment properties in the study area.

4.16.5.3 Long-Term Impacts on Archaeological Resources for the Build Alternatives

Impacts or Effects

The terms impact and effect are used purposefully in this Draft EIS Section 4.16 and Appendix J5, Historic and Archaeological Resources Technical Report. The word "effect" is used when referring to the effects (e.g., adverse effect) the project has on historic properties in a Section 106 framework, following implementing regulations at 36 CFR Part 800.

The word "impact" is used when referring to specific long-term or construction impacts, both direct and indirect, pursuant to NEPA implementing regulations at 40 CFR Part 1502.

Potential impacts to archaeological resources include, but are not limited to, the following:

- Demolition or alteration of the resource.
- Physical encroachment upon a site.

The anticipated depths of disturbance of the project are variable throughout the APE. Deep ground disturbance below 20 feet is anticipated across approximately 85 to 90 percent of the guideway alignment and is associated with construction of drilled shafts or columns used to support the elevated guideway. Approximately 10 to 15 percent of the guideway is anticipated to be at grade. Shallower anticipated ground disturbance is also associated with access road construction, staging area use, utility work, and stormwater facilities.

Direct long-term impacts can happen during operation or as a result of a construction activity that causes a permanent change. For archaeological resources, long-term impacts are generally initiated when ground-disturbing activities occur; they are characterized as long-term impacts because they permanently affect the archaeological record.

One of the alternatives would affect one of the NRHP-eligible built-environment resources within the APE. None of the alternatives would affect any additional resources surveyed and recommended potentially eligible for listing in King County, Pierce County, or the City of Tacoma registers of historic places.

The project will result in an adverse effect to one NRHP-eligible archaeological site (45PI1557) and has the potential for adverse effects to an additional two NRHP-eligible archaeological resources and one potentially NRHP-eligible archaeological resource that have been identified in the APE. The probability of encountering intact archaeological resources in the corridor ranges from low to very high. Ground-disturbing activities, specifically those involving excavation or ground clearance, could encounter an unanticipated archaeological site. If the site is determined to be eligible for listing in the NRHP an adverse effect could occur.

Through consultation, the potential for TCPs within the APE has been identified. Sound Transit and FTA will continue to coordinate and consult on potential TCPs as the project moves forward.

Through the NEPA review and the Section 106 process, FTA and Sound Transit will continue to consult with Tribes, SHPO, and other interested parties to avoid, minimize, or mitigate impacts to archaeological sites, if identified.

Federal Way Segment

None of the alternatives in the Federal Way Segment are anticipated to have long-term impacts on known or previously recorded archaeological resources that are listed or have been determined eligible for listing in the NRHP. As there are no such resources within the APE, and no landmarks or locally significant resources identified by the City of Federal Way or King County in the Federal Way Segment, no cultural resources are anticipated to be affected. However, if archaeological resources are identified, FTA, in coordination with Sound Transit and in consultation with SHPO, Tribes and other consulting parties will determine eligibility for listing to the NRHP and apply the criteria for adverse effects to the resource.

South Federal Way Segment

The SF 99-West and SF 99-East alternatives (with or without the Porter Way Design Option) are not anticipated to have long-term impacts on archaeological resources that are currently listed or have been determined eligible for listing in the NRHP, and no landmarks or locally significant resources in the Puyallup Tribe of Indians Reservation, Federal Way, Milton, King County, or Pierce County are anticipated to be affected. However, a culturally sensitive portion of the St. George's Cemetery (45KI867) is along the SF Enchanted Parkway and SF I-5 alternatives within this segment. The eastern boundaries of the cemetery are poorly documented, and ground disturbance associated with construction under the SF Enchanted Parkway and SF I-5 alternatives may encroach on undocumented portions of the cemetery. Based on comments received from the Puyallup Tribe of Indians, the alignment that parallels I-5 has potential to impact significant cultural resources. If unknown resources, including but not limited to human remains, are encountered, an irreversible long-term impact could occur. The potential to encounter unrecorded archaeological resources is generally low.

Additionally, one newly recorded archaeological resource (45KI1586) has been determined eligible for listing in the NRHP and would potentially be affected during the construction of the SF Enchanted Parkway and the SF I-5 alternatives, causing a long-term impact. Potential impacts to this site would be associated with ground clearance and subsurface disturbances because the site was identified both at the surface and within shovel probes. Ground-disturbing activities at the site location could destroy, alter, and/or displace artifacts and the culturally relevant sedimentary context associated with the site. These effects would diminish the integrity of site 45KI1586 as a potentially significant resource.

Because the South Federal Way Segment includes multiple alternatives and there is currently not a Preferred Alternative, FTA will continue to assess impacts to archaeological resources following identification of a Preferred Alternative by the Sound Transit Board.

Fife Segment

In the Fife Segment, one NRHP eligible archaeological resource (45PI488) and one potentially eligible resource (45PI1555) may be affected during the construction of TDLE under all alternatives, causing a long-term impact. Potential impacts to this site would be associated with ground disturbance, as the resources were identified almost entirely below the surface. Ground-disturbing activities at the site location could destroy, alter, and/or displace artifacts and the culturally relevant sedimentary context associated with the site. These effects would diminish the integrity of site 45PI488 as a significant resource and site 45PI1555 as a potentially significant resource.

Additionally, archaeological and geoarchaeological investigations conducted near both the east and west ends of the Fife Segment demonstrated the presence of buried and deeply buried landforms with high potential to contain archaeological resources. If archaeological resources exist in this segment and are eligible for listing in the NRHP, impacts to them would constitute adverse effects.

None of the Fife alternatives would affect landmarks or locally significant resources in the Puyallup Tribe of Indians Reservation, Fife, or Pierce County.

Archaeological resources identified along the Fife Segment are located in a portion of the segment that does not have a Preferred Alternative. As such, FTA will assess effects to archaeological resources following identification of a Preferred Alternative by the Sound Transit Board. The potential to encounter unrecorded archaeological resources is moderate to high in much of this segment.

Tacoma Segment

In the Tacoma Segment, two eligible archaeological resources (45PI1327 and 45PI1557) would potentially be affected causing a long-term impact. Site 45PI1327 would potentially be affected during the construction of TDLE under the Tacoma Close to Sounder and the Tacoma 26th Street alternatives. Site 45PI1557 would be adversely affected during the construction of TDLE under all alternatives within the Tacoma Segment. Potential impacts to these sites would be associated with ground disturbance, as the resources were identified entirely below the surface. Ground-disturbing activities at the sites' locations could destroy, alter, and/or displace artifacts and the culturally relevant sedimentary context associated with the sites. These effects would diminish each site's integrity as significant resources.

Within this segment, ethnographic information as well as previously documented archaeological sites demonstrate the potential for this area to contain archaeological resources. If archaeological resources exist in this segment and are eligible for listing in the NRHP, impacts to them would constitute adverse effects.

None of the alternatives would affect landmarks or locally significant resources in the Puyallup Tribe of Indians Reservation, Tacoma, or Pierce County.

As described above, archaeological site 45PI1557 is adversely affected by all alternatives within the Tacoma Segment. Therefore, FTA has determined and SHPO concurred that the project will have an adverse effect on site 45PI1557. Other portions of this segment include archaeological sites that would be adversely affected by one or more, but not all, alternatives. After the Sound Transit Board identifies a Preferred Alternative, FTA anticipates consultation on adverse effects for these archaeological resources.

4.16.5.4 Construction Impacts on Archaeological Resources for the Build Alternatives

Construction effects are those that occur only during the construction period and are relatively short in duration. These effects may include noise, vibration, dust, etc. It is unlikely that these kinds of effects will adversely affect archaeological resources. However, through the NEPA review and the Section 106 process, FTA and Sound Transit will continue to consult with Tribes, SHPO, and other interested parties to minimize effects to archaeological sites, if found.

4.16.5.5 Indirect Impacts on Archaeological Resources

Indirect impacts may occur during the long-term operation of TDLE or may occur during construction but farther away from the project corridor. Development or redevelopment of the neighborhoods and commercial properties surrounding TDLE is likely to occur, especially near station areas. The probability of encountering intact archaeological resources in the corridor ranges from low to very high. Where further development and redevelopment of residential and commercial areas occurs, there could be indirect impacts if archaeological resources are encountered.

4.16.5.6 Long-Term Impacts on Built-Environment Resources for the Build Alternatives

Impacts Common to All Alternatives

There are 26 listed or eligible built-environment properties with existing structures within the APE, many are within view of, or associated with, existing transportation networks and urban environments.

Where the project alternatives involve an acquisition of all or part of a built-environment property, and where the development of an alternative may require demolishing a built-environment resource or altering major sections of its historically platted and current tax lot, direct effects are likely to be adverse. For properties located outside the construction footprint of alternatives, and where effects are likely to be limited to audible and more distant visual changes, these effects may not be adverse, as long as those resources retain their historic associations. A finding of no adverse effect occurs when the project's effects do not alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the NRHP in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association.

A review of the project's conceptual design (Appendix F, Conceptual Design Drawings) has resulted in a preliminary effects assessment for each built-environment resource in the APE. When alternatives will not diminish the integrity of any of the characteristics that qualify a resource for listing in the NRHP, no adverse effects are anticipated (Tables 4.16-5 and 4.16-6).

Federal Way Segment

As no NRHP-eligible or listed built-environment resources are in the APE of the Federal Way Segment, the Preferred FW Enchanted Parkway and FW Design Option have no potential for long-term effects on NRHP-eligible or listed built-environment resources.

South Federal Way Segment

Nine built-environment resources within the APE of the South Federal Way Segment have been determined NRHP-eligible and are shown in Figures 4.16-5 through 4.16-20 below. Of these, five may be adversely affected by either the SF 99-West or the SF 99-East alternative, with or without the Porter Way Design Option.

Figure 4.16-5. 34726 16th Avenue S, view southeast

Figure 4.16-6. 34726 16th Avenue S, view northwest

Figure 4.16-7. 726 S 356th Street, view northwest

Figure 4.16-8. 726 S 356th Street, view southwest

Figure 4.16-9. School at 36605 Pacific Highway S, view southwest

Figure 4.16-10. Classrooms at 36605 Pacific Highway S, view north

Figure 4.16-11. 36530A Pacific Highway S, courtesy of the King County Assessor

Figure 4.16-12. 36606 Pacific Highway S, courtesy of Redfin.com

Figure 4.16-13. 36903 Pacific Highway S, undated, courtesy of the King County Assessor

Figure 4.16-14. 36903 Pacific Highway S, undated, courtesy of the Redfin.com

Figure 4.16-15. 3700 Pacific Highway S, view southwest

Figure 4.16-16. 3700 Pacific Highway S, view southwest

Figure 4.16-17. 7909 Pacific Highway E, view northwest

Figure 4.16-18. 7909 Pacific Highway E, view west

Figure 4.16-19. 7700 Pacific Highway E, view southeast

Figure 4.16-20. 7700 Pacific Highway E, view south

Constructing the SF 99-West Alternative along the western shoulder of the Pacific Highway within the South Federal Way Segment would result in the partial acquisitions of parcels that include NRHP-eligible buildings; would remove screening trees that shield NRHP-eligible resources including the Montessori Academy at Spring Valley (36605 Pacific Highway S) from Pacific Highway, potentially diminishing the school's integrity of setting; would demolish one NRHP-eligible building (a 1921 residence at 36903 Pacific Highway S); and would require the removal or relocation of significant signage at the Daffodil Motel (7909 Pacific Highway E). Demolition and/or diminishing the integrity of characteristics that qualify a resource for listing in the NRHP constitutes an adverse effect.

Constructing the SF 99-East Alternative along the eastern shoulder and median of the Pacific Highway within the South Federal Way Segment would result in the partial acquisitions of parcels that include NRHP-eligible buildings, would remove screening trees that shield NRHP-eligible resources from Pacific Highway, and would demolish one building that potentially contributes to an NRHP-eligible resource (a ca. 1977 outbuilding at 36530A Pacific Highway S). Demolition and/or diminishing the integrity of characteristics that qualify a resource for listing in the NRHP constitutes an adverse effect.

By contrast, the SF Enchanted Parkway and the SF I-5 alternatives do not have the potential to adversely affect NRHP-eligible built-environment resources as they will not alter any of the characteristics that qualify a resource for listing in the NRHP (Table 4.16-5).

