

4.2 West Seattle Link Extension

4.2.1 Acquisitions, Displacements, and Relocations

4.2.1.1 Affected Environment

The West Seattle Link Extension study area for acquisitions, displacements, and relocations includes parcels within the project limits. The project limits include areas that would potentially be acquired for track alignments, stations, and related facilities and to support construction activities for each alternative. All parcels are within the city of Seattle.

The West Seattle Link Extension study area includes residential, commercial, and industrial development, and some vacant and public properties. Properties within the SODO and Duwamish segments are primarily industrial with some commercial development, while properties within the Delridge and West Seattle Junction segments are mostly residential with some mixed-use and commercial development. Section 4.2.2, Land Use, describe current and projected future land uses along each West Seattle Link Extension alternative.

4.2.1.2 Environmental Impacts of the No Build Alternative

The No Build Alternative would not acquire any properties. No displacements or relocations would occur.

4.2.1.3 Environmental Impacts of the Build Alternatives during Operation

All segments and alternatives for the West Seattle Link Extension would acquire property and would displace and relocate some uses for operation of the light rail. During construction, additional property would be needed for staging areas and construction access. Tables 4.2.1-1 to 4.2.1-4 summarize the numbers of parcels affected and displacements by alternative, and include parcels needed both for operation and construction. Acquisitions and displacements for alternatives within a segment often vary, depending on which alternatives the alternative would connect to in adjacent segments. This variation is represented by the range of acquisitions and displacements shown in the tables. The following discussion highlights the key differences between alternatives and includes information on the minimum operable segment (M.O.S.).

The City of Seattle adopted Mandatory Housing Affordability (M.H.A.), an affordable housing incentive program for new development, in the City Code in 2019 in the West Seattle Link Extension project area. There are currently no M.H.A. properties that would be displaced by the project. If any are developed on properties to be acquired, these would be mitigated as required by the City. There would be affected parcels that currently have income-restricted housing under the Multifamily Tax Exemption Program or that are managed by Seattle Housing Authority.

In addition to the potential property acquisitions described in this section, some of the West Seattle Link Extension alternatives would require subterranean easements. These easements would not require displacements of the surface uses, and the area of the easements is not included in the data presented here. The project would also require use of public rights-of-way owned by the City of Seattle and the Washington State Department of Transportation (WSDOT). Subterranean easements and public right-of-way are not included in tables in this section.

Properties that would be difficult to relocate based on their size or use are also noted.

Appendix L4.1, Acquisitions, Displacements, and Relocations, provides tables and maps to identify the potentially affected parcels by parcel number and address for each alternative.

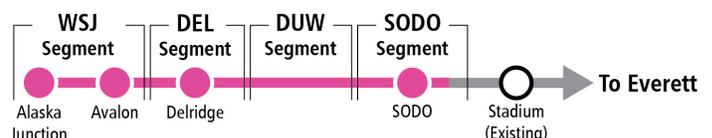


Table 4.2.1-1. Number of Potential Parcels Affected and Displacements by Alternative – SODO Segment, West Seattle

Alternative	Parcels Affected							Displacements	
	Single-Family	Multi-Family	Commercial and Industrial	Mixed-Use	Public and Institutional	Vacant	Total	Business	Residential
Preferred At-Grade (SODO-1a)	0	0	17	0	0 to 1 ^a	1	18 to 19^a	16 to 17 ^a	0
At-Grade South Station Option (SODO-1b)	0	0	14	0	1	1	16	14	0
Mixed Profile (SODO-2)	0	0	8	0	1	1	10	9	0

Note: Ranges reflect differences from connecting to different alternatives in adjacent segments. The total impacts are based on individual alternatives and connection options and not the high and low numbers of each impact type shown in the table.

^a The range reflects that the staggered station configuration would avoid relocation of the United States Postal Service facility.

Table 4.2.1-2. Number of Potential Parcels Affected and Displacements by Alternative – Duwamish Segment

Alternative	Parcels Affected							Displacements	
	Single-Family	Multi-Family	Commercial and Industrial	Mixed-Use	Public and Institutional	Vacant	Total	Business	Residential ^a
Preferred South Crossing (DUW-1a)	8 to 9	12 to 13	41	0	7 to 9	5 to 9	77	35 to 36	22 to 26
South Crossing South Edge Crossing Alignment Option (DUW-1b)	9	12 to 13	41	0	8 to 9	5 to 9	77 to 79	28 to 29	23 to 26
North Crossing (DUW-2)	0	0	51	0	10	4	65	38	0

Note: Ranges reflect differences from connecting to different alternatives in adjacent segments. The total impacts are based on individual alternatives and connection options and not the high and low numbers of each impact type shown in the table.

^a Number of residential displacements is based on the number of dwelling units, not the number of buildings.

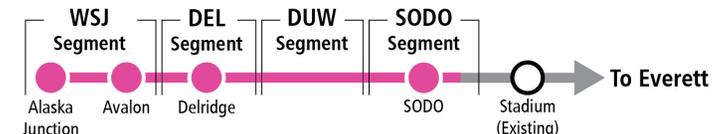


Table 4.2.1-3. Number of Potential Parcels Affected and Displacements by Alternative – Delridge Segment

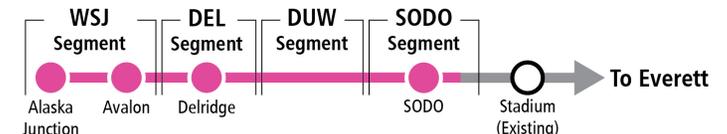
Alternative	Parcels Affected						Displacements		
	Single-Family	Multi-Family	Commercial and Industrial	Mixed-Use	Public and Institutional	Vacant	Total	Business	Residential ^a
Preferred Dakota Street Station (DEL-1a)	47	62	6 to 8	0	5	3 to 4	123 to 126	13 to 16	172
Dakota Street Station North Alignment Option (DEL-1b)	48	61	5 to 8	0	4	3 to 4	121 to 125	13 to 16	191
Preferred Dakota Street Station Lower Height (DEL-2a)*	45	45	6 to 9	0	3	3 to 4	102 to 106	13 to 16	93
Dakota Street Station Lower Height, North Alignment Option (DEL-2b)*	49	62	6 to 9	0	4	4 to 5	125 to 129	13 to 16	197
Delridge Way Station (DEL-3)	22 ^b	54	6 to 9	0	4	7 to 8	93 to 97	13 to 16	151 ^b
Delridge Way Station Lower Height (DEL-4)*	20 ^b	36	6 to 9	0	4	6 to 7	72 to 76	13 to 16	70 ^b
Andover Street Station (DEL-5)	5	38	8	0	0	3	54	21	82
Andover Street Station Lower Height (DEL-6)*	17	2	8	0	0	1	28	20	48

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

Note: Ranges reflect differences from connecting to different alternatives in adjacent segments. The total impacts are based on individual alternatives and connection options and not the high and low numbers of each impact type shown in the table.

^a Number of residential displacements is based on the number of dwelling units, not the number of buildings.

^b With the West Seattle and Ballard Link Extensions M.O.S., there would be four additional single-family parcels affected, with four additional residential displacements.



4.2.1 Acquisitions, Displacements, and Relocations

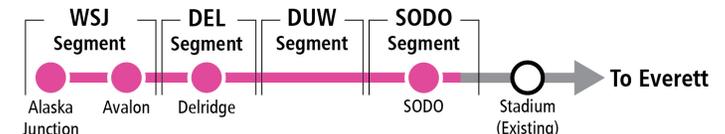
Table 4.2.1-4. Number of Potential Parcels Affected and Displacements by Alternative – West Seattle Junction Segment

Alternative	Parcels Affected							Displacements	
	Single-Family	Multi-Family	Commercial and Industrial	Mixed-Use	Public and Institutional	Vacant	Total	Business	Residential ^a
Preferred Elevated 41st/42nd Avenue Station (WSJ-1)	30 to 33	20 to 22	20	2	2	2	76 to 80	61	349 to 379
Preferred Elevated Fauntleroy Way Station (WSJ-2)	24 to 28	7 to 8	15 to 18	4	2	1	53 to 60	13 to 16	405 to 435
Preferred Tunnel 41st Avenue Station (WSJ-3a)*	17 to 23	10 to 12	12 to 15	2	1	2	46 to 53	15 to 18	167 to 271
Preferred Tunnel 42nd Avenue Station Option (WSJ-3b)*	17 to 22	8 to 9	10 to 13	1	2	1	40 to 47	44 to 47	124 to 228
Short Tunnel 41st Avenue Station (WSJ-4)*	55	18	15	3	1	2	94	18	238
Medium Tunnel 41st Avenue Station (WSJ-5)*	24	9	12	2	1	2	50	15	153

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

Note: Ranges reflect differences from connecting to different alternatives in adjacent segments. The total impacts are based on individual alternatives and connection options and not the high and low numbers of each impact type shown in the table.

^a Number of residential displacements is based on the number of dwelling units, not the number of buildings.



4.2.1.3.1 SODO Segment

Affected properties in the SODO Segment are primarily commercial or industrial, and none of the alternatives would displace residences. As shown in Table 4.2.1-1, Preferred Alternative SODO-1a would have the most business displacements and Alternative SODO-2 would have the least. Both Option SODO-1b and Alternative SODO-2 would displace the United States Postal Service Carrier Annex and Distribution Center/Terminal Post Office at 4th Avenue South and South Lander Street. Preferred Alternative SODO-1a would acquire part of this facility (a portion of the surface parking), which the United States Postal Service has indicated would require relocation of the facility. Relocation of the facility could be challenging due to its size, functions, and the service area that it would need to be within. Impacts of relocating the United States Postal Service facility are yet undefined, and if an alternative that triggers relocation of the facility moves forward, additional environmental review will be conducted to evaluate and disclose impacts of relocating the facility. The staggered station configuration for Preferred Alternative SODO-1a would avoid permanent impacts (i.e., operation and maintenance) to the United States Postal Service facility. Accordingly, this station configuration would not require relocation of the United States Postal Service facility.

The Ballard Link Extension-only M.O.S. would affect the parcels identified in the SODO Segment for the West Seattle Link Extension, including impacts at the United States Postal Service facility discussed here. If the Ballard Link Extension-only M.O.S. is constructed, these properties would no longer be affected by the West Seattle Link Extension when it is built, as shown in Table L4.1-12 in Appendix L4.1.

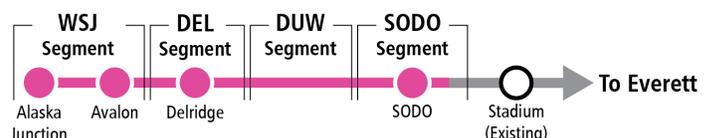
4.2.1.3.2 Duwamish Segment

Affected properties in the Duwamish Segment are primarily commercial or industrial, with some institutional, public, and residential. As shown in Table 4.2.1-2, Preferred Alternative DUW-1a and Option DUW-1b would displace the most residences. The displacements would vary slightly between these alternatives depending on which alternative they would connect to in the Delridge Segment. Because of its location along the north side of the West Seattle Bridge, Alternative DUW-2 would not have any residential displacements but would have the most business displacements.

All of the alternatives in this segment would displace businesses that are water-dependent or that support water-dependent businesses. Alternative DUW-2 would displace the most water-dependent businesses. Preferred Alternative DUW-1a and Option DUW-1b would both displace some businesses at Terminal 102, although Option DUW-1b would displace fewer businesses. These alternatives would also acquire part of the West Duwamish Greenbelt and part of a Seattle City Light property, but would not require relocation of the facility.