Because the South Federal Way segment includes multiple alternatives and there is currently not a Preferred Alternative, FTA will assess effects to additional built-environment resources after the Sound Transit Board identifies a Preferred Alternative. FTA in coordination with Sound Transit will then consult with SHPO, Tribes, and consulting parties on these effects.

Table 4.16-5 Effects on Built-Environment Resources in the South Federal Way Segment

Resource ID	Name/ Address	Build Date	NRHP Eligibility	Alternative	Assessment of Effects
731955	Denny's Restaurant: 34726 16th Avenue S, Federal Way	1978	Determined NRHP Eligible: Criterion C	SF 99-West Alternative, with or without the Porter Way Design Option	No Adverse Effect: The SF 99-West Alternative could construct the light rail track to the rear and approximately 40 feet above the resource, which would add an additional transportation option within a developed commercial area and add supporting columns near the rear of the building. Locating the line to the rear of this building does not diminish any of the characteristics that qualify it for listing.
731955	Denny's Restaurant: 34726 16th Avenue S, Federal Way	1978	Determined NRHP Eligible: Criterion C	SF 99-East Alternative, with or without the Porter Way Design Option	No Adverse Effect: The SF 99-East Alternative could construct the light rail track to the rear and approximately 40 feet. above the resource, which would add an additional transportation option within a developed commercial area and add supporting columns near the rear of the building. Locating the line to the rear of this building does not diminish any of the characteristics that qualify it for listing.
731955	Denny's Restaurant: 34726 16th Avenue S, Federal Way	1978	Determined Eligible: Criterion C	SF Enchanted Parkway Alternative	No Adverse Effect: the Enchanted Parkway Alternative could construct the light rail track to the rear of the resource, although at a greater distance from the building than other alternatives. Locating the line to the rear of this building does not diminish any of the characteristics that qualify it for listing.
731975	Brooklake Community Center: 726 S 356th Street	ca. 1929	Determined Eligible: Criteria A and C	SF 99-West Alternative with or without the Porter Way Design Option	No Adverse Effect
731975	Brooklake Community Center: 726 S 356th Street	ca. 1929	Determined Eligible: Criteria A and C	SF 99-East Alternative with or without the Porter Way Design Option	No Adverse Effect

Table 4.16-5 Effects on Built-Environment Resources in the South Federal Way Segment (continued)

Resource ID	Name/ Address	Build Date	NRHP Eligibility	Alternative	Assessment of Effects
731992, 731994, 731995, 731996, 731998, 731999, 732000, 732001	Montessori Academy at Spring Valley School and Residence: 36605 Pacific Highway S	ca. 1943	Determined Eligible: Criteria A, B, and C	SF 99-West Alternative with or without the Porter Way Design Option	Adverse Effect Possible: While construction impacts would be temporary, the Federal Way SF 99-West Alternative would require partial acquisition and construct a new elevated track along the shoulder of Highway 99, which would remove mature foliage and potentially diminish the school's integrity of setting.
731992, 731994, 731995, 731996, 731998, 731999, 732000, 732001	Montessori Academy at Spring Valley School and Residence: 36605 Pacific Highway S	ca. 1943	Determined Eligible: Criteria A, B, and C	SF 99-East Alternative with or without the Porter Way Design Option	No Adverse Effect: The SF 99-East Alternative would be separated from this location by the highway and existing screens of mature foliage would remain.
396993	K.C.J. Stables and Residence: 36530A Pacific Highway S	ca. 1900	Determined Eligible: Criteria A and B	SF 99-West Alternative with or without the Porter Way Design Option	Adverse Effect Possible: The SF 99-West Alternative requires partial acquisition of this parcel, which could result in the removal of screening trees or other features of the resource that qualify it for listing in the NRHP.
396993	K.C.J. Stables and Residence: 36530A Pacific Highway S	ca. 1900	Determined Eligible: Criteria A and B	SF 99-East Alternative with or without the Porter Way Design Option	Adverse Effect Possible: The SF 99-East Alternative requires partial acquisition of this parcel, which could result in the removal of screens of trees or other features that qualify the 1900 residence for listing in the NRHP. Additionally, this alternative demolishes a ca. 1977 outbuilding, which, if it contributes the resource's eligibility, could constitute an adverse effect.
395115	Residence: 36606 Pacific Highway S	1947	Determined Eligible: Criterion C	SF 99-West Alternative with or without the Porter Way Design Option	No Adverse Effect: The SF 99-West Alternative would be separated from this location by the highway and existing screens of mature foliage would remain.
395115	Residence: 36606 Pacific Highway S	1947	Determined Eligible: Criterion C	SF 99-East Alternative with or without the Porter Way Design Option	Adverse Effect Possible: While construction impacts would be temporary, the Federal Way SF 99-East Alternative would construct a new elevated track along the shoulder of Highway 99, which would potentially remove screening trees and diminish the residence's integrity of setting.
395874	Residence: 36903 Pacific Highway S	1921	Determined Eligible: Criterion C	SF 99-West Alternative with or without the Porter Way Design Option	Adverse Effect: The SF 99-West Alternative indicates demolition of an NRHP-eligible building at this location. Demolition constitutes an adverse effect.

Table 4.16-5 Effects on Built-Environment Resources in the South Federal Way Segment (continued)

Resource ID	Name/ Address	Build Date	NRHP Eligibility	Alternative	Assessment of Effects
395874	Residence: 36903 Pacific Highway S	1921	Determined Eligible: Criterion C	SF 99-East Alternative with or without the Porter Way Design Option	No Adverse Effect: The SF 99-East Alternative would be separated from this location by the highway and existing screens of mature foliage would remain.
537584/ 725425	Gethsemane Catholic Cemetery: 37600 Pacific Highway S, Federal Way	1974	Determined Eligible: Criteria A and C	SF 99-West Alternative with or without the Porter Design Option	No Adverse Effect: The SF 99-West Alternative could construct the new light rail line along the western shoulder of Highway 99, which would require alterations to the entrance and exit lanes outside the walls of the cemetery. While the new line would be visible from within the cemetery, it would not diminish any of the characteristics that qualify the resource for listing.
537584/ 725425	Gethsemane Catholic Cemetery: 37600 Pacific Highway S, Federal Way	1974	Determined Eligible: Criteria A and C	SF 99-East Alternative with or without the Porter Design Option	No Adverse Effect: The SF 99-East Alternative could construct the line down a center median of Pacific Highway adjacent to the cemetery, which would require alterations to the entrance and exit lanes outside the walls of the cemetery. While the new line would be visible from within the cemetery, it would not diminish any of the characteristics that qualify the resource for listing.
731901	Daffodil Motel: 7909 Pacific Highway E	ca. 1948	Determined Eligible: Criterion C	SF 99-West Alternative with or without the Porter Way Design Option	Adverse Effect Possible: The SF 99-West Alternative would require partial acquisition and demolition or relocation of signage along the highway, which has the potential to diminish the resource's integrity of setting, design, materials, and workmanship. The effect could be mitigated if the signage is retained or relocated to a nearby location.
731901	Daffodil Motel: 7909 Pacific Highway E	ca. 1948	Determined Eligible: Criterion C	SF 99-East Alternative with or without the Porter Way Design Option	No Adverse Effect: The SF 99-East Alternative would be separated from this location by the highway and would not diminish the integrity of any characteristics that qualify the resource for listing.
731933	Commercial Building: 7700 Pacific Highway E	1978	Determined Eligible: Criterion C	SF Enchanted Parkway Alternative	No Adverse Effect: The SF Enchanted Parkway Alternative would add an additional transportation option within a transportation corridor, which would be a compatible use and would not diminish any characteristics that qualify the resource for listing.
731933	Commercial Building: 7700 Pacific Highway E	1978	Determined Eligible: Criterion C	SF I-5 Alternative	No Adverse Effect: The SF I-5 Alternative would add an additional transportation option within a transportation corridor, which would be a compatible use and would not diminish any characteristics that qualify the resource for listing.

Table 4.16-5 Effects on Built-Environment Resources in the South Federal Way Segment (continued)

Resource ID	Name/ Address	Build Date	NRHP Eligibility	Alternative	Assessment of Effects
731933	Commercial Building: 7700 Pacific Highway E	1978	Determined Eligible: Criterion C	SF 99-West and SF 99-East alternatives with Porter Design Option	No Adverse Effect: The Porter Design Option, whether paired with the SF 99-East or SF 99-West alternative, could construct the light rail track to the rear (one parcel west and southwest) of this resource. However, locating the line to the rear of this building does not diminish any of the characteristics that qualify the resource for listing.

Fife Segment

Two built-environment resources within the APE of the Fife Segment are determined eligible for listing in the NRHP.

All alternatives in the Fife Segment have the potential to have permanent long-term adverse effects on a residential built-environment resource at 1309 62nd Avenue E (Figures 4.16-21 and 4.16-22) because the building will need to be demolished under all alternatives. Physical destruction of this property results in an adverse effect under Section 106. The 54th Avenue and 54th Span design options would not change the potential effects in the Fife Segment.

The Fife Pacific Highway Alternative also has the potential to have long-term effects on the Pick-Quick Drive In at 4306 Pacific Highway E (Figures 4.16-23 and 4.16-24). This alternative would encroach upon the parcel and require demolition of the building, which constitutes an adverse effect. The Fife Median Alternative does not have the potential to adversely affect the resource.

Figure 4.16-21. 1309 62nd Avenue E, view east

Figure 4.16-22. 1309 62nd Avenue E, with Garage to the East, view southeast

Figure 4.16-23. 4306 Pacific Highway E, view southwest

Figure 4.16-24. 4306 Pacific Highway E, view southeast

The Fife Median Alternative elevated guideway would be approximately 16 feet above the center lane of the Pacific Highway, leaving two lanes of east-bound traffic and a public sidewalk between the Pick-Quick Drive In's parcel and the guideway. Realignment of Pacific Highway to accommodate the elevated guideway would require acquisition of a small amount of the Pick-Quick Drive In to adjust the sidewalk and driveway entrance. The light rail structure would be at such a height and at such a distance from the Pick-Quick building that this alternative would not screen the building from view, directly affect the building or its surrounding parcel, or disrupt traditional transportation routes to and from Pacific Highway, thereby maintaining public access to the Pick-Quick building. Sound Transit would follow the policies described in Section 4.1, Acquisitions, Displacements, and Relocations, to compensate affected business owners for land converted for transportation purposes and restore any landscaped areas disturbed as part of the project. As proposed, the Fife Median Alternative would not adversely affect the character-defining features that qualify the property for inclusion in the NRHP. While the alternative would add an element to the building's setting, the effect would not be adverse, as the building's relationship with the air space above Pacific Highway is not a characteristic that qualifies it for listing in the NRHP. The alteration to the resource's setting would not constitute an adverse effect.

The Fife I-5 Alternative would avoid adverse effects to the Pick-Quick building, as the guideway would be more than one block (roughly 500 feet) to the rear of this property and along the border of I-5, away from Pacific Highway. When alternatives will not diminish the integrity of any of the characteristics that qualify a resource for listing in the NRHP, no adverse effects are anticipated (Table 4.16-6).

As described above, the house at 1309 62nd Avenue E would be adversely affected by all alternatives within the Fife Segment. FTA determined and SHPO concurred that the project would have an adverse effect to this property. Other portions of this segment include built environment resources that would be adversely affected by one or more, but not all, alternatives. These resources are in portions of the Fife Segment where there is not currently a Preferred Alternative. FTA will assess impacts to additional built-environment resources after the Sound Transit Board identifies a Preferred Alternative. FTA in coordination with Sound Transit will then consult with SHPO, Tribes, and consulting parties on these effects.