When connecting to the Delridge Way Station alternatives (Alternative DEL-3 or Alternative DEL-4*) in the Delridge Segment, part of the Fire Station 36 property would be acquired with Preferred Alternative DUW-1a and Option DUW-1b. If access or egress is restricted, the station may need to be relocated. Alternative DUW-2 would acquire part of the Fire Station 14 property but is not expected to require relocation of the station. All of the alternatives in this segment would displace Alaskan Copper and Brass for the connection to the existing Operations and Maintenance Facility Central.

All of the alternatives in this segment would affect Port of Seattle-owned properties. Alternative DUW-2 would affect the most Port-owned properties but would have the fewest business displacements on Port-owned properties. Preferred Alternative DUW-1a would affect the fewest Port-owned properties but would have the most business displacements on Port-owned



properties. The impacts associated with Port-owned properties are discussed in Section 4.2.3, Economics.

The Ballard Link Extension-only M.O.S. would result in property acquisitions in the Duwamish Segment for the connection to the existing Operations and Maintenance Facility Central. If the Ballard Link Extension-only M.O.S. is constructed, these properties would no longer be affected by the West Seattle Link Extension when it is built, as shown in Table L4.1-12 in Appendix L4.1. These effects are described for the Ballard Link Extension SODO Segment in Section 4.3.1.3 and in Appendix L4.1, Table L4.1-12.

4.2.1.3.3 Delridge Segment

Affected properties in the Delridge Segment are primarily residential or commercial. As shown in Table 4.2.1-4, Option DEL-2b* would have the most residential displacements. Alternative DEL-6* would have the least residential displacements of the Delridge Segment alternatives, but would displace a behavioral health facility with supportive housing and assisted living that also provides services to nonresidents who live in the area. Alternative DEL-1a, Option DEL-1b, Option DEL-2b*, and Alternative DEL-3 would acquire buildings within the Edge Apartments, displacing some residential units.

Alternative DEL-5 and Alternative DEL-6* would have slightly more business displacements than other alternatives, but would not affect any institutional or public parcels. These alternatives would also acquire part of the Nucor Steel property, but would not affect any buildings. Sound Transit would work with the property owner to ensure operations could be maintained. The other Delridge Segment alternatives would displace about the same number of businesses. All alternatives except Alternative DEL-5 and Alternative DEL-6* would displace a Department of Child, Youth, and Families office.

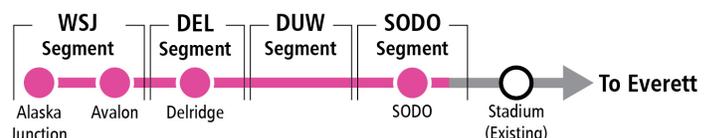
Option DEL-1b and Option DEL-2b* would acquire a portion of the Longfellow Creek Legacy Trail and Natural Area, but the use of the acquired area would not affect the function of the natural area or trail. Alternative DEL-3 would acquire part of the Delridge Community Center property but would not displace or affect use of the community center. Preferred Alternative DEL-2a* and Alternative DEL-4 would acquire part of the West Seattle Golf Course property and would require reconfiguration of holes. Impacts to parks are discussed further in Section 4.2.17, Parks and Recreational Resources.

As shown in Table 4.1-3 and Appendix L4.1, Acquisitions, Displacements, and Relocations, for the West Seattle Link and Ballard Link Extensions M.O.S., Alternative DEL-3 and Alternative DEL-4* would need to acquire additional residential parcels for the bus facilities along Delridge Way Southwest and Southwest Dakota Street.

4.2.1.3.4 West Seattle Junction Segment

Most of the affected properties within the West Seattle Junction Segment are single- or multi-family residences with some commercial and mixed-use development along main arterials. The alternatives in this segment would affect more mixed-use properties than in other segments. The majority of residential displacements in this segment are multi-family residences near Fautleroy Way Southwest and Southwest Alaska Street.

As shown in Table 4.2.1-4, Preferred Alternative WSJ-1 and Preferred Alternative WSJ-2 would have the most residential displacements. Preferred Alternative WSJ-1 would displace residential units from four apartment or condominium complexes, including about 200 units at Spruce Apartments. Preferred Alternative WSJ-2 would displace residential units from five apartment or condominium complexes, including about 250 units at Maris Luxury Apartments.



Alternative WSJ-5* would have the least residential displacements. Preferred Alternative WSJ-3a*, Alternative WSJ-4*, and Alternative WSJ-5* would each displace 90 residential units at the City Watch Apartments. Alternative WSJ-4* would affect more single-family properties than other alternatives. Although it is partly tunneled, the elevated guideway prior to entering the tunnel and the cut-and-cover tail tracks would border residential areas and require property acquisition.

Preferred Alternative WSJ-1 would have the most business displacements. Both this alternative and Preferred Option WSJ-3b* would displace the Jefferson Square complex, which accounts for most business displacements, with almost 40 businesses. Preferred Alternative WSJ-2 would have the least business displacements when connecting to Alternative DEL-5. Preferred Alternative WSJ-2, Preferred Alternative WSJ-3a*, Alternative WSJ-4*, and Alternative WSJ-5* would displace a similar number of businesses.

4.2.1.4 Environmental Impacts of the Build Alternatives during Construction

During construction, property would be needed for staging areas and construction access. Most of the area needed for construction would be accommodated within areas required for permanent right-of-way, although some additional properties would need to be acquired for construction and are accounted for in estimated acquisitions and in the construction limits depicted in Appendix J, Conceptual Design Drawings.

Temporary construction easements provide for temporary use of a property during construction. These easements might be needed along the project corridor. Once construction is complete, the property would be restored to its previous condition, and the easement would be terminated. These parcels are not included in Appendix L4.1 because the exact locations where these easements might be needed are not known at the current level of design, they would not permanently displace existing uses, and they are not anticipated to substantially disrupt existing uses.

Option DUW-1b would temporarily displace moorage at the Harbor Island Marina, which allows live-aboard boats, and could potentially affect people living there. See Section 3.11.3.6, Navigation, for more information on impacts to moorage during construction.

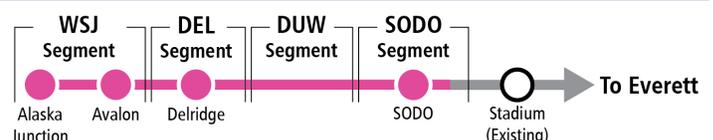
4.2.1.5 Indirect Impacts of the Build Alternatives

Consistent with Sound Transit policy and local land use regulations, some parcels initially acquired for a project use, such as construction staging, could be redeveloped to accommodate transit-oriented development (TOD). The potential indirect impacts associated with TOD are discussed in Section 4.2.2, Land Use. The potential indirect impacts associated with displacement of industrial and maritime uses are discussed in Section 4.2.3, Economics.

4.2.1.6 Mitigation Measures

Sound Transit's policies and procedures comply with the Federal Uniform Relocation Act and the Washington state relocation and property acquisition requirements. In some cases, Sound Transit provides advisory services to property owners above the minimum requirements of federal and state law.

Sound Transit would compensate affected property owners according to the provisions specified in Sound Transit's adopted *Real Property Acquisition and Relocation Policy, Procedures, and*



Guidelines (2017; see Section 4.2.1.7, Sound Transit Real Property Acquisition and Relocation Policy, Procedures, and Guidelines Summary). Benefits would depend on the level of impact, available relocation options, and other factors.

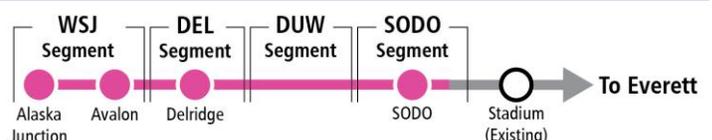
For Option SODO-1b and Alternative SODO-2, Sound Transit would identify a replacement property for the Carrier Annex and Distribution Center/Terminal Post Office at 4th Avenue South and South Lander Street. For Preferred Alternative SODO-1a, Sound Transit would identify replacement parking adjacent to the existing facility if acceptable to the United States Postal Service or, if full relocation is required, replacement property. Sound Transit would be responsible for future environmental review, design, and construction of replacement parking or a replacement facility. The replacement parking or facility would meet siting criteria and requirements identified by the United States Postal Service. For Preferred Alternative SODO-1a, Option SODO-1b, and Alternative SODO-2, postal parking or operations would be relocated prior to the project impacting the existing facility. The staggered station configuration for Preferred Alternative SODO-1a would avoid permanent impacts. Relocation would occur in accordance with the Uniform Relocation Assistance and Real Property Acquisitions Policies Act of 1970 and the Sound Transit *Real Property Acquisition and Relocation Policy, Procedures and Guidelines* (Sound Transit 2017).

4.2.1.7 Sound Transit Real Property Acquisition and Relocation Policy, Procedures, and Guidelines Summary

Sound Transit has notified property owners whose property may be directly affected by any of the alternatives. Property acquisition generally would not begin until the environmental process is complete and the Sound Transit Board selects the alternative to build after publication of the Final Environmental Impact Statement. The tables and maps in Appendix L4.1 identify each potentially affected parcel. Property acquisition activities would begin during final design. Sound Transit would continue to communicate with property owners during the Sound Transit Board decision process on the project to build and during final design. As described in Chapter 2, Alternatives Considered, the project may be constructed in phases.

Relocation assistance applies to all residences (regardless of ownership status), businesses, and organizations displaced by the project. Sound Transit relocation staff would be available to answer questions and provide additional information about relocation assistance services, payments, reimbursement eligibility, and the timing of the process. Relocation agents from Sound Transit would determine the needs and preferences of each household, business, and organization to be displaced. They would work closely and proactively with residents and businesses to help them plan for relocation, and would help find new homes or sites and solve problems that might occur. While the ultimate choice of relocation site is up to the affected resident or business, the agency would help identify possible locations, including nearby properties. Sound Transit would use interpreters to help those with limited English proficiency understand their choices and options.

Boat owners whose moorage would be displaced may also be eligible for relocation assistance. In addition to advisory services, relocation assistance could include moving expenses to transport the vessel to another location. If the boat and/or slip is used as a primary residence, the boat owner may be eligible for a replacement housing payment for condominiumized or rented boat slips. However, it is expected that most affected boats would be classified as personal property (not primary residences), and that the slips would generally be rented, not mortgaged; in these cases, the owners would be eligible for advisory services plus moving expenses. A public agency must pay just compensation to property owners for land and



improvements acquired for public purposes, including measurable loss in value to any remaining property as a result of a partial acquisition. 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 mitigate for the permanent loss of parking spaces resulting from partial property acquisition by compensating the property owner or by providing replacement parking. Sound Transit would pay for normal expenses of sale, including escrow fees, title insurance, prepayment penalties, mortgage release fees, recording fees, and typical costs incurred as part of conveying title.

Owners would not have to relocate until they were either paid the agreed purchase price or an amount equal to Sound Transit's estimate of just compensation has been deposited with the court. Residents, businesses, and tenants would receive at least 90 days' written notice prior to having to relocate. Property owners would be offered just compensation for their land and improvements as described here.