Table 4.16-6 Effects on Built-Environment Resources in the Fife Segment

Resource ID	Name/Address	Build Date	NRHP Eligibility Determinations and Criteria	Alternative	Preliminary Effects Recommendation
31927	Residence: 1309 62nd Avenue E, Fife	1900	Determined Eligible: Criteria A and/or B or C	All Fife Segment alternatives	Adverse Effect based on demolition
29547	Pick-Quick Drive In: 4306 Pacific Highway E, Fife	1950	Determined Eligible: Criteria A and C	Fife Pacific Highway Alternative	Adverse Effect based on demolition
29547	Pick-Quick Drive In: 4306 Pacific Highway E, Fife	1950	Determined Eligible: Criteria A and C	Fife Median Alternative	No Adverse Effect
29547	Pick-Quick Drive In: 4306 Pacific Highway E, Fife	1950	Determined Eligible: Criteria A and C	Fife I-5 Alternative	No Adverse Effect

Tacoma Segment

Fifteen built-environment resources in the APE of all Tacoma Segment alternatives are either listed or eligible for listing in the NRHP. Resources surveyed for TDLE and determined NRHP-eligible are visible in Figures 4.16-25 through 4.16-44 below. Of the 14 resources, 12 are located outside the construction footprint for all alternatives and would not be physically altered. The remaining resources, the Northern Pacific Railway/BNSF and the Puyallup River levees, are partially located within the APE and may be minimally affected by construction at the proposed Puyallup River Crossing. However, the project will not adversely affect any characteristics that qualify them for listing in the NRHP and the great majority of the railroad corridors and levee system are located outside the APE and would remain unaltered. Additionally, alteration to the levees within the APE would not be visible once construction was complete and the levees repaired in-kind.

Changes to the settings of the built-environment resources would also be minimized because most are more than a block away from any of the proposed stations and tracks for the alternatives. This includes the three eligible bridges that carry historic associations with Tacoma's transportation development and feature views north to the Puget Sound. These setting characteristics would remain with any of the alternatives, including the historic-period associations (visual, circulatory) the bridges have with the surrounding historic transportation network. Apart from the levees, which are located along a river already crossed by multiple roadway and rail bridges, the only resource within a block of new construction is Engine House 4, which is approximately 16 feet away from proposed construction. Based on the proposed plans, which indicate that the guideway will be about four stories above Engine House No. 4 and 16 feet away from the building and will not adversely affect any of the characteristics that qualify Engine House No. 4 for listing in the NRHP (Table 4.16-7).

Figure 4.16-25. BNSF Rail from I-5, West Bank of the Puyallup River, view north

Figure 4.16-26. BNSF Rail and Bridge from I-5, West Bank of the Puyallup River, view south

Figure 4.16-27. Residence at 1320 E 26th Street, view south

Figure 4.16-28. Residence at 1320 E 26th Street, view southeast

Figure 4.16-29. Residence at 1112 E 26th Street, view southwest

Figure 4.16-30. Residence at 1112 E 26th Street, view southeast

Figure 4.16-31. Residence at 1106 E 26th Street, view southwest

Figure 4.16-32. Residence at 1106 E 26th Street, view southeast

Figure 4.16-33. BNSF Freight Warehouse at 603–605 Puyallup Avenue, View Northwest

Figure 4.16-34. BNSF Freight Warehouse at 603–605 Puyallup Avenue, View Northeast

Figure 4.16-35. Puyallup River Levees, view north from the I-5 bridge

Figure 4.16-36. Puyallup River Levees, view south from the I-5 bridge

Figure 4.16-37. Commercial Building at 101 E 26th Street, Facade and East Elevation, view northwest

Figure 4.16-38. Commercial Building at 101 E 26th Street, Undated, view northwest, courtesy of the Department of the Interior

Figure 4.16-39. Commercial Building at 102 S 26th Street, Facade and West Elevation, view southeast

Figure 4.16-40. Commercial Building at 102 S 26th Street, East Elevation, view west

Figure 4.16-41. Almond Roca Factory at 110 E 26th Street, view southwest

Figure 4.16-42. Original Brown and Haley Factory at 110 E 26th Street, 1948, courtesy of Tacoma Public Library

Figure 4.16-43. Pavilion at 102 E 26th Street, view southwest

Figure 4.16-44. Pavilion at 102 E 26th Street, view southeast

Table 4.16-7 Effects on Built-Environment Resources in the Tacoma Segment

Resource ID	Name/Address	Build Date	NRHP Eligibility	Alternative	Assessment of Effects
536705	Residence, 1320 E 26th Street, Tacoma	1914	Determined Eligible: Criterion C	All Tacoma Segment alternatives	No adverse effect
721797	Residence, 1112 E 26th Street, Tacoma	1903	Determined Eligible: Criterion C	Tacoma Close to Sounder and 26th Street alternatives	No adverse effect
516320	Residence, 1106 E 26th Street, Tacoma	1903	Determined Eligible: Criterion C	Tacoma Close to Sounder and 26th Street alternatives	No adverse effect
32815	BNSF Freight Warehouse, 603-605 Puyallup Avenue, Tacoma	1950	Determined Eligible: Criteria A and C	Tacoma: 25th Street-West and 25th Street-East alternatives	No adverse effect
722117	Puyallup River Levees	1950	Determined Eligible: Criterion A	All Tacoma Segment alternatives	No adverse effect
31231	Milwaukee Railroad-Puyallup River Bridge, Tacoma (railroad crossing)	1910	Determined Eligible: Criteria A and C by FHWA (2009)	All Tacoma Segment alternatives	No adverse effect
31786	Puyallup River Bridge, Tacoma (Pacific Highway E crossing)	1927	Determined Eligible: criteria undetermined by FHWA (2013)	All Tacoma Segment alternatives	No adverse effect
90499	East 21st Street Bridge, Tacoma (Lincoln Avenue crossing)	1929	Determined Eligible: criteria undetermined by FHWA (2008)	All Tacoma Segment alternatives	No adverse effect
722131	Northern Pacific Railway/BNSF	ca. 1873	Determined Eligible: Criterion A	All Tacoma Segment alternatives	No adverse effect
31673	Engine House 4 – Tacoma Fire Station No. 4, 220-224 E 26th Street, Tacoma	1910	Listed in the WHR and NRHP in 1984	All Tacoma Segment alternatives	No adverse effect

Table 4.16-7 Effects on Built-Environment Resources in the Tacoma Segment (continued)

Resource ID	Name/Address	Build Date	NRHP Eligibility	Alternative	Assessment of Effects
31674	Commercial building, 101 E 26th Street, Tacoma	1909	Determined Eligible: Criteria A and C	All Tacoma Segment alternatives	No adverse effect
536748	Commercial building, 102 S 26th Street, Tacoma	1937	Determined Eligible: Criteria A and C	Tacoma 26th Street Alternative	No adverse effect
536754	Commercial building, 110 E 26th Street, Tacoma	1920	Determined Eligible: Criteria A and C	Tacoma 26th Street Alternative	No adverse effect
722335	Commercial building, 102 E 26th Street, Tacoma	1962	Determined Eligible: Criteria A and C	Tacoma 26th Street Alternative	No adverse effect

4.16.5.7 Construction Impacts on Built-Environment Resources for the Build Alternatives

Construction-related impacts to built-environment resources can be caused by several factors, including, but not limited to, restricted access, increased truck traffic along haul routes, glare, noise, vibration, and temporary changes to setting. These factors can lead to reduced commercial activity and reduced investment in historic resources. Typically, these impacts would not be considered adverse effects under Section 106 of the National Historic Preservation Act unless they diminish the characteristics that contribute to a historic property's National Register eligibility.

Federal Way Segment

As there are no NRHP-eligible or listed built-environment resources in the APE for the Federal Way Segment, there is, therefore, no potential for construction-related effects on NRHP-listed or eligible built-environment resources.

South Federal Way Segment

Short-term, construction-related effects are possible based on the close proximity of construction and temporary construction easement needs, which could restrict public access, lead to increased noise and vibration, and limit economic, spiritual, or educational activities at commercial, religious, and educational resources, including the Denny's Restaurant at 34726 16th Avenue S, the Gethsemane Cemetery at 37600 Pacific Highway S, the Montessori Academy at Spring Valley at 36605 Pacific Highway S, and the Daffodil Motel at 7909 Pacific Highway E (the SF 99-West Alternative), the K.C.J. stables at 36530A Pacific Highway S (the SF 99-East Alternative), and the commercial showroom at 7700 Pacific Highway E (the SF Enchanted Parkway Alternative, the SF I-5 Alternative, and the Porter Design Option, paired with either the SF 99-West Alternative or the SF 99-East Alternative). These short-term construction-related impacts are not anticipated to result in adverse effects.

Fife Segment

The Fife Median Alternative could have temporary construction effects on the Pick-Quick Drive In (4306 Pacific Highway E). These effects would result from the close proximity of construction and

temporary construction easement needs, which could restrict public access, lead to increased noise and vibration, and limit economic activity for the business. These short-term construction-related impacts are not anticipated to result in adverse effects.

Tacoma Segment

No adverse effects are anticipated for the Preferred Tacoma 25th Street-West, Tacoma 25th Street-East, or Tacoma Close to Sounder alternatives. Short-term construction impacts due to the close proximity of construction and temporary construction easement needs for the Tacoma 26th Street Alternative is expected to occur at Engine House 4, which could limit public access, lead to increased noise or vibration, and limit economic activity for businesses. These short-term construction-related impacts are not anticipated to result in adverse effects.

4.16.5.8 Indirect Impacts on Built-Environment Resources

Indirect effects of TDLE may include increased population, transportation, and commercial and economic activity in the area, including associated public infrastructure, retail, residential, or industrial construction projects that occur over time after the project is operating. These urban development pressures may be higher near station areas, where the economic and mobility benefits of light rail would be most apparent. Other urban development activities may impact historic-period, built-environment resources either through potential redevelopment of historic properties or through changes to their surrounding settings that add up over time. Indirect impacts associated with increased development may be minimal, depending on their context. For example, the NRHP-eligible built-environment resources in the South Federal Way Segment are located along Pacific Highway, which is a main arterial. While the addition of a light rail line will add transportation options within the transportation corridor, those uses will be compatible with existing transportation uses, and any resulting growth will likely be consistent with historic patterns. Highway traffic may increase or decrease over time. Because no stations are proposed within the vicinity of NRHP-eligible resources, the addition of a light rail line may not greatly alter patterns of use and development in the area along the South Federal Way Segment. Similarly, most of the NRHP-eligible or listed historic-period, built-environment resources in Tacoma and Fife have long been defined by their location along a growing transportation corridor associated with the Port of Tacoma, the transcontinental railroad, and roadways linking Tacoma and Seattle. These areas have been through numerous periods of development and change and do not retain high integrity of setting, are not home to NRHP-listed historic districts, and are not noteworthy for their cohesive architectural character. Those resources that have been found eligible in recent years, and those that were determined eligible for TDLE, are located within heavily altered settings and will remain eligible if the transportation corridor with which they are associated continues to evolve over time in association with the construction of TDLE.

Avoidance and Minimization of Impacts

Potential impacts to archaeological and built-environment resources would be controlled through project planning, design, and the application of required best management practices during construction and operation. Construction of the proposed project may result in temporary impacts due to reduced access or general construction activity. Measures presented in Chapter 3, Transportation Environment and Consequences; Section 4.7, Noise and Vibration; Section 4.5, Visual and Aesthetics; and Section 4.1, Acquisitions, Displacements, and Relocations, will minimize these impacts.

4.16.6 Potential Mitigation Measures

Archaeological Resources

The project will result in an adverse effect to one NRHP-eligible archaeological site (45PI1557) and has the potential for adverse effects to an additional two NRHP-eligible archaeological resources and one potentially NRHP-eligible archaeological resource. As noted above, additional adverse effects may be identified through further consultation and project design progression. The project is in areas with high to very high potential for encountering archaeological resources and human remains. In order to assess these risks, Sound Transit anticipates engaging in additional preconstruction archaeological investigations. It is likely that these investigations will be phased as a result of the property acquisition process. Investigations will likely focus on specific areas of concern within each segment. Sound Transit, in coordination with FTA will develop an investigation and treatment plan that identifies specific areas where investigations will be focused. FTA and Sound Transit will consult with the Puyallup Tribe of Indians, the Muckleshoot Indian Tribe, the Nisqually Indian Tribe, the Yakama Nation, SHPO, and other consulting parties to develop and review the plan. If precontact or historic-period archaeological sites are encountered, FTA and Sound Transit will consult with affected Tribes, SHPO, and other consulting parties about eligibility for listing in the NRHP, project effects, necessary mitigation, and/or other treatment measures.

To resolve identified adverse effects, FTA and Sound Transit, in consultation with affected Tribes, SHPO, and other interested parties, will prepare a Section 106 Programmatic Agreement, as per 36 CFR 800.6 and 800.14. A draft Section 106 Programmatic Agreement is included in Appendix J5, Historic and Archaeological Resources Technical Report. Consultation on this agreement will continue throughout the remainder of the environmental review process and will be executed prior to FTA's issuance of a Record of Decision. The agreement will include appropriate measures to resolve the adverse effects to the eligible resources. Examples of mitigation measures include, but are not limited to, modifying the undertaking through redesign, reorientation, or other similar changes, implementing data recovery of archaeological information and materials, preparing a National Register nomination for an archaeological site, and preparing an ethnographic study. An archaeological resources monitoring and treatment plan and an unanticipated discovery plan will be prepared to guide archaeological monitoring work before and during construction.

Built-Environment Resources

To resolve adverse effects, FTA, SHPO, and Sound Transit, in consultation with the cities of Federal Way and Fife as well as other consulting parties, will prepare a Section 106 Programmatic agreement document. A draft programmatic agreement, which sets out the procedure for consultation, review, and compliance, is included as an attachment to Appendix J5, Historic and Archaeological Resources Technical Report. The agreement will include appropriate mitigation measures to resolve the adverse effects to the eligible resources. Examples of mitigation measures include, but are not limited to, preparing additional documentation or interpretation for the resources, designing/installing an interpretive/educational display or exhibit, or preparing an NRHP nomination (DAHP 2020). As described above, consultation on this agreement will continue throughout the remainder of the environmental review process and will be executed prior to FTA's issuance of a Record of Decision.

4.17 Parks and Recreational Resources

4.17.1 Introduction to Resource and Regulatory Requirements

The purpose of this section is to identify and evaluate the impacts of TDLE on parks and recreational resources, including designated public parks and open spaces, trails, and other publicly owned and publicly accessible lands that support recreational activities. The analysis considers how the project could affect the use or enjoyment of existing and planned parks and recreation resources, including long-term operational impacts, short-term construction impacts, and potential direct, and indirect impacts of project alternatives.

Impacts on parks and recreational resources are also evaluated under two federal statutes: Section 6(f) of the 1965 Land and Water Conservation Fund Act and Section 4(f) of the U.S. Department of Transportation Act of 1966. Additionally, records were reviewed to identify if the project would change or convert any properties directly funded by the Washington State Recreation and Conservation Office (RCO). Discussion of potential Section 6(f) resources and RCO properties is included in Section 4.17.4. The Section 4(f) resources are evaluated in Section 4.18.

4.17.2 Affected Environment

The study area includes existing and planned parks, trails, recreation sites, dedicated open space areas, and adjacent public rights-of-way used to access those facilities within 250 feet of the project footprint and area used for construction and 0.5 mile from each potential station location. Recreational uses in the study area include a wide range of activities, such as walking, biking, fishing in the Puyallup River, and the passive enjoyment of open space. Table 4.17-1 identifies each park and recreational resource within the study area, which are shown by segment on Figures 4.17-1 through 4.17-4 and described below.

Table 4.17-1 Parks, Open Space, and Recreational Resources in the Study Area

Park Facility	Location and Access	Recreational Uses	Size
Federal Way Segment			
Cedar Grove Park	S 333rd Street Federal Way	Neighborhood park with picnic facilities, play equipment, paved trails, basketball court, and grassy open space	2.7 acres
South Federal Way Segment			
Brooklake Park	S 356th Street Federal Way	Natural area, trail, small lake, adjacent to West Hylebos Wetlands	4.5 acres
West Hylebos Wetlands Park	S 348th Street Federal Way	Natural area, trails	99.8 acres
Hylebos Wetlands (North)[1]	S 359th Street Federal Way	Natural area	47.5 acres
Spring Valley Open Space[1]	Pacific Highway Federal Way	Natural area, wetlands, and open space	44.8 acres
West Hylebos Basin Open Space (North)[1]	Pacific Highway Federal Way	Natural area	22.4 acres
Hylebos Wetlands (South)[1]	1st Avenue S	Natural area and wetlands (mitigation area designated by the Commencement Bay Natural Resource Damage Assessment)	32.8 acres

Table 4.17-1 Parks, Open Space, and Recreational Resources in the Study Area (continued)

Park Facility	Location and Access	Recreational Uses	Size
West Hylebos Basin Open Space (South) [1]	Pacific Highway Federal Way	Natural area	9.0
West Hylebos Osaka Property	Pacific Highway Milton	Public conservation area, public access to Hylebos Creek	1.7 acres
Fife Segment			
Hylebos Nature Area and Trail	8th Avenue E Fife	Natural area with trails through the Hylebos wetlands, with a picnic area and restroom.	16.7 acres
Interurban Trail connection and spuyaləpabš Trail[2] (Planned)	Vicinity of Wapato Way E and 20th Street E to the western Fife city limit near the Puyallup River	Shared-use path connecting the Interurban Trail to the spuyaləpabš Trail that is planned to connect Puyallup, Fife, and downtown Tacoma. The connection to the Interurban Trail and a short section of the path across the Wapato Way E Bridge has been constructed as part of WSDOT's SR 167 Completion Project.	4 miles (of 7-9 miles total project)
Ellenswood Conservancy	12th Street E Fife	Undeveloped site	1.3 acres
Cappa Park (Planned)	3812 Pacific Highway East Fife	Undeveloped property, subject to current park planning process (Fife 2022 Parks, Recreation, and Open Space Plan)	4.2 acres
Fife Aquatic Center and Colburn Park	20th Street E Fife	Public swimming pool and adjacent playground	2.1 acres
Fountain Memorial Park	54th Avenue E and 20th Street E Fife	Small green space, fountain, and park benches	0.8 acres
Tacoma Segment			
First Creek Park (Planned)	Southwest of the roundabout at East S Street, E 30th Street, and E 29th Street Tacoma	Planned to include green space, landscaping, walking path, play area	Less than 1 acre
spuyaləpabš Trail[2] (Planned)	Downtown Tacoma (along Puyallup Avenue between the Thea Foss Esplanade and Puyallup River)	Shared-use path connecting Tacoma to Fife, the Interurban Trail, and Puyallup. In Tacoma, the path is part of the city's Puyallup Avenue Complete Streets project and connects to the Thea Foss Esplanade	1.2 miles (of 7-9-mile total project)
McKinley Park and Upper Park Trail	Upper Park Street Tacoma	Green space, pond, paths, dog park, and two playgrounds	24.6 acres
Waterway Park (Planned)	East D Street Tacoma	Existing water access for human-powered watercraft, planned amenities, including open space, park benches, walking paths, and possibly a community building that would include a tribal exhibit	5.4 acres

Table 4.17-1 Parks, Open Space, and Recreational Resources in the Study Area (continued)

Park Facility	Location and Access	Recreational Uses	Size
Foss Waterway Public Esplanade and 21st Street Park	S 4th Street at Thea's Park Tacoma	Multiuse path along the east side of Foss Waterway and small grassy area with benches, eventually planned to connect Thea's Park and the planned Waterway Park	1.9 miles
Don Pugnetti Park	Pacific Street and 21st Street	Green space, landscaping, park benches	0.5 acre
Water Flume Line Trail	S 25th Street	Multiuse path along South Tacoma Way	3.5 miles

Sources: City of Federal Way Parks, Recreation and Open Space Plan Recommendation (May 2019); City of Fife Parks, Recreation and Open Space Plan (February 2022); Cappa Park Site Master Plan Summary Report (September 2022); Metropolitan Park District of Tacoma 2024-2030 System and Strategic Plan (July 2024); and Foss Waterway Park Final Management and Operations Plan (November 2019).

Notes:

(1) Collectively referred to as Spring Valley Vista Open Space. The City of Federal Way has begun some preliminary planning for a potential trail network connecting these City-owned parcels along the West Hylebos.

(2) The spuyaləpabš Trail was previously called the Tacoma to Puyallup Regional Trail during the planning process for the trail.

4.17.3 Environmental Impacts

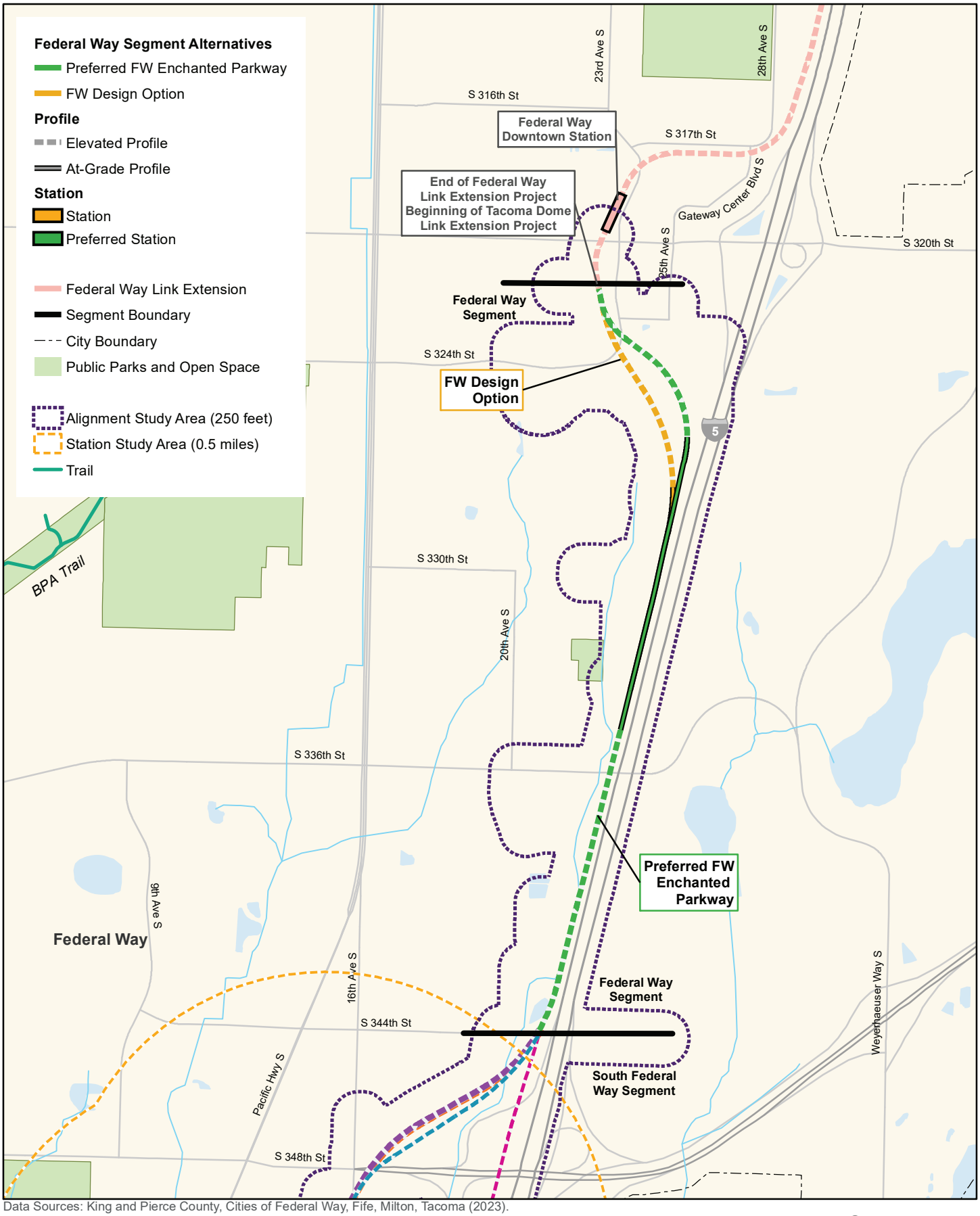
4.17.3.1 No-Build Alternative

The No-Build Alternative includes projects, funding packages, and proposals in the central Puget Sound region that are planned to occur with or without TDLE, as described in Chapter 2 (Section 2.2). The No-Build Alternative would not affect any park or recreational resource in the study area.