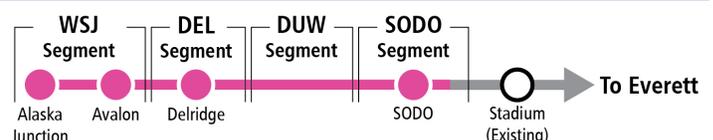
Relocation benefits depend on individual circumstances. Factors that can affect relocation benefits include time of occupancy at the displaced property and the condition of the replacement property. Depending on the type of displacement, Sound Transit might pay for expenses associated with moving, replacement housing payments, business reestablishment expenses, and/or other eligible expenses. Depending on the individual factors for each business, business reestablishment expenses could include exterior signage, modifications to make the relocation site suitable to conduct business, advertisement of replacement location, and the difference (or a portion of the difference) between the present and future cost of operations during the first 2 years.

Owners may be eligible for price differential payment and mortgage interest differential payment if the cost of comparable decent, safe, and sanitary housing is greater than the value of their existing property. Likewise, tenants may be eligible for replacement housing payments if comparable decent, safe, and sanitary replacement housing rents are more than their current rental cost. In these cases, Sound Transit would pay the difference, or a portion of the difference, between the tenant's current and new rental rates for 42-month period.

4.2.1.8 Relocation Opportunities

Sound Transit researched market conditions for available residential and commercial real estate in the city of Seattle. Property availability will change over time, but research indicates that there are adequate opportunities for most residents and businesses to successfully relocate within the project vicinity. Some affected properties with unique characteristics or uses, such as water-dependent uses, assistive living and supportive housing, and public facilities (including the United States Postal Service facility discussed in Section 4.2.1.3.1) could be difficult to relocate and may require construction of new facilities. Some water-dependent facilities may not be able to be relocated. There is currently adequate retail, office, and industrial space available in the Seattle area to accommodate the spaces that could be displaced by the project. In some instances, zoning restrictions may make it difficult for some businesses to relocate in the same area, particularly industrial and maritime businesses.

Currently available residential units in Seattle also exceed the number of units potentially displaced, and there is a sufficient supply of relocation housing similar in size and quality for renters in the study area; however, depending on market conditions and individual circumstances, the replacements property may cost more. Section 4.2.1.7 describes how Sound Transit would accommodate this difference. Additional information on relocation opportunities is provided in Appendix L4.1.

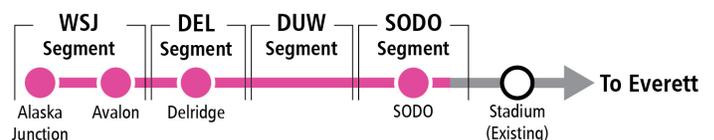


4.2.1 Acquisitions, Displacements, and Relocations

Sound Transit would offer relocation assistance that includes compensation and supporting services that consider the needs of those being relocated, to help reduce inconveniences or hardships. Sound Transit would also satisfy federal and state requirements for residential relocation, which define a “comparable replacement dwelling” as follows (42 United States Code 4601(10)):

- Decent, safe, and sanitary;
- Adequate in size to accommodate the occupants;
- Within the financial means of the displaced person;
- Functionally equivalent;
- In an area not subject to unreasonable adverse environmental conditions; and
- In a location generally not less desirable than the location of the displaced person’s dwelling with respect to public utilities, facilities, services, and the displaced person’s place of employment.

To meet these requirements, Sound Transit may identify relocation properties that are in better condition and of higher value than the properties being acquired. If so, tenants may be eligible for a rent supplement.



4.2.2 Land Use

4.2.2.1 Affected Environment

This section describes existing and potential future land uses in each segment and summarizes overarching land use policies as they relate to the West Seattle Link Extension. The land use study area for the West Seattle Link Extension is the area within 0.5 mile of the project limits, which include permanent project improvements and areas needed for project construction. Land uses in the areas within 0.5 mile of the potential stations have the greatest potential to be affected, both directly and indirectly. The study area is within the city of Seattle. Neighborhoods and communities identified in this section are mapped and described in more detail in Section 4.2.4, Social Resources, Community Facilities, and Neighborhoods.

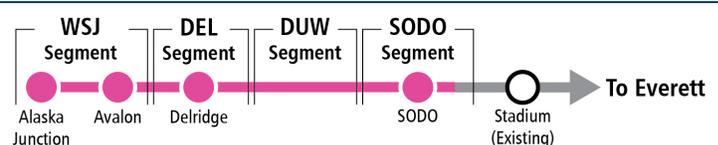
Existing land uses are generalized into dominant land use categories (i.e., single-family residential, multi-family residential, commercial, institutional/public, mixed use, downtown office, downtown harbor front, parks and open space, industrial, vacant land, and other). Existing land uses are based on current King County assessor data (King County 2019) and are shown in Appendix L4.2, Land Use. The future land uses shown on Figure 4.2.2-1 are based on current municipal data (City of Seattle 2020). Mandatory Housing Affordability zoning is in the study area and applies to a variety of zoning designations. Mandatory Housing Affordability requires developers to provide affordable housing within their project or pay into a fund that supports affordable housing (City of Seattle 2019). The study area east of Interstate 5 is not described because Interstate 5 acts as a barrier between the West Seattle Link Extension and land uses east of the interstate. Direct and indirect land use effects are not anticipated to occur in this area.

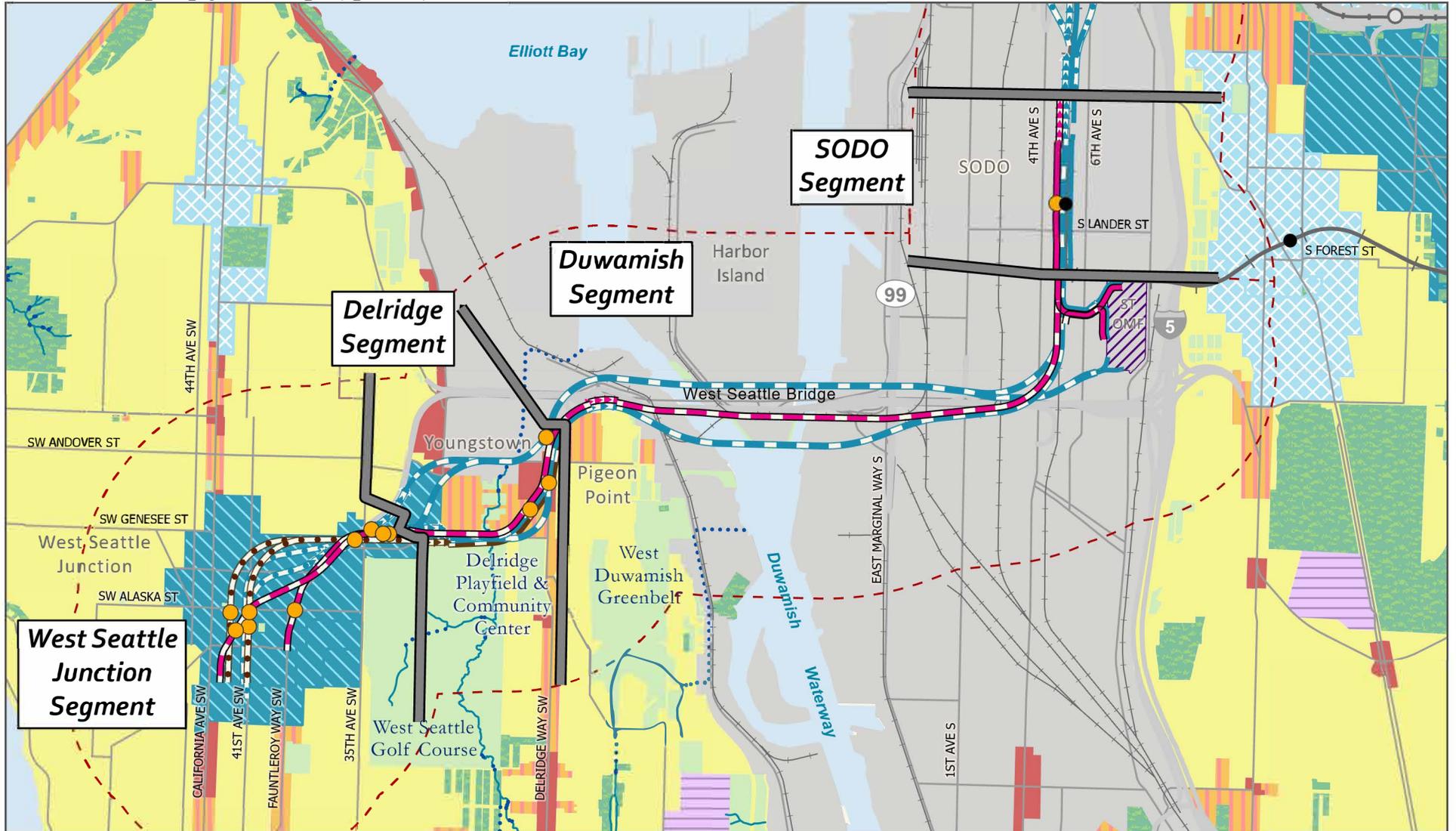
Much of the study area falls within areas designated in the City of Seattle Comprehensive Plan (2018) as urban centers or urban villages. The City has the goal of concentrating most of the expected future growth in these areas.

4.2.2.1.1 SODO Segment

The primary neighborhood in the SODO Segment is the Industrial District, which is an area designated by both the Puget Sound Regional Council and the City of Seattle as the Duwamish Manufacturing/Industrial Center. Land uses are predominantly industrial with limited commercial development.

The Seattle Public Schools' central office, the John Stanford Center for Educational Excellence, United States Postal Service Carrier Annex and Distribution Center/Terminal Post Office, and Starbucks headquarters are in this segment. Port terminals and port-related uses are along the East Duwamish Waterway (also known as the Duwamish River). Transportation maintenance and storage facilities (owned by King County Metro Transit [Metro], Sound Transit, and BNSF Railway) are also in this segment. The City has identified the industrial nature of SODO in the manufacturing/industrial center designation and has plans and policies in place to protect existing industrial land uses given their crucial role in the city and regional economies. As a result, potential future land uses are similar to existing land uses in this segment. The Greater Duwamish Manufacturing/Industrial Center Plan in the Neighborhood Plans chapter of the City of Seattle Comprehensive Plan promotes continued growth and retention of employment and industrial use in the manufacturing/industrial center. This includes retaining and promoting port, trade, and maritime industrial uses, and seeking to prioritize use of land for private industrial uses rather than public facilities. One of the City's goals for this area is to provide a transportation network that minimizes conflicts between different travel modes while emphasizing mobility of freight and goods (City of Seattle 2018).





Source: City of Seattle, King County (2019, 2020, 2021).