4.17.3.2 Long-Term Impacts for the Build Alternatives

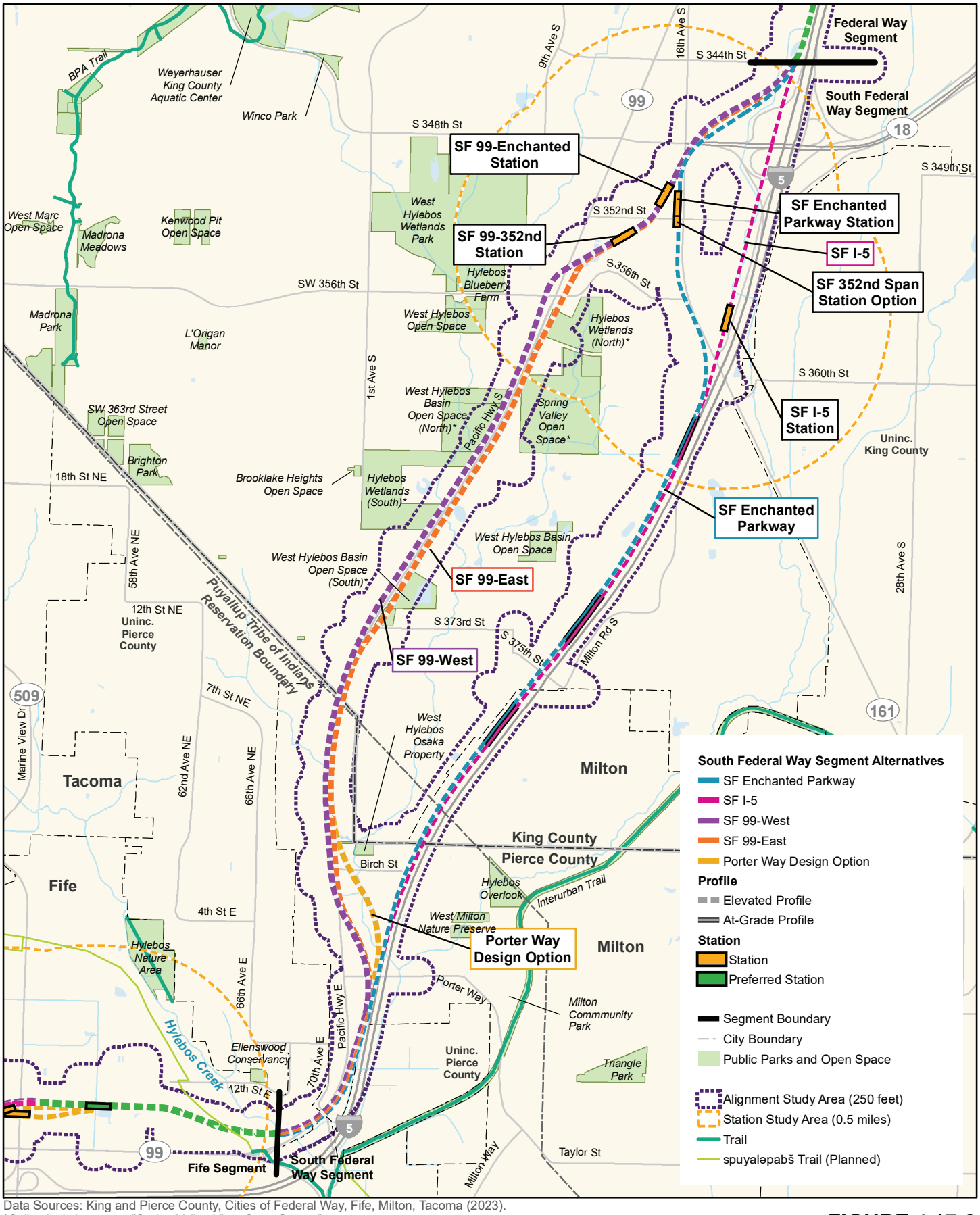
Direct long-term impacts typically include permanent changes to a resource, such as converting a park or recreational resource to another use. All the existing parks and recreational resources within the TDLE study area are outside the permanent project footprint. TDLE would make no physical changes to any existing park or recreational resource. However, with some alternatives, some elevated track and columns would be located adjacent to or in open space and natural areas. Elevated track and columns would add a new visual element and columns would create a physical obstruction on some portion of the property.

A portion of the SF 99-West Alternative would be on the West Hylebos Basin Open Space (North) and Hylebos Wetlands (South), and that alignment would be adjacent to the Hylebos Wetlands (North) and West Hylebos Open Space (South) to the east. A portion of the SF 99-East Alternative would be located on the Hylebos Wetlands (North) and the West Hylebos Open Space (North). A portion of the SF 99-West Porter Way Design Option would cross a small portion of the West Hylebos Osaka Property.



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

FIGURE 4.17-1
Public Parks, Open Spaces, and Recreational Resources
Federal Way Segment
Tacoma Dome Link Extension

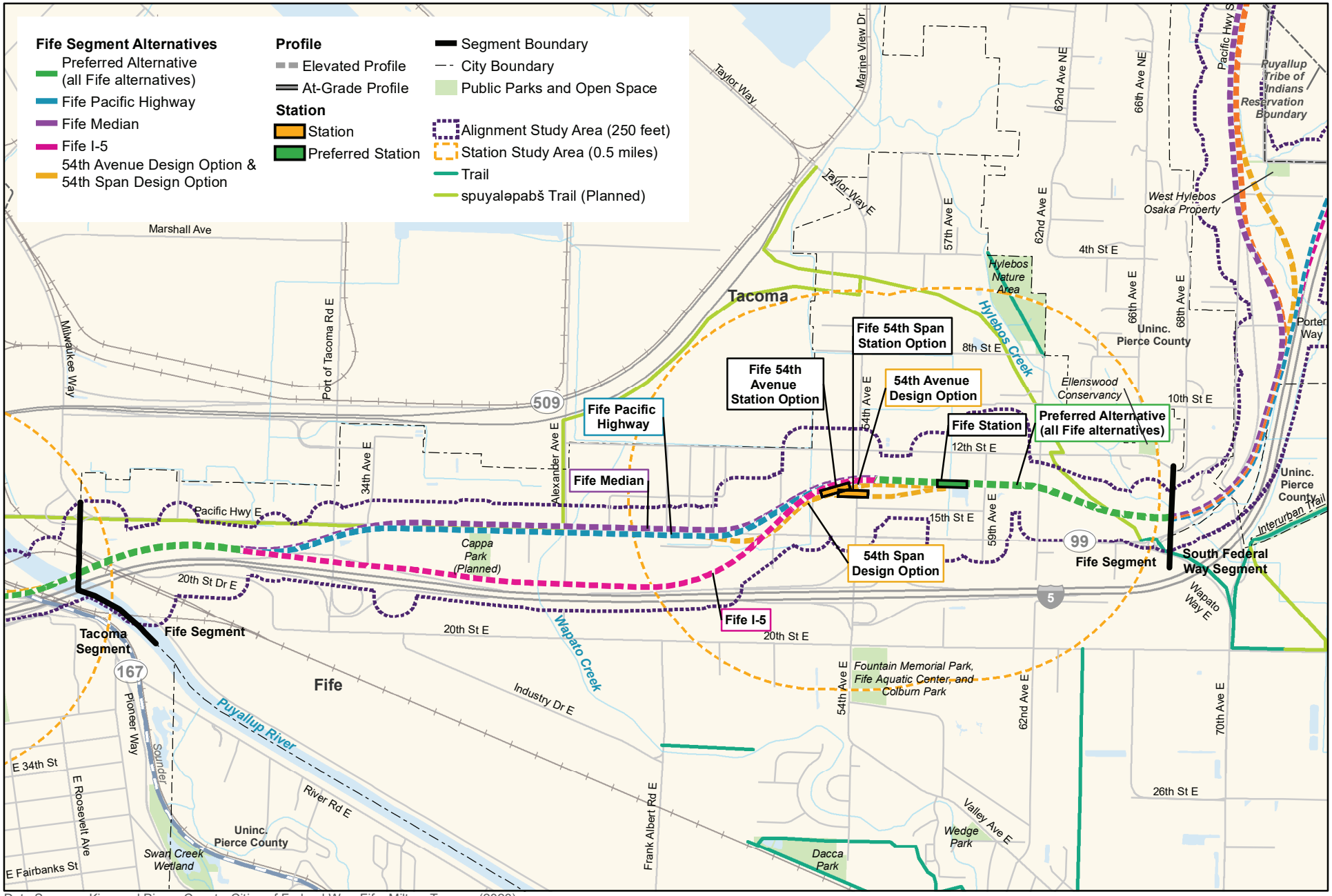


Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).
*Collectively known as "Spring Valley Vista Open Space."

N

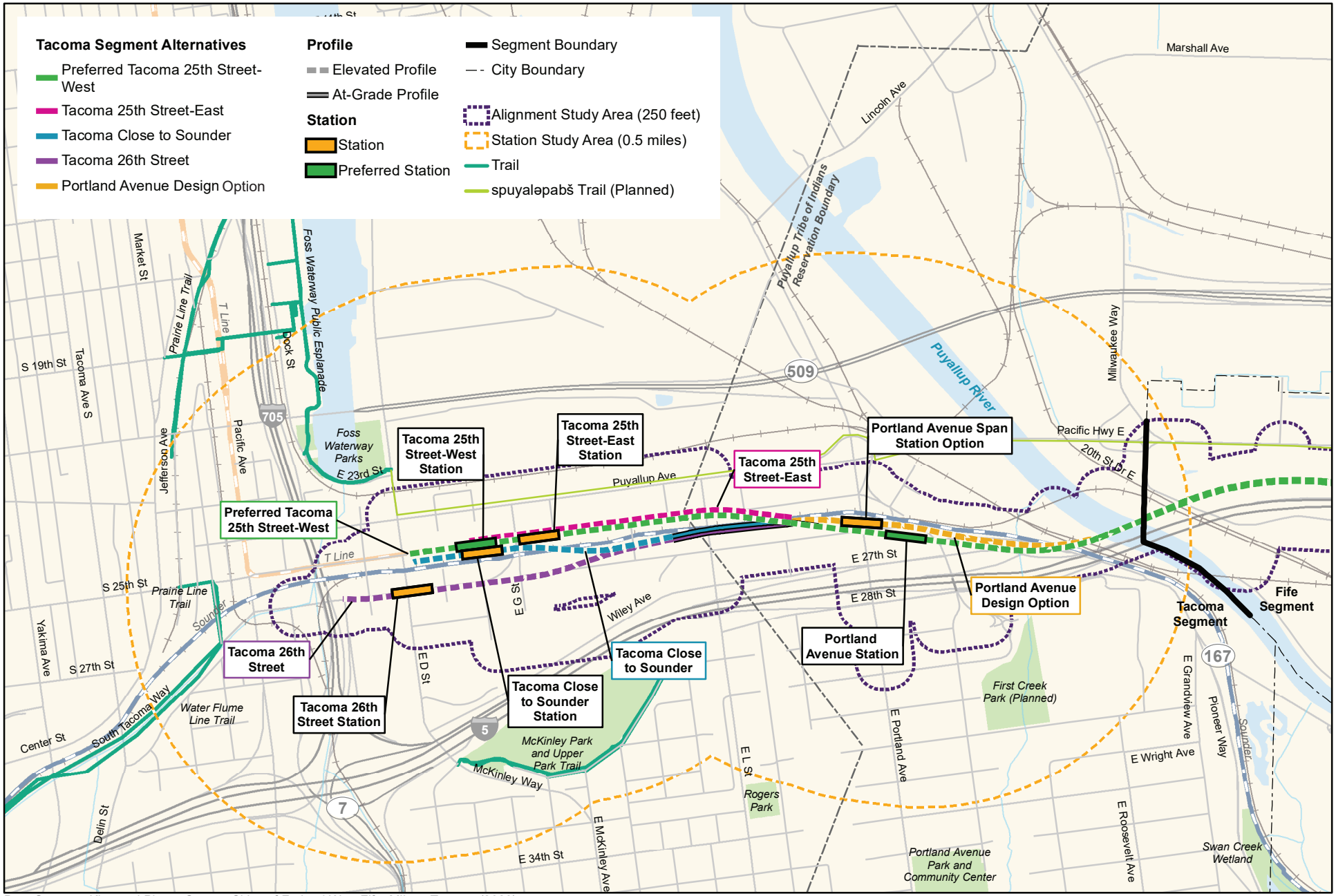
0 0.5 1 Mile

FIGURE 4.17-2
Public Parks, Open Spaces, and Recreational Resources
South Federal Way Segment
Tacoma Dome Link Extension



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

FIGURE 4.17-3
Public Parks, Open Spaces, and Recreational Resources
Fife Segment
Tacoma Dome Link Extension



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

0 0.5 1 Mile

FIGURE 4.17-4
Public Parks, Open Spaces, and Recreational Resources
Tacoma Segment
Tacoma Dome Link Extension

All of the alternatives in the Fife Segment would include columns and an elevated guideway along the property line of the planned Cappa Park; the Fife I5 Alternative would impact the south edge and the Fife Median and Fife Pacific Highway alternatives would impact the north edge of the planned park property. No timeline for development of the proposed park has been determined, nor has the proposed use or configuration of the property. Sound Transit would continue to coordinate with the City of Fife to minimize impacts as the planning for Cappa Park moves forward. There would be no additional direct impacts to any existing park, open space, or recreational resources from operations.