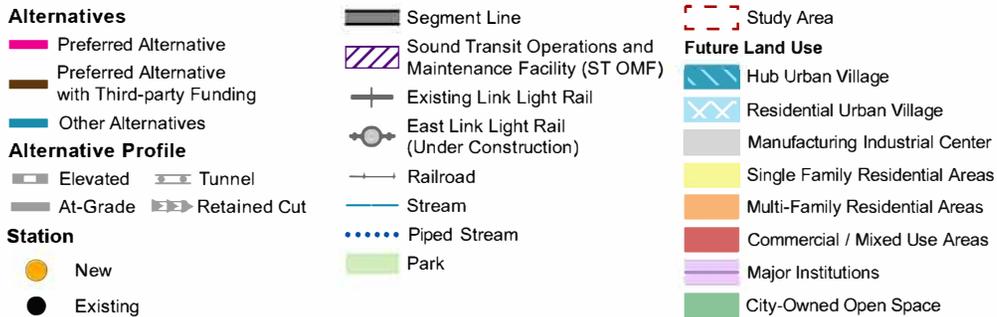
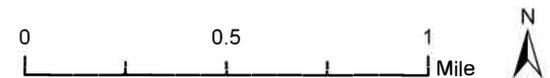


FIGURE 4.2.2-1
Future Land Use
 West Seattle Link Extension
West Seattle and Ballard Link Extensions



4.2.2.1.2 Duwamish Segment

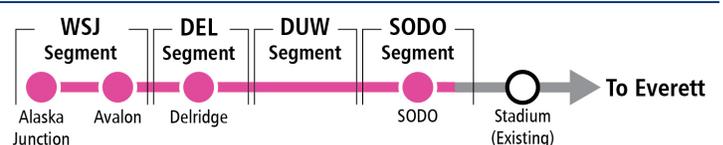
Similar to the SODO Segment, the Duwamish Segment neighborhoods include the Industrial District and the Duwamish Manufacturing/Industrial Center. Harbor Island is a key marine freight terminal for the Port of Seattle, and much of the surrounding uses support this function. Two fire stations (Fire Stations 14 and 36) make up the institutional land uses in this area. Single-family housing, public/institutional uses (Pathfinder K-8 School), and open space (the West Duwamish Greenbelt) are in the area of the Pigeon Point community. Potential future land uses are generally similar to existing land uses. The Greater Duwamish Manufacturing/Industrial Center Plan in the Neighborhood Plans chapter of the *Seattle 2035 Comprehensive Plan* promotes employment and industrial use in the manufacturing/industrial center. The City's plan for this area includes maintaining economic vitality, providing adequate public infrastructure, and maintaining land for industrial uses (City of Seattle 2018).

4.2.2.1.3 Delridge Segment

The Delridge Segment includes the Delridge neighborhood, which includes the Youngstown community. A small portion of this segment is within the Industrial District and manufacturing/industrial center, and includes Nucor Steel Seattle, a steel manufacturing plant. The Delridge Segment has single and multi-family land uses with parks and open spaces. There is limited commercial development along arterials with multi-family residential uses concentrated along Southwest Avalon Way. Potential future land uses allow for commercial and multi-family development in the Youngstown community, where future development is subject to Mandatory Housing Affordability requirements. The Delridge Plan in the Neighborhood Plans chapter of the City of Seattle Comprehensive Plan calls for preservation of open spaces in Delridge and for clustering mixed-use activity nodes to provide services to residents. Delridge neighborhood planning policies in the Comprehensive Plan also advocate for providing educational, recreational, cultural, and social opportunities, and potentially increased housing to the neighborhood near Southwest Delridge Way and Southwest Genesee Street, as a vibrant center. They also advocate for more commercial services and pedestrian improvements in the neighborhood anchor vicinity near Southwest Delridge Way and Southwest Andover Street to serve the neighborhood's needs and provide safe pedestrian conditions. The City's goals for this area include providing a transportation system that allows for convenient access to local travel and access to employment, shopping, and entertainment (City of Seattle 2018).

4.2.2.1.4 West Seattle Junction Segment

The West Seattle Junction Segment includes the West Seattle neighborhood and a small portion of the Delridge neighborhood. There are multi-family and commercial uses along Southwest Avalon Way. The West Seattle neighborhood includes the West Seattle Junction hub urban village, where there is an active mixed-use district serving the surrounding single- and multi-family residential areas. Commercial and mixed-use development is mostly clustered along Fauntleroy Way Southwest, Southwest Alaska Street, and California Avenue Southwest. There are parks and open space areas on the eastern edge of this segment. There are also a number of religious institutions concentrated in the northern portion of the study area. Potential future land uses include additional mixed-use areas where zoning allows for denser development in the West Seattle Junction hub urban village. Near the Alaska Junction (the intersection of Southwest Alaska Street and California Avenue Southwest) and along Fauntleroy Way Southwest, future development is subject to Mandatory Housing Affordability requirements (City of Seattle 2019). The West Seattle Junction Plan in the Neighborhood Plans chapter of the City of Seattle Comprehensive Plan emphasizes maintaining a compact mixed-use commercial core with a "small town character." It also reinforces pedestrian orientation and balances



parking, traffic circulation, and pedestrian safety purposes. The plan promotes housing, services, and amenities to support populations of “diverse incomes, ages, and other social characteristics.” One of the City’s goals for this area includes facilitating movements of people and goods using a full range of transportation choices.

4.2.2.2 Environmental Impacts of the No Build Alternative

The No Build Alternative includes the existing transportation system and future employment and population growth assumed in adopted plans, but without the West Seattle Link Extension (see Section 2.2, No Build Alternative). Proposed and planned development would continue to move through permitting procedures consistent with adopted land use plans and would be constructed.

This alternative is inconsistent with many regional land use and transportation policies because it would not develop and expand upon the high-capacity-transit system and would not connect the region’s highest growth centers. It is also not consistent with many local plans and policies that call for increased density and transit-oriented development (TOD). The *Seattle 2035 Comprehensive Plan* estimates that between 2015 and 2035, the population in the city of Seattle will grow by 120,000 people, adding 115,000 jobs and 70,000 households (City of Seattle 2018). With the No Build Alternative, population growth in the study area would not be supported by TOD near high-capacity transportation options. Under the No Build Alternative, a major transportation investment that is called for in local and regional plans to accommodate transportation demand from existing land uses and anticipated growth would not be in place. As such, the No Build Alternative would limit transportation options, increasing traffic congestion and slowing the rate of denser development in Seattle.

4.2.2.3 Environmental Impacts of the Build Alternatives during Operation

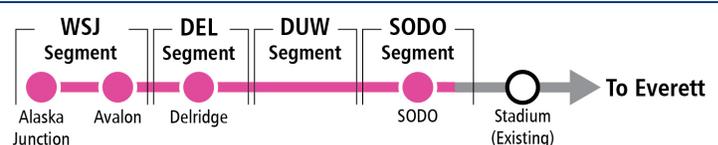
This section discusses the consistency of the Build Alternatives with regional, state, and local land use policies and the direct and indirect operational impacts on planned future land uses. Sound Transit’s property acquisitions are detailed in Section 4.2.1, Acquisitions, Displacements, and Relocations. The land use analysis also considers findings from other environmental elements including Chapter 3, Transportation Environment and Consequences; Section 4.2.3, Economics; Section 4.2.5, Visual and Aesthetic Resources; Section 4.2.6, Air Quality; Section 4.2.7, Noise and Vibration; and Section 4.2.17, Parks and Recreational Resources.

Long-term direct impacts would occur in locations where the light rail alternatives would require private or public property acquisitions for the new project facilities. These acquisitions would convert property to a transportation-related use. Direct impacts also include proximity impacts (e.g., visual, noise, and traffic impacts) that could cause changes in adjacent land uses. The following discussion highlights the key differences between alternatives and includes information on the West Seattle and Ballard Link Extensions Minimum Operable Segment (M.O.S.).

4.2.2.3.1 Impacts Common to All Alternatives

Consistency with Land Use Plans and Policies

Improving transit accessibility and encouraging transit use are goals shared by regional, state, and local land use plans in the study area. The West Seattle Link Extension would connect residential and commercial areas to Seattle’s major economic centers and create uninterrupted



access among several neighborhoods within the corridor. All alternatives would enhance a regional transit system serving a growing transportation need in planned high-density areas. The project would support the 2020 Puget Sound Regional Council VISION 2050 strategies of focusing growth within regional growth centers and high-capacity-transit station areas, reducing greenhouse gas emissions through mobility options, building the region’s planned high-capacity-transit system to support growth in designated growth centers, and building more diverse and affordable housing near transit. The project would also support Puget Sound Regional Council’s *Regional Transportation Plan* (2018) and *Growing Transit Communities Strategy* (2013) and Sound Transit’s *Regional Transit Long-Range Plan* (2014a) by developing safe and efficient high-capacity transit to improve mobility within and among the region’s major cities and urban areas. In addition, the *Sound Transit Transit-Oriented Development (TOD) Strategic Plan Update* (2014b), *Equitable Transit Oriented Development Policy* (Board Resolution No. R2018-10) (2018), and *Real Property Excess, Surplus, and Disposition Policy* (2013) would be followed as land acquisitions and disposition occurs. Also relevant are the City of Seattle Comprehensive Plan goals and policies seeking integrated land use and transportation planning strategies. A detailed analysis of the project’s consistency with adopted applicable plans is provided in Appendix L4.2, Land Use.

The project is a “regional transit authority facility” and is, therefore, explicitly recognized as an essential public facility in the Growth Management Act (Revised Code of Washington 36.70A.200). Once a West Seattle Link Extension alternative is selected, jurisdictions have a duty to accommodate the project in their land use plans and development regulations.

Conversion of Land Uses to Transportation Uses

Direct land use impacts occur where Sound Transit would acquire property for the project. Most of this property would be permanently converted to a transportation use for the light rail tracks, stations, or ancillary facilities. Property that is already public right-of-way for transportation uses is not included in this analysis because it would remain a transportation use. The West Seattle Link Extension alternatives generally follow existing transportation corridors, limiting the amount of land that would be converted to a transportation use. Property acquisitions are discussed in Section 4.2.1, Acquisitions, Displacements, and Relocations, and listed in Appendix L4.1, Acquisitions, Displacements, and Relocations.

Land acquired for construction and operation of the West Seattle Link Extension would account for less than 0.1 percent of the total land in Seattle. Tables 4.2.2-1 through 4.2.2-4 summarize the approximate amount of land that would be permanently converted to a transportation use within each segment. In areas where the project would acquire property for construction staging, the land could be restored to its previous land use or redeveloped with an allowed use under current zoning. Redevelopment would be consistent with the City’s zoning and Sound Transit’s Equitable Transit Oriented Development Policy. Sound Transit’s TOD policy includes goals for prioritizing affordable housing when redeveloping suitable agency-owned properties. These properties may also be used for joint development of transit facilities with other compact residential or commercial development done in partnership with others.

Tables 4.2.2-1 to 4.2.2-4 summarize impacts by alternative. Development and redevelopment potential in station areas is discussed in Section 4.2.2.5, Indirect Impacts of the Build Alternatives.

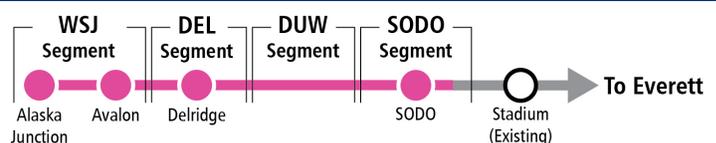


Table 4.2.2-1. Potential Permanent Conversion of Land Use to a Transportation-Related Land Use – SODO Segment, West Seattle Link Extension

Alternative	City-owned Open Space (acres)	Commercial/Mixed-Use Areas (acres)	Hub Urban Village (acres)	Manufacturing Industrial Center (acres)	Multi-family Residential (acres)	Single-family Residential (acres)	Urban Center (acres)	Total Acres Affected
Preferred At-Grade (SODO-1a)	0	0	0	3.4	0	0	0	3.4
At-Grade South Station Option (SODO-1b)	0	0	0	4.2	0	0	0	4.2
Mixed Profile (SODO-2)	0	0	0	4.4	0	0	0	4.4

Note: Future land use types were developed using City of Seattle Future Land Use 2035 dataset (2020).

Table 4.2.2-2. Potential Permanent Conversion of Land Use to a Transportation-Related Land Use – Duwamish Segment

Alternative	City-owned Open Space (acres) ^a	Commercial/Mixed-Use Areas (acres)	Hub Urban Village (acres)	Manufacturing Industrial Center (acres) ^a	Multi-family Residential (acres)	Single-family Residential (acres) ^a	Urban Center (acres)	Total Acres Affected ^b
Preferred South Crossing (DUW-1a)	1.1 to 1.2	0	0	9.4 to 9.5	0.4	0.5 to 1.0	0	11.5 to 12.0
South Crossing South Edge Crossing Alignment Option (DUW-1b)	1.3	0	0	9.6	0.4	0.7	0	12.1
North Crossing (DUW-2)	0	0	0	13.2	0	0	0	13.2

Note: Future land use types were developed using City of Seattle Future Land Use 2035 dataset (2020).

^a Shown as a range if the number of acres changes depending on connections in adjacent segments or options.

^b Totals reflect the high and low values in component ranges.

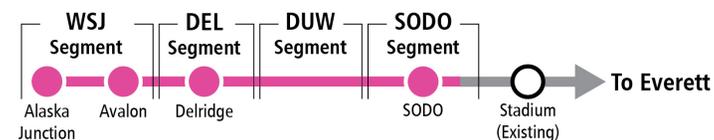


Table 4.2.2-3. Potential Permanent Conversion of Land Use to a Transportation-Related Land Use – Delridge Segment

Alternative	City-owned Open Space (acres) ^a	Commercial/Mixed-Use Areas (acres) ^a	Hub Urban Village (acres)	Manufacturing Industrial Center (acres) ^a	Multi-family Residential (acres)	Single-family Residential (acres)	Urban Center (acres)	Total Acres Affected ^b
Preferred Dakota Street Station (DEL-1a)	0.4 to 0.5	1.3 to 1.4	<0.1	0 to 0.7	3.6	<0.1	0	5.6 to 6.1
Dakota Street Station North Alignment Option (DEL-1b)	0.1	1.4	0.3	<0.1	4.1	<0.1	0	6.0
Preferred Dakota Street Station Lower Height (DEL-2a)*	1.3	1.7	0	<0.1	3.4	<0.1	0	6.5
Dakota Street Station Lower Height, North Alignment Option (DEL-2b)*	<0.1	1.7	0.7	<0.1	4.0	<0.1	0	6.5
Delridge Way Station (DEL-3)	0.6	1.7	<0.1	<0.1	1.0 ^c	0.4	0	3.7
Delridge Way Station Lower Height (DEL-4)*	1.2	1.7	0	<0.1	1.0 ^c	0.3	0	4.2
Andover Street Station (DEL-5)	0	0.7	0.6	5.1	0.2	0	0	6.6
Andover Street Station Lower Height (DEL-6)*	0	0.9	0.5	4.6	0	0.1	0	6.2

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement, some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

Note: Future land use types were developed using City of Seattle Future Land Use 2035 dataset (2020).

^a Shown as a range if the number of acres changes depending on connections in adjacent segments or options.

^b Totals reflect the high and low values in component ranges.

^c With the West Seattle and Ballard Link Extensions M.O.S., there would be 0.3 additional acre of multi-family residential land converted to a transportation use.

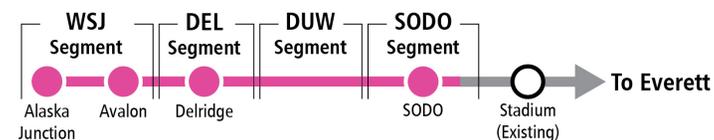


Table 4.2.2-4. Potential Permanent Conversion of Land Use to a Transportation-Related Land Use – West Seattle Junction Segment

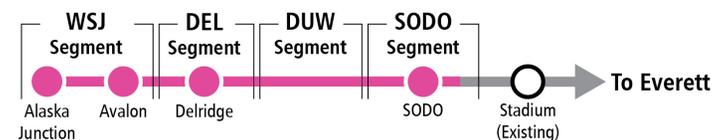
Alternative	City-owned Open Space (acres)	Commercial /Mixed-Use Areas (acres)	Hub Urban Village (acres) ^a	Manufacturing Industrial Center (acres)	Multi-family Residential (acres)	Single-family Residential (acres)	Urban Center (acres)	Total Acres Affected ^b
Preferred Elevated 41st/42nd Avenue Station (WSJ-1)	0.1	0	6.6	0	0	0	0	6.7
Preferred Elevated Fauntleroy Way Station (WSJ-2)	<0.1	0	6.9 to 7.0	0	0	0	0	6.9 to 7.0
Preferred Tunnel 41st Avenue Station (WSJ-3a)*	0	0	4.3 to 4.4	0	0	0	0	4.3 to 4.4
Preferred Tunnel 42nd Avenue Station Option (WSJ-3b)*	0.1	0	4.0	0	0	0	0	4.1
Short Tunnel 41st Avenue Station (WSJ-4)*	0	0	6.6	0	0	0	0	6.6
Medium Tunnel 41st Avenue Station (WSJ-5)*	0	0	5.3	0	0	0	0	5.3

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement, some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

Note: Future land use types were developed using City of Seattle Future Land Use 2035 dataset (2020).

^a Shown as a range if the number of acres changes depending on connections in adjacent segments or options.

^b Totals reflect the high and low values in component ranges.



4.2.2.3.2 SODO Segment

The alternatives in the SODO Segment would convert manufacturing/industrial center land to a transportation use. Each of the alternatives would convert a similar amount of land to a transportation use. Alternative SODO-2 would convert the most manufacturing/industrial center land to a transportation use and Preferred Alternative SODO-1a would convert the least. All alternatives would include a station north of South Lander Street within Industrial General Zone 1 (IG1 U-85), which has no height limit for noncommercial projects.

The Ballard Link Extension-only M.O.S. would convert land identified in this section to a transportation use for the West Seattle Link Extension in the SODO Segment.

4.2.2.3.3 Duwamish Segment

Alternatives in the Duwamish Segment would mostly convert manufacturing/industrial center uses to a transportation use. Preferred Alternative DUW-1a would convert less land to a transportation use than other alternatives in this segment. Most of this land is designated as manufacturing/industrial center, although some residential and City-owned open space land would also be converted. Alternative DUW-2 would convert the most land to a transportation use, including Port of Seattle-owned properties. This alternative would not convert any single- or multi-family residential land or City-owned open space to a transportation use, but would convert more manufacturing/industrial center land than other alternatives in this segment.

The Ballard Link Extension-only M.O.S. would convert land in the Duwamish Segment to a transportation use for the connection to the existing Operations and Maintenance Facility Central. These effects are described for the Ballard Link Extension SODO Segment in Section 4.3.2.3.2.

4.2.2.3.4 Delridge Segment

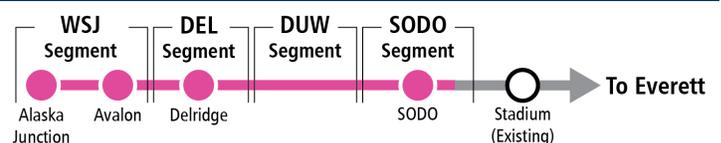
Preferred Alternative DEL-2a* and Option DEL-2b* would convert the most land to a transportation use. Alternative DEL-3 would convert the least amount of land to a transportation use.

Preferred Alternative DEL-2a* would convert the most City-owned open space land to a transportation use, and Alternative DEL-4* would convert a similar but slightly less amount. Alternative DEL-5 and Alternative DEL-6* would not convert open space land.

All alternatives except Alternative DEL-6* would convert multi-family residential land to a transportation use. Option DEL-1b and Option DEL-2b* would convert the most multi-family residential land. Alternative DEL-3 and Alternative DEL-4* would convert the most single-family residential land.

Alternative DEL-5 would convert the most manufacturing/industrial center land. Preferred Alternative DEL-1a would only convert manufacturing/industrial land to a transportation use when connecting to Alternative DUW-2. Option DEL-1b, Alternative DEL-2a*, Option DEL-2b*, Alternative DEL-3, and Alternative DEL-4* would convert less than 0.1 acre of manufacturing/industrial land.

Preferred Alternative DEL-1a, Option DEL-1b, Preferred Alternative DEL-2a*, and Option DEL-2b* would include a Delridge Station in a multi-family residential area near Southwest Dakota Street. The addition of a light rail station in a predominantly residential area is a notable change in land use. The top of the station structure would be approximately 110 feet high for Preferred Alternative DEL-1a and Option DEL-1b and approximately 60 feet high for Preferred Alternative



DEL-2a* and Option DEL-2b*; however, this station would be within the City’s Low-Rise Multifamily LR1(M) zone, which limits structure height to 35 feet. The Seattle Department of Construction and Inspection’s Director has the authority to waive or modify applicable development standards based on certain conditions. Alternatives DEL-3 and DEL-4* would have a station height of approximately 90 feet, which is higher than the 55-foot to 75 -foot height limit allowed by zoning. However, Alternatives DEL-3 and DEL-4* would include a station building in the street right-of-way and so may not require the same adjustments to applicable development standards. Alternatives DEL-5 and DEL-6* would have a Delridge Station height of between approximately 90 feet and 100 feet, while the zoning only allows for a structure up to 85 feet high. Because this station would be in a General Industrial 2 zone with no height limit for noncommercial projects, it would be less of a change than the other Delridge Segment Build Alternatives.

As shown in Table 4.2.2-3, under the West Seattle and Ballard Link Extensions M.O.S., Alternatives DEL-3 and DEL-4* would require converting additional multi-family residential land to a transportation use for the bus stops and bus layover spaces along Delridge Way Southwest and Southwest Dakota Street.

4.2.2.3.5 West Seattle Junction Segment

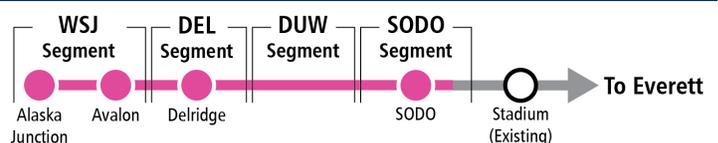
The alternatives in the West Seattle Junction Segment would convert hub urban village land and City-owned open space land to a transportation use. Preferred Alternative WSJ-1 and Preferred Alternative WSJ-2 would convert the most land to a transportation use. Alternative WSJ-4* would convert slightly less. Preferred Option WSJ-3b* would convert the least amount of land to a transportation use.

Alternatives with an elevated guideway in the West Seattle Junction Segment (Preferred Alternative WSJ-1, Preferred Alternative WSJ-2, and Alternative WSJ-4*) could be close enough to adjacent properties to limit future development. Due to fire life safety access requirements, these properties may not be able to be developed to the full extent allowed under current zoning. This would affect potential density in several buildings in the junction area, including potential future affordable housing units under Mandatory Housing Affordability zoning requirements or payment into a fund to support affordable housing.

Preferred Alternatives WSJ-1 and WSJ-2 and Alternative WSJ-4* would include an elevated Avalon Station in a residential area near Southwest Genesee Street. The top of the station would be between 60 feet and 80 feet high, which would be above the 30-foot limit allowed by zoning. Preferred Alternatives WSJ1 and WSJ-2 would include an Alaska Junction Station in a commercial neighborhood near Southwest Alaska Street. The top of the station would be approximately 60 feet to 80 feet high, which is below the 95-foot height limit allowed by zoning.