If TDLE is constructed in phases, the M.O.S. to the station in South Federal Way or the M.O.S. to the station in Fife, like the full build alternatives, would have no direct impacts to existing parks within the TDLE study area. Impacts to the planned Cappa Park would be avoided until the full build alternative is constructed.

4.17.3.3 Construction Impacts for the Build Alternatives

Common temporary construction impacts include impacts to access due to detours and street or lane closures, increased congestion caused by construction traffic, or dust and noise. For parks and recreational resources near construction activities, access could be affected by detours and street or lane closures, and by increased congestion caused by construction traffic. These types of construction impacts may occur in the Federal Way Segment with the Preferred FW Enchanted Parkway, which would require some utility relocations on S 333rd Street — the street used to access Cedar Grove Park. During that work, access to Cedar Grove Park from the east may be affected through detour or lane closure, but access from the west would be maintained. In the Fife Segment, temporary construction would also occur on the planned Cappa Park with any of the alternatives. If the planned park is constructed prior to TDLE, potential construction impacts could include impacts to access or some dust or noise related to the placement of columns and elevated guideway. Construction in the Fife and Tacoma segments could require temporary closure or detours to the spuyaləpabš Trail connection (previously called the Tacoma to Puyallup Regional Trail during planning), if that project is constructed before TDLE.

Avoidance and Minimization of Impacts

For any potential construction impacts that would not involve physical changes to a park or recreational facility, Sound Transit would coordinate with appropriate jurisdictions and facility operators to maintain access to parks. Sound Transit would implement outreach to the public to provide information on temporary roadway closures or detours, on-site signage describing the duration and type of temporary construction activities, detour signage, temporary ADA improvements (for example, temporary curb ramps for detour routes that do not currently include curb ramps for existing sidewalks), and similar strategies to ensure the continued use and enjoyment of affected park facilities. Sound Transit would incorporate these measures into construction plans and specifications as applicable.

Potential permanent impacts to the Cappa property could require additional mitigation and is discussed further in Section 4.18.

4.17.3.4 Indirect Impacts

Indirect impacts could include changes to access or changes to surroundings and user experiences. TDLE could improve access to parks and recreational activities, particularly to the planned Waterway Park that would be within walking distance of several of the potential Tacoma Dome station locations. The remaining parks and recreational facilities in the study

area are all more than 0.25 mile from proposed light rail stations, so they are less likely to be indirectly impacted, but they may benefit from improved access due to the nonmotorized and other street improvements being implemented as part of TDLE.

4.17.4 Section 6(f) Resources and RCO Properties

The Land and Water Conservation Fund (LWCF) provides funds for acquiring or developing parks and recreation areas intended to safeguard natural areas, water resources, and cultural heritage and to provide recreational opportunities. Section 6(f) of the LWCF Act prohibits conversion of properties developed with funding from the LWCF to a nonrecreational purpose, without the approval of the U.S. Department of the Interior's National Park Service.

Similar to Section 6(f), documentation and consultation are also required to approve any changes to or conversion of properties directly funded by the RCO. Sound Transit reviewed project records on RCO's PRISM database (RCO 2020).

The following Section 6(f) or RCO-funded properties were identified within the TDLE study area, including:

- North Fork West Hylebos Creek (Federal Way) – A project that removed an existing 18-inch culvert and restored a stream channel at S 359th Street.
- Puyallup River Watershed Revegetation (Pierce County) – A project that established or improved riparian buffers along streams in the Puyallup River Watershed.
- Birch Street Barrier Removal (Milton) – A project that removed a barrier culvert located on Birch Street and the west fork of Hylebos Creek and replaced it with a new structure that provides fish passage.
- Thea Foss – 21st Street Park (Tacoma) – A project that completed the initial phase of the Thea Foss Waterway Public Esplanade and provided 2.5 acres of waterfront park space for esplanade walkways, benches, picnic areas, green space, landscaping, and parking.
- Waterway Park Kayak Float (Tacoma) – A project that installed a pier and canoe and kayak boat launch on the Thea Foss Waterway at E 21st Street. Future development would provide a new water access facility, a shoreline esplanade, and possibly a community building and tribal cultural exhibits (the future development described here is being planned as the Waterway Park, described in Section 4.17.2, Tacoma Segment).

Although these properties are located within the 0.5-mile study area, they are more than 0.25 mile from all project elements for all alternatives. No impacts to any Section 6(f) or RCO-funded properties under any of the build alternatives are anticipated because the project would not have a direct or indirect conversion of any RCO-funded properties.

4.17.5 Potential Mitigation Measures

No mitigation beyond the avoidance and minimization measures described above would be anticipated for construction impacts. Potential mitigation for any permanent impacts is discussed further in Section 4.18.

4.18 Section 4(f) Evaluation Summary

This section summarizes the evaluation in Appendix D, Draft Individual Section 4(f) Evaluation, which provides the documentation necessary to support determinations required to comply with the provisions of Section 4(f) of the Department of Transportation Act of 1966, as amended (codified in 49 U.S.C. 303, implemented by 23 CFR Part 774).

What is Section 4(f)?

Section 4(f) is a federal statute intended to protect significant publicly owned parks, recreation areas, and wildlife or waterfowl refuges, as well as any publicly or privately owned historic site listed or eligible for listing on the National Register of Historic Places.

FTA may not approve the use of a Section 4(f) property, unless there is no "feasible and prudent alternative to the use of land from the property and the action includes all possible planning to minimize harm to the property resulting from the use."

A Section 4(f) use is generally defined as an activity that permanently or temporarily incorporates land from a Section 4(f) property or that substantially impairs the important activities, features, or attributes that qualify the property as a Section 4(f) resource (23 CFR 774.17).

4.18.1 Study Area

The study area for the TDLE Section 4(f) evaluation includes the study area used for the parks and recreational resources analysis in Section 4.17, which included the areas within 250 feet (about one block) from the light rail alignment and station footprint, and the area of potential effects (APE) for historic and archaeological resources, established in accordance with Section 106 of the National Historic Preservation Act (discussed in Section 4.16). The study area and properties that have been identified as potential Section 4(f) resources are shown on Figures 4.18-1 through 4.18-4. FTA and Sound Transit will continue to consult with the State Historic Preservation Officer and other consulting parties regarding the APE.

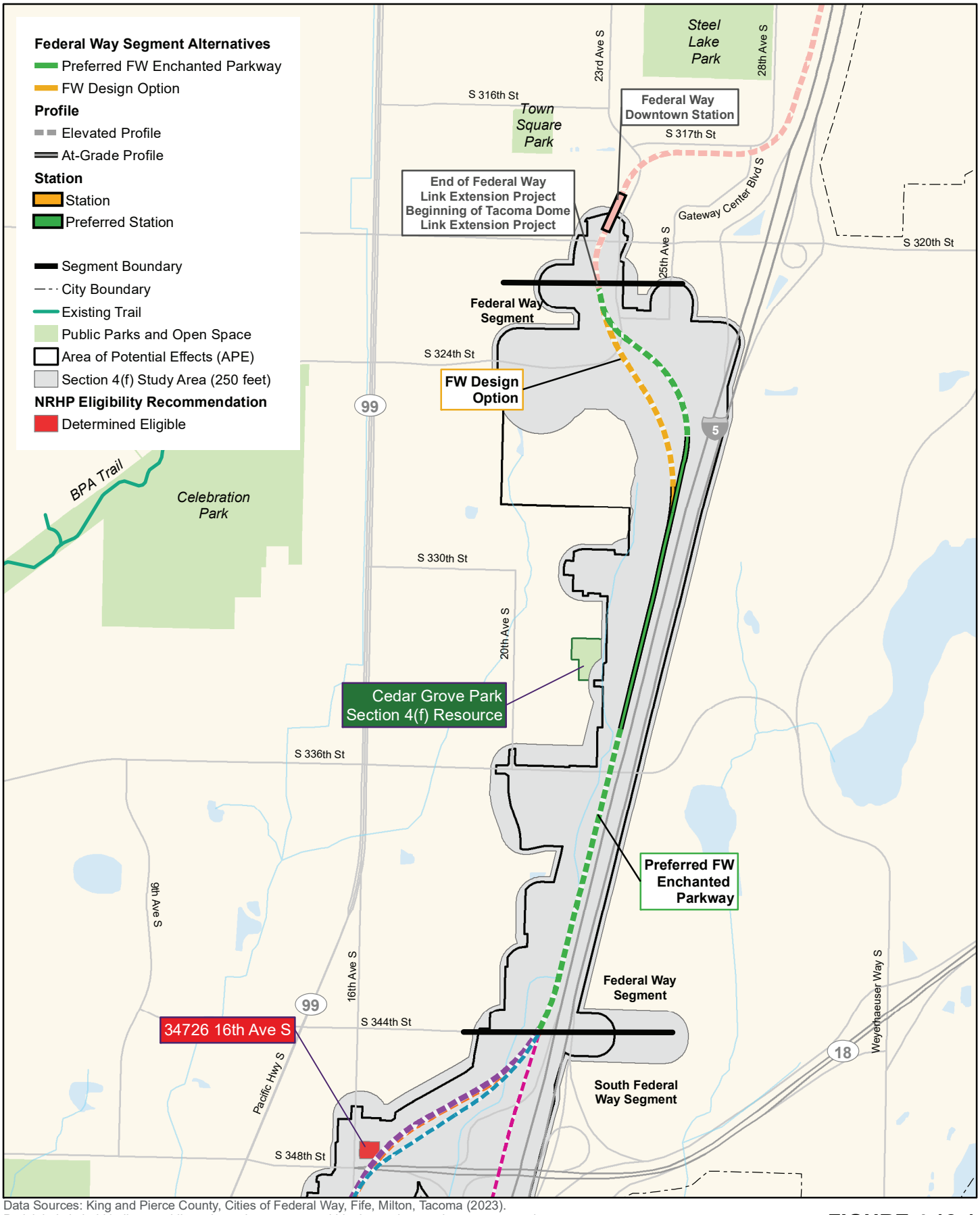
4.18.2 Section 4(f) Resources in the TDLE Study Area

The Section 4(f) resources in the study area are summarized in Table 4.18-1 and shown on Figures 4.18-1 through 4.18-4.