4.2.2.4 Environmental Impacts of the Build Alternatives during Construction

Potential impacts to existing land uses include temporary impacts from construction staging areas; easements; noise, air emissions, and visual changes; and traffic congestion. These impacts would not affect the land use types unless the property became vacant, and, are not anticipated to be severe enough to cause vacancies after mitigation, as described in Section 4.2.2.6, Mitigation Measures. Proximity and construction impacts were determined based on the findings of other environmental elements. For more information, see Section 4.2.3, Economics, and Section 4.2.7, Noise and Vibration.



4.2.2.5 Indirect Impacts of the Build Alternatives

4.2.2.5.1 Transit-oriented Development Potential Common to All Alternatives

Improvements in transportation systems can influence changes to nearby land uses. Although the West Seattle Link Extension would directly affect land use through property acquisitions, the project would not directly change surrounding land use designations. Cities and counties control land use regulations, including zoning, and property owners make decisions about developing or redeveloping their property. The West Seattle Link Extension could indirectly affect land use by acting as a catalyst for others to develop or redevelop land near project facilities consistent with city land use and zoning requirements. This type of development could increase availability and density of housing options, including affordable housing units. Alternatively, this could result in the indirect effect of increased housing prices and business rent around desirable station areas.

Transit-oriented Development

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.

TOD is a pattern of land use and development that includes a mix of uses at higher density or intensity in the vicinity of transit stations. TOD generally occurs when stations are in prime regional or community centers, areas attractive to typical market forces, areas with active regional and local real estate markets with willing investors, and jurisdictions where public policies and regulations such as zoning encourage intensive development in station areas. There is also the potential for joint development of transit facilities like station entrances and concourses, as well as redevelopment of surplus properties no longer needed after construction.

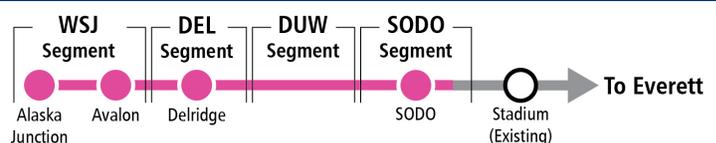
Agency TOD

“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 in the long-term, or through joint development. Agency TOD is implemented through partnerships with public, non-profit, or private developers. Sound Transit’s Equitable Transit Oriented Development Policy prioritizes partnerships with developers of affordable housing.

The Sound Transit Board adopted the Equitable Transit Oriented Development Policy in 2018 (Board Resolution No. R2018-10). The 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 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.

Notably, the policy also supports exploration of development potential of transit project decisions, and pursuit of joint or co-development of transit facilities where and when



appropriate. There is specific priority placed on partnerships that deliver affordable housing, responding to a state statute that requires Sound Transit to first offer at least 80 percent of surplus property suitable for housing to qualified developers of affordable housing, who are then obligated to ensure 80 percent of housing units constructed are affordable to those earning 80 percent or less of the area median income for the county.

Sound Transit prepared a study, *Station Area Development Opportunities Evaluation* (2021), to identify and assess specific potential TOD opportunities associated with the West Seattle Link Extension’s stations to identify areas where TOD could occur. This study provides more information and analysis to supplement the summary discussion below.

4.2.2.5.2 Transit-oriented Development Potential by Alternative

For the SODO Segment, all SODO station alternatives have potential for TOD on surplus properties and for joint development of station access features. All station alternatives within the Delridge Segment have some TOD potential based on current zoning and project footprints, except the two Delridge Way station alternatives (Alternatives DEL-3 and DEL-4*), which are primarily constructed within the right-of-way. Of the Delridge Segment station alternatives, the stations north of Andover (Alternative DEL-5 and Alternative DEL-6*) have some potential for future TOD due to the mix of industrial and commercial zoning, which allows for increased building heights and more diverse uses. The Dakota Street station alternatives (Preferred Alternative DEL-1a, Option DEL-1b, Preferred Alternative DEL-2a*, and Option DEL-2b*) result in surplus parcels that could be redeveloped but have lower potential for future TOD based on current low-rise residential zoning. This zoning allows for multi-family residential construction, but limits building heights to 30 feet and does not allow for non-residential uses. The TOD potential of the Andover Street station alternatives (DEL-5 and DEL-6*) and Dakota Street station alternatives (DEL-1a, DEL-1b, DEL-2a*, DEL-2b*) would be increased with adjustments to zoning.

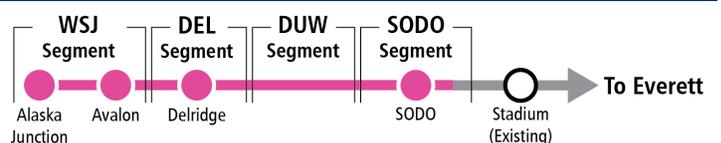
In the West Seattle Junction Segment, all station alternatives have some potential for future TOD based on current zoning and the possibility of redeveloping surplus property after construction. Tunnel alternatives at Alaska Junction and Avalon stations (Preferred Alternative WSJ-3a*, Preferred Option WSJ-3b*, Alternative WSJ-4*, and Alternative WSJ-5*) have higher potential for future TOD due to the ability to use air rights above tunnels and stations for joint development, along with fewer permanent impacts to development capacity due to the guideway.

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 2020) 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.”

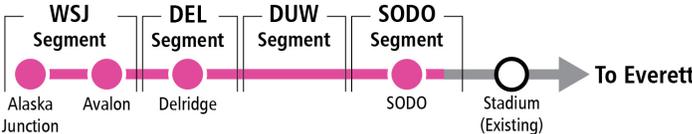
Equitable Transit-oriented Development

Equitable TOD explicitly advances a mission of social, racial, and/or economic equity in its use, programming, or ownership structure. Equitable TOD can include affordable housing, cooperative or affordable commercial space and uses, childcare and human development, and community-based management or stewardship of property. Sound Transit supports Equitable TOD objectives through its 2018 Equitable Transit Oriented Development Policy.



4.2.2.6 Mitigation Measures

No mitigation would be required for land use impacts during operation or construction of the West Seattle Link Extension. In general, the West Seattle Link Extension would not result in inconsistencies with adopted land use plans. During construction, Sound Transit would minimize disturbances to surrounding land uses as described in Section 2.6, Construction Approach, Section 4.2.5, Visual and Aesthetic Resources, Section 4.2.6, Air Quality, and Section 4.2.7, Noise and Vibration. Therefore, impacts are not expected to cause substantial changes to land use during construction.



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4.2.3 Economics

4.2.3.1 Affected Environment

Demographic and economic trends in the study area were assessed by using Forecast Analysis Zone estimates (a map of the zones is shown on Figure L4.3-1 in Appendix L4.3, Economics). Forecast Analysis Zones are geographic units used to delineate future socio-economic conditions to support transportation planning. Table L4.3-2 in Appendix L4.3 shows the population, household, and employment forecast trends for the Forecast Analysis Zones associated with each segment area in the West Seattle Link Extension from 2015 to 2040. Tables L4.3-3, L4.3-4, and L4.3-5 in Appendix L4.3 provide a closer look at employment forecast trends since 2000 and by employment sector.

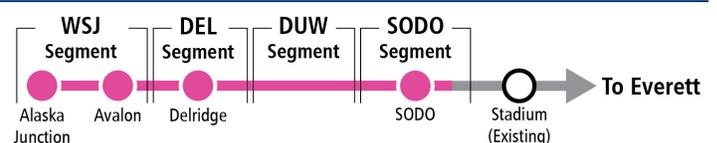
This analysis includes an assessment of potential adverse and beneficial economic effects of the proposed project alternatives across three different study area scales:

- **Segment:** Site-specific business and employment impacts were evaluated for potential displacement of business activity. Impacts to Tribal treaty-protected fishing were evaluated for applicable segments.
- **City:** Potential impacts to tax revenues were evaluated within the city of Seattle.
- **Regional:** Broader 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 were assessed for King, Kitsap, Pierce, and Snohomish counties (referred to as the Puget Sound region study area) stemming from project operation. The regional study area encompasses the four-county area to account for shifts in the population's demand for goods and services within and outside the project corridor study area.

4.2.3.1.1 Regional Demographic and Economic Trends

Over the last 20 years, employment increased from 1.9 million to 2.3 million jobs in the Puget Sound region. Along with employment, the median household income increased regionally (Puget Sound Regional Council 2020). This trend of economic growth is forecasted to continue for the next few decades.

Population, household, and employment forecasts for the Puget Sound region and associated counties in the region are provided in Appendix L4.3, Table L4.3-1. The forecast population data for the Puget Sound region shows regional growth between 2015 and 2040 (the forecast period) of over 1 million people, which would result in a population of approximately 5 million people in the region by 2040. This represents a 0.8 percent increase in population per year (Puget Sound Regional Council 2018). Puget Sound Regional Council data from 2017 shows that King County's population will grow at a slower pace of 0.7 percent per year over the same time period (Puget Sound Regional Council 2017). The number of households in the Puget Sound region is predicted to grow by approximately 575,000 households over the 2015 to 2040 period—or by 1.1 percent a year—which is greater than the regional population growth rate (0.8 percent). This reflects faster growth in smaller households. Travel demand typically tracks more closely to growth in the number of households than to population; consequently, the forecasted household growth suggests a potentially faster increase in demand for highway and transit service.



Median household incomes in the Puget Sound region study area are higher than that of the state overall, which is about \$74,000. King County had the highest median household income within the region, at about \$95,000 in 2018 (Puget Sound Regional Council 2018). From 2013 to 2018, incomes in King County grew by about 33 percent, while statewide incomes increased by about 21 percent. Employment in the region is expected to grow at an approximate annual average rate of 1.1 percent through 2040, which is equivalent to about 816,000 additional jobs over the forecast period (Puget Sound Regional Council 2018). King County is predicted to expand employment by 1.2 percent, with much of that growth centered in urban Seattle. Approximately 115,000 jobs are expected to be added by 2035 in the city of Seattle (City of Seattle 2019). These trends in income and employment growth support forecasts for increasing travel demand in the region and the project corridor.

4.2.3.1.2 Segment Demographic and Economic Trends

Jobs are concentrated in the SODO and Duwamish segments because of their greater concentration of land uses and zones associated with manufacturing and industrial activities (City of Seattle 2018). These Forecast Analysis Zones have the highest forecasted job growth, with projected annual job growth of 0.4 percent in the SODO Segment compared to 0.04 percent in the West Seattle Junction Segment between 2015 and 2040. The West Seattle Junction Segment area is more residential in nature. It has far more households and more single-family residential uses in comparison to the SODO, Delridge, and Duwamish segments, where there are a greater mix of residential and commercial uses (City of Seattle 2018). The average annual household growth rate is projected to be at 1.1 percent between 2015 and 2040 for the forecast analysis zone that covers the SODO Segment, and 0.6 percent for that of the West Seattle Junction Segment; these average annual growth rates are faster than the 0.2 percent household growth rate of the Delridge and Duwamish segments. (Forecast Analysis Zone geographies are larger than the areas encompassing the project segments). For more information on Forecast Analysis Zones, see Table L4.3-2 in Appendix L4.3.

4.2.3.1.3 Tax Revenue Sources

The West Seattle Link Extension would be within the city of Seattle, where property, sales, utility, and business and occupation taxes represent the largest contribution to the general fund’s taxes.

Table 4.2.3-1 shows the breakdown of different tax revenues and their share in the City’s general fund. These taxes, combined with other sources of funding, such as license fees, grants, and fines, help fund a range of general City services, including police and fire, human, general government, and transportation services (City of Seattle 2019). The City has a range of district-based (or dedicated) funding sources for certain uses such as the Metropolitan Park District property tax levy to fund park and recreation services and the Transportation Benefit District sales tax to fund transportation services that are included under the respective property and sales taxes in Table 4.2.3-1.

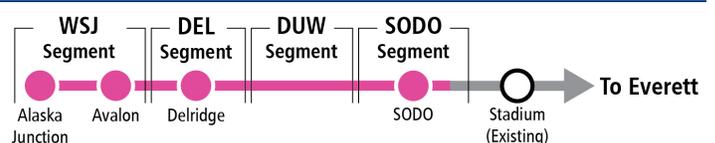


Table 4.2.3-1. Percent of Total General Fund Revenues for the City of Seattle

Tax	General Fund Total (\$ millions)	General Fund Percent
Property Tax	\$345.9	23.5
Sales Tax	\$296.3	20.2
Utility Tax	\$220.6	15.0
Business and Occupation Tax	\$296.9	20.2
Other	\$309.6	21.1
Total	\$1,469.3	100.0

Source: City of Seattle 2019, 2020b.

Note: "Other" represents revenue garnered through licenses, federal and state grants, state entitlements and impact programs, external service charges, court fines, and other miscellaneous investments, earnings, and charges.

4.2.3.1.4 Seattle Comprehensive Plan

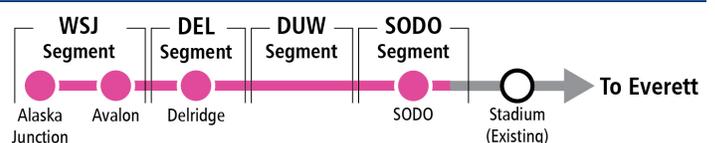
The *Seattle 2035 Comprehensive Plan: Managing Growth to Become an Equitable and Sustainable City 2015-2035* (Seattle Comprehensive Plan) outlines goals to concentrate anticipated job and housing growth in urban centers and urban villages (City of Seattle 2018). The Urban Village Strategy within the plan promotes housing and employment development in specific locations by supporting compact, pedestrian-oriented development and reliable transit access accommodations. The strategy identifies four different types of growth areas: urban centers, hub urban villages, residential urban villages, and manufacturing and industrial centers. The study area includes the Duwamish Manufacturing/Industrial Center, one of two Puget Sound Regional Council and City-designated manufacturing and industrial centers in the city (see Figure 4.2.2-1 in Section 4.2.2, Land Use). These centers are designated as locations for more intensive industrial activity as part of the regional growth strategy set forth by the Puget Sound Regional Council and the City of Seattle. The City of Seattle (2020a) is in the process of updating industrial and maritime land use policies and aims to devise a comprehensive strategy. The West Seattle Junction Hub Urban Village is a City-designated area focused on balancing employment and housing opportunities with a mix of goods and services.

4.2.3.1.5 Regional Transportation of Goods and Services

As one of the most trade-dependent states in the nation (City of Seattle 2016), the economy of Washington and the need for effective freight mobility are closely related. Both consumers and businesses in the region depend on the efficient and safe movement of goods by truck, rail, and water modes. The primary truck freight corridors in the state for regional and interstate commerce include Interstate 5 and Interstate 90. Substantial freight traffic also uses State Route 99. All three routes can be heavily congested during peak travel times. This congestion leads to longer travel times, increased operating costs, and decreased pick-up and delivery reliability. As a result, some businesses have shifted their delivery to non-peak hours and others have chosen to use alternate routes.

4.2.3.1.6 Industrial Centers

The Duwamish and SODO segments are within the Duwamish Manufacturing/Industrial Center along the Duwamish Waterway (also known as Duwamish River) (see Figure 4.2.2-1 in Section 4.2.2, Land Use). As one of the largest industrial centers in the Pacific Northwest, it supports close to 70,000 jobs across important sectors such as manufacturing, construction, resource extraction, and wholesale/transportation/utilities (City of Seattle, Port of Seattle, and Northwest



Seaport Alliance 2020). This center is a critical trade and transportation hub, serving as the Port of Seattle’s primary marine shipping area equipped with deep-water berths, wharfs, piers, shipyards, drydocks, container cranes, on-dock rail, container yards, cargo distribution and warehousing, and major railroad yards (Puget Sound Regional Council 2013, City of Seattle 1998). This center also includes Harbor Island, a key freight terminal for the Port of Seattle and the Northwest Seaport Alliance. Overall, Seattle’s South Industrial areas support 104,800 jobs throughout the King County economy directly and through multiplier effects. Additionally, the total economic impact of jobs on Seattle’s South Industrial areas are more than \$24.3 billion in business revenue. Seattle’s South Industrial areas support a total of 1.6 jobs per direct job throughout the King County economy, 5.9 total jobs per million dollars in final demand and \$1.40 per dollar of final demand (City of Seattle, Port of Seattle, and Northwest Seaport Alliance 2020).

The Port of Seattle and NW Seaport Alliance container terminals serve as an international gateway for imports and exports. In 2017, use of the NW Seaport terminals generated a total direct revenue of over \$2 billion and over 7,000 direct jobs (Port of Seattle 2021). Terminal 18, a 196-acre container terminal that is the largest in the Pacific Northwest, is on Harbor Island. The Duwamish Waterway serves as an important hub for exporting regional agricultural goods and other commodities and importing commodities and final goods from around the globe. The recently renovated Terminal 5 is expected to support 1,700 jobs in 2024, with a total economic impact of \$1.2 billion, and indirectly support 5,200 jobs in the region (City of Seattle, Port of Seattle, and Northwest Seaport Alliance 2020).

Railroads are also an important and cost-effective component of moving goods and services to markets. BNSF Railway and Union Pacific Class 1 Rail run through the Duwamish Manufacturing/Industrial Center, and these rail lines often provide direct service for local businesses. Some of the container docks at the port have rail to increase the efficiency of intermodal transfers.

4.2.3.2 Environmental Impacts of the No Build Alternative

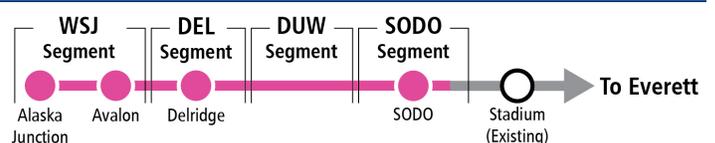
The No Build Alternative would have fewer transportation options and longer travel times for transit riders, potentially resulting in increased road congestion and less transit usage. Chapter 3, Transportation Environment and Consequences, provides additional information. This may deter or slow some investment in the study area, and the development that occurs could be more dispersed and of lower density than with the West Seattle Link Extension.

The No Build Alternative would likely result in a different pattern of economic development and property development than with the project. Business and employee displacements could occur as part of the natural process of changing business dynamics and land development

4.2.3.3 Environmental Impacts of the Build Alternatives during Operation

The West Seattle Link Extension has the potential to advance local and regional plans by expanding transportation infrastructure and modal options available, thus increasing the efficiency of transportation and strengthening the local and regional economy. There would also be a small increase in long-term transit employment (train operators and maintenance staff) once new West Seattle Link Extension light rail service begins in 2032.

Changes to the local business environment and surrounding neighborhoods might occur as a result of the West Seattle Link Extension. Direct economic impacts include business and



employee displacements, as well as associated potential tax impacts from changes in land use, regional freight mobility, or maritime operations resulting from land acquisition for the project.

All Build Alternatives could result in some change in economic activity at or near the project corridor. Some alternatives could result in changes in economic activity for the broader region if the economic activity could not be relocated within the region. These changes might include business displacements when property is acquired for the project, along with corresponding effects on employees and property taxes that could shift the tax burden to other businesses and residents. If businesses are displaced outside of the region, business and occupation taxes and retail sales taxes could also be affected.

Potential maritime industry impacts that would have broader supply-chain impacts in the region and potential impacts on Tribal fishing where the project would cross the Duwamish Waterway are discussed in Section 4.2.3.3.3, Duwamish Segment.

4.2.3.3.1 Impacts Common to All Alternatives

This section describes impacts common to all alternatives, including business and employee displacements, the impact of acquisitions and displacements on the tax base of the city, and includes information on the minimum operable segment (M.O.S.). Additional detail on displacements is also provided by segment, along with impacts to the regional transportation of goods and services and freight mobility and access.

Business and Employee Displacements

The West Seattle Link Extension would require acquisition of commercial, industrial, and institutional properties that might result in the disruption or displacement of businesses along the project corridor. Substantial displacement of local businesses can affect residents and businesses by altering the scale and mix of land uses and economic activity.

Often the direct impacts for displaced businesses are financial, but this does not capture the broader dynamics associated with displacement. Businesses are affected differently based on their characteristics, such as firm size, community importance, employment impact, and ability to relocate. For example, businesses that rely on a localized customer base might have more difficulty finding a suitable new location to serve the same population. Businesses that use machinery or hazardous substances might require large parcels or have perceived negative costs to the public (such as waste and pollution) that make relocation difficult. Moving to a new location could also restrict their labor pool.

Potentially displaced businesses generate local tax revenues, provide employment opportunities, and contribute to the local economy. Table 4.2.3-2 indicates the number of business and employee displacements that would be required by each Build Alternative within each West Seattle Link Extension segment. Those alternatives with the least amount of such displacements and acquisitions would generally be expected to have a smaller negative effect on the local economy. The analysis considers impacts to specific industries that are dependent on critical waterways or infrastructure for operations by assessing if those businesses would be directly acquired.

Some businesses might relocate to other areas or permanently close when their property is purchased, thereby causing a loss of associated jobs. However, it is anticipated that most displaced businesses and jobs would not be lost permanently because Sound Transit would provide relocation assistance to displaced businesses. Potential business displacements that are location-specific to neighborhoods are evaluated in Section 4.2.4, Social Resources, Community Facilities, and Neighborhoods.

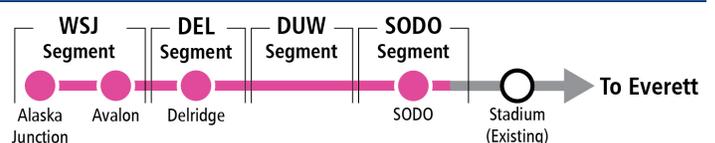


Table 4.2.3-2. Estimated Property Acquisition Impacts on Businesses and Employees from the West Seattle Link Extension

Segment	Alternative	Business Displacements ^a	Employee Displacements ^a
SODO	Preferred At-Grade (SODO-1a)	16 to 17 ^b	130 to 170 ^b
	At-Grade South Station Option (SODO-1b)	14	130
	Mixed Profile (SODO-2)	9	110
Duwamish	Preferred South Crossing (DUW-1a)	35 to 36	670 to 680
	South Crossing South Edge Crossing Alignment Option (DUW-1b)	28 to 29	680 to 690
	North Crossing (DUW-2)	38	400
Delridge	Preferred Dakota Street Station (DEL-1a)	13 to 16	140 to 150
	Dakota Street Station North Alignment Option (DEL-1b)	13 to 16	140 to 150
	Preferred Dakota Street Station Lower Height (DEL-2a)*	13 to 16	140 to 150
	Dakota Street Station Lower Height North Alignment Option (DEL-2b)*	13 to 16	140 to 150
	Delridge Way Station (DEL-3)	13 to 16	140 to 150
	Delridge Way Station Lower Height (DEL-4)*	13 to 16	140 to 150
	Andover Street Station (DEL-5)	21	170
	Andover Street Station Lower Height (DEL-6)*	20	140
West Seattle Junction	Preferred Elevated 41st/42nd Avenue Station (WSJ-1)	61	280
	Preferred Elevated Fauntleroy Way Station (WSJ-2)	13 to 16	80 to 90
	Preferred Tunnel 41st Avenue Station (WSJ-3a)*	15 to 18	90 to 100
	Preferred Tunnel 42nd Avenue Station Option (WSJ-3b)*	44 to 47	130 to 140
	Short Tunnel 41st Avenue Station (WSJ-4)*	18	100
	Medium Tunnel 41st Avenue Station (WSJ-5)*	15	90

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

Data Sources: King County Assessment Department 2019; United States Department of Energy 2016.