Table 4.18-1 Summary of Section 4(f) Resources in the TDLE Study Area

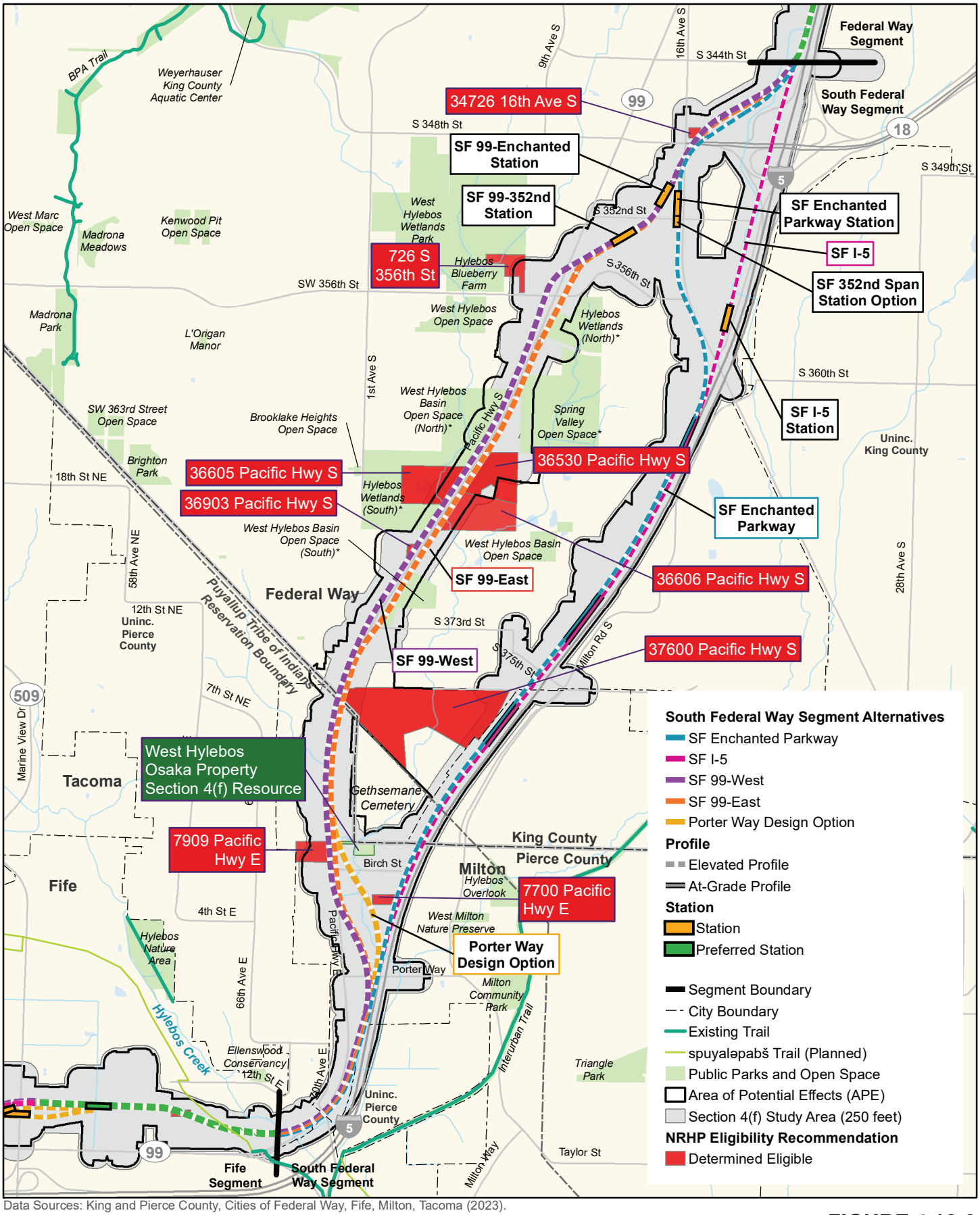
Segment	Number of Park/Recreation Resources	Number of Historic and Archeological Resources
Federal Way	1	0
South Federal Way	1	10
Fife	1	2
Tacoma	0	15

There are two planned trails within the study area, the Interurban Trail connection and the spuyaləpabš Trail (previously called the Tacoma to Puyallup Regional Trail during the planning process for the trail), that are used by both commuters and recreationists and have been determined to be part of the transportation system and function primarily for transportation. Therefore, these trails are not subject to Section 4(f) protection pursuant to 23 CFR 774.13(f)(4). In the South Federal Way Segment, there are several properties owned by the City of Federal Way along Pacific Highway (Hylebos Wetlands (North), Spring Valley Open Space, West Hylebos Basin Open Space (North), Hylebos Wetlands (South), and West Hylebos Basin Open Space (South)), that are collectively referred to as Spring Valley Vista Open Space. As described in Appendix D, Individual Section 4(f) Evaluation, FTA determined that the Spring Valley Vista Open Space does not qualify as a Section 4(f) resource because it has not been officially designated as park or recreation area or as a wildlife or waterfowl refuge, nor does it include recreation uses, or conservation, restoration, or management of wildlife and waterfowl resources as its primary purpose.



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).
Park labels in bold indicate public parks and open space within the study area that are assumed to qualify as Section 4(f) properties.

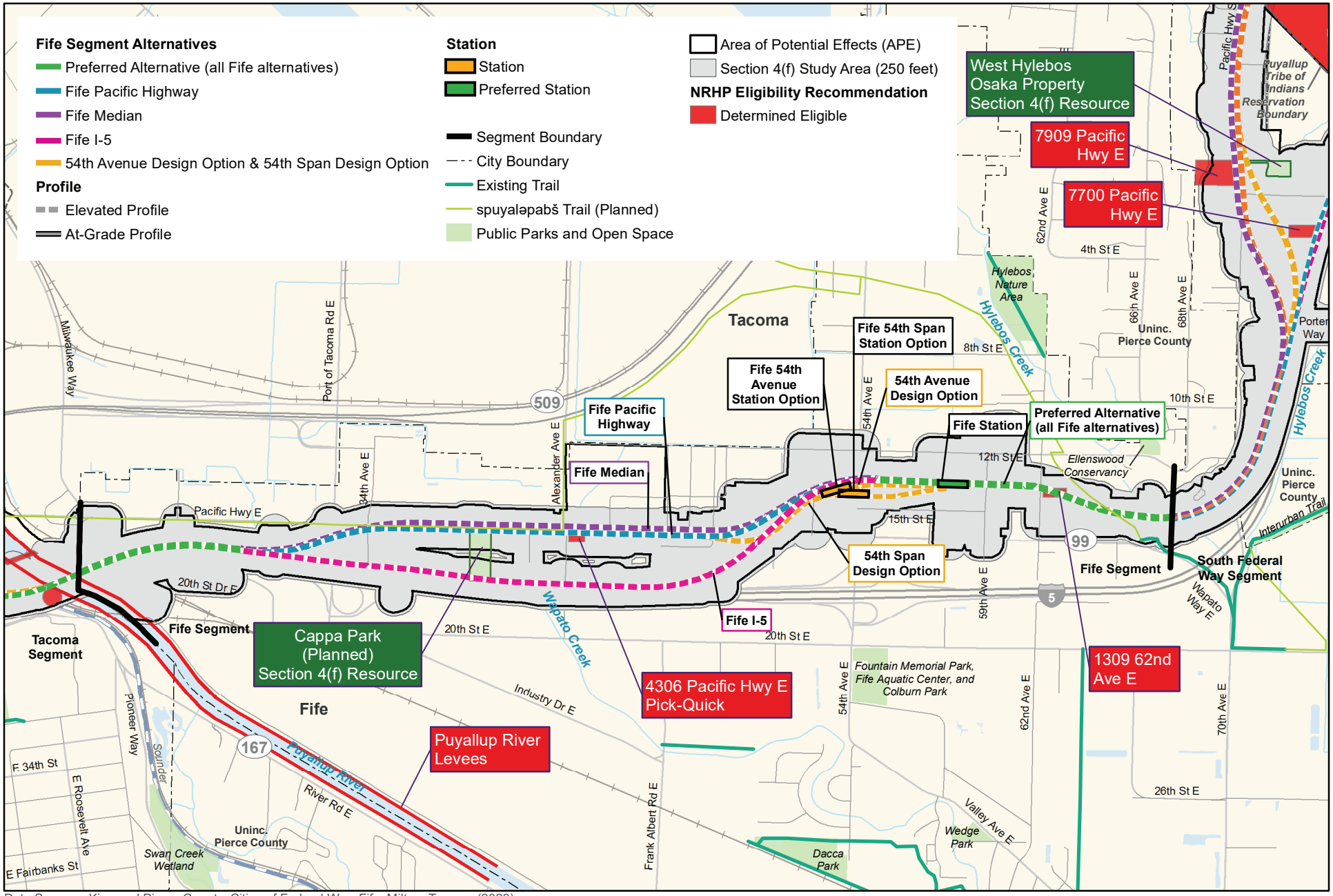
FIGURE 4.18-1
Section 4(f) Resources
Federal Way Segment
Tacoma Dome Link Extension



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).
Park labels in bold indicate public parks and open space within the study area that are assumed to qualify as Section 4(f) properties.
* Collectively known as "Spring Valley Vista Open Space."

FIGURE 4.18-2
Section 4(f) Resources
South Federal Way Segment

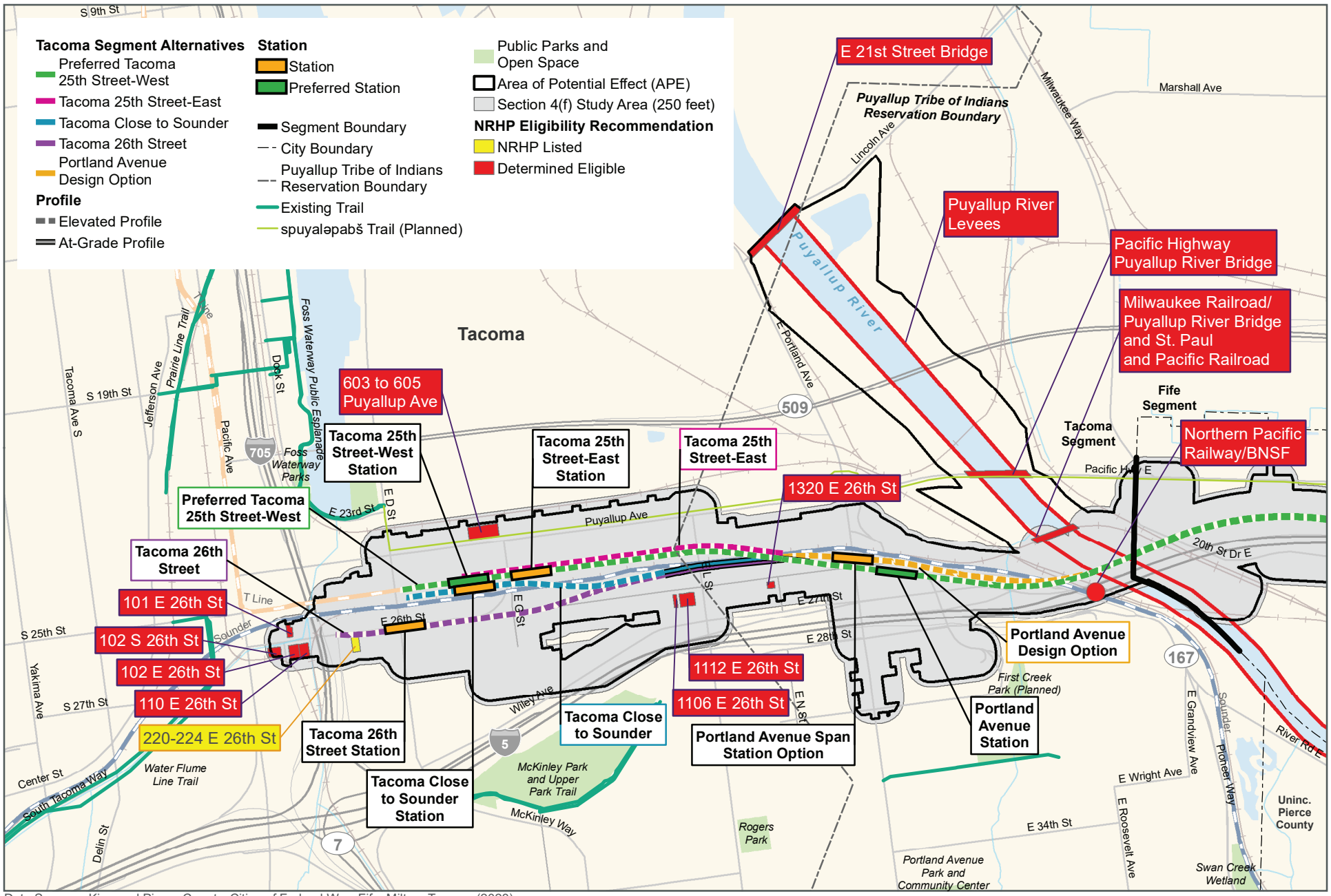
Tacoma Dome Link Extension



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).
Park labels in bold indicate public parks and open space within the study area that are assumed to qualify as Section 4(f) properties.

FIGURE 4.18-3
Section 4(f) Resources
Fife Segment

Tacoma Dome Link Extension



Data Sources: King and Pierce County, Cities of Federal Way, Fife, Milton, Tacoma (2023).

N

0 0.5 1 Mile

FIGURE 4.18-4
Section 4(f) Resources
Tacoma Segment

Tacoma Dome Link Extension

Appendix D, Draft Individual Section 4(f) Evaluation, describes the parks and recreational facilities in the study area and identifies which ones are not Section 4(f) resources and why. More information about the parks and recreational resources in the study area can be found in Section 4.17, Parks and Recreational Resources. More information about historic and archaeological resources can be found in Section 4.16, Historic and Archaeological Resources, and Appendix J.5, Historic and Archaeological Resources Technical Report.

4.18.3 Potential Use of Section 4(f) Resources

This section summarizes the potential use of Section 4(f) properties in the study area; the full Section 4(f) analysis can be found in Appendix D, Draft Section 4(f) Evaluation. If a resource is not mentioned in this section, there is no use of that resource. No use of Section 4(f) resources is anticipated to occur in the Federal Way Segment or the Tacoma Segment.

The Section 4(f) resources and FTA's preliminary determination regarding TDLE's use of those resources is summarized in Table 4.18-2 for the South Federal Way Segment, Table 4.18-3 for the Fife Segment, and Table 4.18-4 for the Tacoma Segment. Assessments of effects to individual historic properties and park resources are preliminary and have not been formally determined by FTA. Final effects determinations are pending additional consultation with the State Historic Preservation Officer, Tribes, officials with jurisdiction, and other consulting parties.

Table 4.18-2 Summary of Preliminary Section 4(f) Use Determinations by Alternative for the South Federal Way Segment

Resource	SF Enchanted Parkway	SF I-5	SF 99-West[1]	SF 99-East[1]
Denny's Restaurant at 34726 16th Avenue S	No use	No use	*De minimis*	*De minimis*
Montessori Academy at Spring Valley, 36605 Pacific Highway S, Federal Way	No use	No use	Use	No use
K.C.J. Stables and Residence, 36530A Pacific Highway S, Federal Way	No use	No use	Use	Use
Residence at 36606 Pacific Highway S, Federal Way	No use	No use	No use	Use
Residence at 36903 Pacific Highway S, Federal Way	No use	No use	Use	*De minimis*
Site 45KI1586	Use	Use	No use	No use
West Hylebos Osaka Property	No use	No use	*De minimis* only with Porter Way Design Option	*De minimis* only with Porter Way Design Option
Daffodil Motel, 7909 Pacific Highway E, Milton	No use	No use	Use	No use

Notes:
(1) Preliminary Section 4(f) use determinations apply with or without the Porter Way Design Option unless otherwise noted.

Table 4.18-3 Summary of Preliminary Section 4(f) Use Determinations by Alternative for the Fife Segment[1]

Resource	Fife Pacific Highway	Fife Median	Fife I-5
Residence at 1309 62nd Avenue E	Use	Use	Use
Pick-Quick Drive In, 4306 Pacific Highway	Use	*De minimis*	No use
Cappa Park (planned)	*De minimis*	*De minimis*	*De minimis*

Note:
(1) Preliminary Section 4(f) use determinations apply with or without the 54th Street Design Option or 54th Span Design Option.

Table 4.18-4 Summary of Preliminary Section 4(f) Use Determinations by Alternative for the Tacoma Segment[1]

Resource	Tacoma 25th Street-West	Tacoma 25th Street-East	Tacoma Close to Sounder	Tacoma 26th Street
Puyallup River Levees	*De minimis*	*De minimis*	*De minimis*	*De minimis*

Note:
(1) Preliminary Section 4(f) use determinations apply with or without the Portland Avenue Design Option.

4.18.4 Avoidance Alternatives, Minimization Measures, and Least Harm Analysis

Unless the use of a Section 4(f) property is determined to have a *de minimis* impact, FTA is required to consider whether there are feasible and prudent alternatives that would avoid the use and whether the project includes all possible planning to minimize harm. Section 4(f) defines a feasible alternative as an alternative that could be built as a matter of sound engineering judgment. An alternative is not prudent if:

(i) It compromises the project to a degree that it is unreasonable to proceed with the project in light of its stated purpose and need;

(ii) It results in unacceptable safety or operational problems;

(iii) After reasonable mitigation, it still causes:

  (A) Severe social, economic, or environmental impacts;

  (B) Severe disruption to established communities;

  (C) Severe disproportionate impacts to minority or low income populations; or

  (D) Severe impacts to environmental resources protected under other Federal statutes;

(iv) It results in additional construction, maintenance, or operational costs of an extraordinary magnitude;

(v) It causes other unique problems or unusual factors; or

(vi) It involves multiple factors in paragraphs (3)(i) through (3)(v) of this definition, that while individually minor, cumulatively cause unique problems or impacts of extraordinary magnitude. (23 CFR 774.17).

Avoidance alternatives can include location alternatives, which would reroute the entire project along a different alignment; alternative actions, which could be a different mode of transportation or some other action that does not involve construction; alignment shifts, which would reroute a portion of the project to a different alignment to avoid a specific resource; or design changes, which would modify the proposed design in a manner that would avoid use.

If the FTA finds that an alternative causes a Section 4(f) use and there is another alternative that is feasible and prudent that avoids use of all Section 4(f) resources, then the alternative that avoids all Section 4(f) use must be selected. But if there are no prudent and feasible alternatives

that can avoid all Section 4(f) resources, then FTA must determine which alternative results in the least overall harm in light of the statute's preservation purpose, called a Least Harm Analysis. As described further in Appendix D, Draft Individual Section 4(f) Evaluation, there is not an avoidance alternative that would avoid all Section 4(f) resources for the length of the project because all of the alternatives would use a Section 4(f) resource in the South Federal Way Segment and another in the Fife Segment.

If there is no alternative that avoids all Section 4(f) use, the alternative with the least overall harm may be approved, but only if it includes all possible planning to mitigate harm to Section 4(f) property (23 CFR 774.3(c)). All possible planning means "that all reasonable measures identified in the Section 4(f) evaluation to minimize harm or mitigate for adverse impacts and effects must be included in the project" (23 CFR 774.17). The proposed measures to minimize harm or mitigate for adverse impacts to Section 4(f) resources where potential use may occur are summarized in Table 4.18-5 and further discussed in Section 4.17, Parks and Recreational Resources, Section 4.16, Historic and Archaeological Resources, and Appendix D, Draft Individual Section 4(f) Evaluation.

An analysis of potential avoidance alternatives is included in Appendix D, Individual Section 4(f) Evaluation, and concludes that there is no prudent and feasible alternative that would avoid all Section 4(f) properties. As a result, a Least Harm Analysis for TDLE will be included in the Final EIS and will take into account Draft EIS comments from agencies with jurisdiction, the public, and consulting parties under Section 106, and possibly new information as design progresses. The alternative with the least overall harm would be selected to proceed.

Table 4.18-5 Proposed Measures to Minimize Harm to Section 4(f) Resources

4(f) Resource	Impacts	Potential Measures to Minimize Harm	Associated Alternative	Section 4(f) Use Assessment
South Federal Way Segment				
Montessori Academy at Spring Valley, 36605 Pacific Highway S	**Permanent:** Partial acquisition, new elevated track nearby, potential removal of mature foliage **Temporary occupancy:** Construction impacts	**Permanent:** Preparing additional documentation or interpretation for the resources, designing/installing an interpretive/educational display or exhibit, or preparing an NRHP nomination. **Temporary:** • Typical BMPs to minimize and avoid construction impacts, such as dust or noise, would be applied • Restore disturbed areas following construction • Access maintained to school	SF 99-West Alternative with or without the Porter Way Design Option	Use
Residence and Stables at 36530A Pacific Highway S	**Permanent:** Partial acquisition and potential removal of screening trees; for SF 99-East Alternative, would also include demolition of a ca.1977 outbuilding **Temporary occupancy:** Construction impacts	**Permanent:** Potential mitigation measures could include preparing additional documentation or interpretation for the resources, designing/installing an interpretive/educational display or exhibit, or preparing an NRHP nomination. **Temporary:** • Typical BMPs to minimize and avoid construction impacts, such as dust or noise, would be applied • Restore disturbed areas following construction • Access maintained to property	SF 99-East Alternative and SF 99-West Alternative, with or without the Porter Way Design Option	Use

Table 4.18-5 Proposed Measures to Minimize Harm to Section 4(f) Resources (continued)

4(f) Resource	Impacts	Potential Measures to Minimize Harm	Associated Alternative	Section 4(f) Use Assessment
Residence at 36606 Pacific Highway S	**Permanent:** New elevated track nearby and potential removal of screening trees **Temporary occupancy:** Construction impacts	**Permanent:** Potential mitigation measures could include the restoration of screening trees. **Temporary:** • Typical BMPs to minimize and avoid construction impacts, such as dust or noise, would be applied • Restore disturbed areas following construction • Access maintained to property	SF 99-East Alternative with or without the Porter Way Design Option	Use
Residence at 36903 Pacific Highway S	**Permanent:** Demolition of NRHP-eligible building	**Permanent:** Potential mitigation measures could include an interpretive display on or near the property or documentation under the Historic American Buildings Survey/Historic American Engineering Record.	SF 99-West Alternative with or without the Porter Way Design Option	Use
Site 45K101586	**Permanent:** Ground-disturbing activity within archaeological site **Temporary occupancy:** Construction impacts	**Permanent:** Potential mitigation measures could include protection in place, data recovery, or other measures. **Temporary:** • Typical BMPs to minimize and avoid construction impacts, such as dust or noise, would be applied • Restore disturbed areas following construction	Enchanted Parkway and SF I-5 alternatives	Use
Daffodil Motel at 7909 Pacific Highway E	**Permanent:** Partial acquisition and demolition or relocation of signage along the highway **Temporary occupancy:** Construction impacts	**Permanent:** Potential mitigation could include relocating the signage to another location on the property or to a nearby, potentially adjacent, property. If nearby relocation is infeasible, providing a new interpretive display on or near the property, documentation under the Historic American Buildings Survey/Historic American Engineering Record, or the compilation of a historic context study detailing Pacific Highway's construction in Fife and its mid-twentieth-century evolution as a major auto thoroughfare featuring businesses designed to attract customers traveling the highway. **Temporary:** • Typical BMPs to minimize and avoid construction impacts, such as dust or noise, would be applied • Restore disturbed areas following construction • Access maintained to property	SF 99-West Alternative with or without the Porter Way Design Option	Use
Fife Segment				
Vacant residence 1309 62nd Avenue E, Fife	**Permanent** Demolition of NRHP-eligible building	**Permanent:** Potential mitigation measures could include an interpretive display on or near the property, making the building available for relocation or documentation under the Historic American Buildings Survey/Historic American Engineering Record. The building may not have the structural integrity to withstand relocation.	All Fife Segment alternatives	Use
Pick-Quick 4306 Pacific Highway, Fife	**Permanent**: Demolition of NRHP-eligible building	**Permanent:** Potential mitigation measures could include providing a new interpretive display on or near the property, documentation under the Historic American Buildings Survey/Historic American Engineering Record, or the compilation of a historic context study detailing Pacific Highway's construction in Fife and its mid-twentieth-century evolution as a major auto thoroughfare featuring businesses designed to attract customers traveling the highway.	Fife Pacific Highway Alternative	Use

Note:
BMP – best management practice; ca. – circa; NRHP – National Register of Historic Places

Additional discussion of regulations pertaining to a Least Harm Analysis are included in Appendix D, Draft Individual Section 4(f) Evaluation. A Least Harm Analysis for TDLE will be included in the Final EIS and will take into account Draft EIS comments from agencies with jurisdiction, the public, and consulting parties under Section 106, and new information as design progresses.

4.18.5 Coordination with Officials with Jurisdiction of Section 4(f) Resources

FTA is engaging in government-to-government consultation with the Puyallup Tribe of Indians, Muckleshoot Indian Tribe, Nisqually Indian Tribe, and the Confederated Tribes and Bands of the Yakama Nation. FTA and Sound Transit are also coordinating with the City of Federal Way regarding the parks and open space resources along SR 99 that FTA has determined do not qualify as Section 4(f) resources. FTA and Sound Transit are also coordinating with the City of Milton regarding the West Hylebos Osaka Property. The City of Milton preliminarily concurred that TDLE would have a *de minimis* impact on that Section 4(f) resource. FTA and Sound Transit are coordinating with the SHPO, officials with jurisdiction, and other consulting parties, including the City of Fife, Historic Preservation Officers from King County, Pierce County, City of Tacoma, and Washington Trust for Historic Preservation, regarding the Section 106 properties that qualify as Section 4(f) properties that will require use by the TDLE project, as well as regarding any archaeological resources that may be used and the applicability of Section 4(f). Sound Transit is also coordinating with the City of Fife regarding the proposed Cappa Park, which is currently undergoing planning. Coordination meetings with the jurisdictions regarding potential use of parks and open space resources occurred:

- City of Fife: July 10 and August 14, 2024.
- City of Milton: July 11 and August 1, 2024.
- City of Federal Way: June 25 and August 8, 2024.