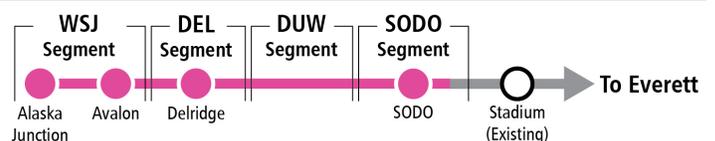
Note: The employee numbers are estimates and rounded to the nearest 10 digit. These employee numbers were derived using an accepted formula used by the United States Department of Energy (2016). The estimate for each alternative is based on translating the size of the business building area into jobs using a job density factor. The estimate is based off the predominant building use parcel data.

^a Ranges reflect differences from connecting to different alternatives in adjacent segments.

^b The range reflects that the staggered station configuration would avoid relocation of the United States Postal Service facility.

Industrial Properties Acquired

Industrial and manufacturing land that would be converted to a transportation use is described in Section 4.2.1, Acquisitions, Displacements, and Relocations, and Section 4.2.2, Land Use. Section 4.2.1 also cites an industrial vacancy rate of 4.3 percent, which indicates some land availability for relocations. However, industrial business replacements can be challenging when unique land features, such as access to rail or water, are required for business operation.



Impact of Acquisitions and Displacements on Tax Base of City

All of the West Seattle Link Extension Build Alternatives would require acquisition of parcels that have existing commercial or industrial activity and businesses that pay a sales and/or business and occupation tax. Acquisition of these parcels would result in the initial reduction of sales and business and occupation taxes from the displacement of existing businesses. Determining the potential reduction for such taxes is not possible because it is not known if businesses would relocate within the city. If displaced businesses were to relocate within the city, they would resume paying sales and business and occupation taxes and there would be no effect on the city tax base.

Like sales and business and occupation taxes, specific property tax impacts are not possible to calculate because of the structure of property taxes in Washington. Potential acquisitions would not initially reduce property taxes in Seattle due to the budget-based system that limits the growth of property tax revenues (Initiative 747 and subsequent legislative action to cap City property tax revenues at 1 percent per year, plus some add-on value from new construction). This means the overall amount of tax collected is determined by statute and not directly determined by changes in assessed valuation. The amount of tax is then distributed across taxable property on the basis of assessed valuation. If the amount of taxable property is reduced via acquisition and made exempt, the same tax amount is redistributed to the remaining taxable properties within the jurisdiction. However, the conversion of property from taxable to tax-exempt would shift the property tax burden to other non-exempt property taxpayers. The impact is expected to be minimal given the reduction in taxable assessed valuation of acquired properties in relation to the City’s overall tax base. For example, the total taxable assessed valuation of real property for West Seattle Link Extension acquisitions is equal to 0.4 percent of the City of Seattle’s overall assessed valuation in 2019.

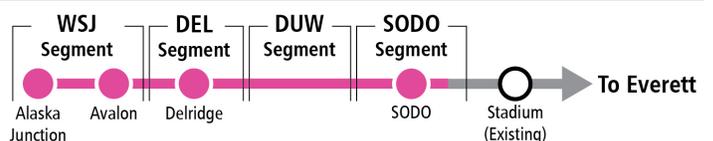
Some of the initial tax revenue displacement would be offset by future construction elsewhere in Seattle. Not all the land required for the project would be needed permanently, and the unused land could be redeveloped after project completion. The long-term implications of the project fiscal impacts depend on business location decisions. Some displaced businesses might choose to relocate to another site in the local area. Retaining those displaced businesses could reduce the effect on local sales taxes. In addition, if the project were to promote future development and investment in the local vicinity, property tax assessments could increase. However, the project could also result in shifting demand across the region, so that while assessments near the stations increase, property tax assessments in other areas of the city might be reduced. Overall, long-term property tax impacts are expected to be low, and it is difficult to determine if the result on property tax assessments would be a net positive or negative to the region.

4.2.3.3.2 SODO Segment

Business and Employee Displacements

The properties that would be affected in the SODO Segment are primarily commercial or industrial, as well as a public/institutional property (the United States Postal Service Carrier Annex and Distribution Center/Terminal Post Office). Preferred Alternative SODO-1a would have the most business and employee displacements. Alternative SODO-2 would displace the fewest businesses. All alternatives would displace a similar number of employees.

Both Option SODO-1b and Alternative SODO-2 would displace the United States Postal Service Carrier Annex and Distribution Center/Terminal Post Office (Carrier Annex/Terminal Post Office) at 4th Avenue South and South Lander Street. Preferred Alternative SODO-1a would acquire



part of this facility (a portion of the surface parking), which the United States Postal Service has indicated would require relocation of the facility. Relocation of the facility could be challenging due to its size, functions, and the service area that it would need to be within. Impacts of relocating the United States Postal Service facility are yet undefined, and should an alternative that triggers relocation of the facility move forward, additional environmental review will be conducted to evaluate and disclose impacts of relocating the facility. The staggered station configuration of the Preferred Alternative would avoid permanent impacts (i.e., operation and maintenance) to the Carrier Annex/Terminal Post Office. Accordingly, this station configuration would not require relocation of the facility.

The Ballard Link Extension-only M.O.S. would result in business and employee displacements identified in this section for the West Seattle Link Extension in the SODO Segment, including potential impacts at the United States Postal Service facility.

Impacts to Regional Transportation of Goods and Services and Freight Mobility and Access

For all SODO Segment alternatives, spur tracks along the SODO Busway north of South Forest Street would be removed, which would affect rail access to businesses. Option SODO-1b and Alternative SODO-2 would displace the Carrier Annex/Terminal Post Office at South Lander Street and 4th Avenue South. Preferred Alternative SODO-1a would acquire a portion of this facility (a portion of the surface parking), which the United States Postal Service has indicated would require relocation of the facility. Impacts of relocating the United States Postal Service facility are yet undefined, and should an alternative that triggers relocation of the facility move forward, additional environmental review will be conducted to evaluate and disclose impacts of relocating the facility.

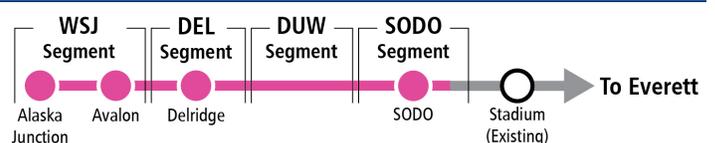
The staggered station configuration for Preferred Alternative SODO-1a would avoid permanent impacts (i.e., operation and maintenance) to the United States Postal Service facility. Preferred Alternative SODO-1a and Option SODO-1b would build new vehicle overpasses over the existing and future light rail tracks on South Lander Street, which is a major truck street, and would improve truck mobility by eliminating conflict and delay with the existing light rail crossings. These mobility improvements could support industrial businesses by making the local freight system more efficient by reducing delay. With the staggered station configuration, where the Carrier Annex/Terminal Post Office is not displaced, access to and from the facility would remain or be reconfigured to ensure that operations would not be affected (see Section 4.2.14, Public Services, Safety and Security for more information).

4.2.3.3.3 Duwamish Segment

Business and Employee Displacements

The properties that would be affected in the Duwamish Segment are primarily commercial or industrial, with a few institutional parcels. Option DUW-1b would displace the fewest number of businesses in the segment but would result in the most employee displacements. Alternative DUW-2 would result in the most business displacements and the fewest employees. The Duwamish Segment Build Alternatives would displace businesses that might be water-dependent or supportive of water-dependent businesses (see the Impacts to Maritime Industry section below).

The Ballard Link Extension-only M.O.S. would result in business and employee displacements in the Duwamish Segment for the connection to the existing Operations and Maintenance



Facility Central. These effects are described for the Ballard Link Extension SODO Segment in Section 4.3.3.3.

Impacts to Regional Transportation of Goods and Services and Freight Mobility and Access

Preferred Alternative DUW-1a and Option DUW-1b would displace United Motor Freight, because it would be unable to maintain operations during project construction and operation. United Motor Freight transports cargo off ships to container freight stations. It is one of the few heavy and long-haul equipment companies in the Puget Sound region for importing and exporting cargo, and their operations could be difficult to relocate. Option DUW-1b would also displace General Construction, which uses gravel from barges and requires waterside docks. The company provides construction services for bridges, piers, marinas, breakwaters, jetties, dam upgrades, ferry terminals, submarine cables, and outfalls. It is highly dependent on its existing property due to the existing onsite infrastructure and co-location with CalPortland. This facility is the company’s equipment yard. The facility would likely be challenging to relocate within the area.

Alternative DUW-2 would displace Olympic Tug and Barge, Centerline Logistics, Island Tug and Barge, Sea-Pac Transport Services, and Maxum Petroleum. These businesses are involved in supporting the movement of marine transportation in Puget Sound, and their operations could be difficult to relocate. Island Tug and Barge is highly dependent on the existing property due to its access to the waterway, moorage, railroad lines, and freight access/circulation. Olympic Tug and Barge rents moorage space from the Port of Seattle and primarily hauls crushed aggregate for CalPortland, and occasionally scrap metal. Their business is highly dependent on their current location due to the proximity to CalPortland.

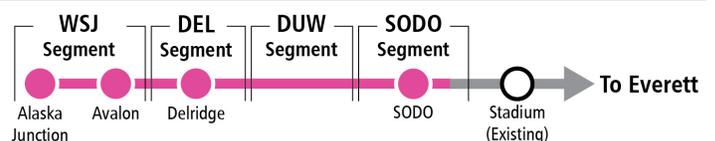
Sea-Pac Transport Services’ property has unique features such as direct railroad, intermodal loading access from the marine terminal, and deep-water moorage. Maxum Petroleum stores fuels in storage tanks that require a large property. To find adequate space and infrastructure, Maxum Petroleum might need to relocate outside of the immediate area, which would result in temporary impacts to their operations, including their ability to fulfill a biodiesel contract with Washington State Ferries. There would be no long-term impacts to rail access.

Impacts to Maritime Industry

Maritime businesses along the Duwamish Waterway would be displaced by the Duwamish Segment Build Alternatives. If the businesses have cargo operations or waterfront dependent functions, they could be difficult to relocate. Where feasible, Sound Transit would work with the maritime businesses to explore ways to maintain their operations.

Preferred Alternative DUW-1a would displace water-dependent businesses, including the following:

- United Motor Freight – This business provides multi-modal commercial shipping services and is highly dependent on its current location in proximity to Port of Seattle terminals. The business requires multiple modes of transportation, including access to water and rail.
- Bob’s Boat Shop – This business is dependent on the existing property for dock and waterway access and proximity to marinas because of its maritime customer base. It provides marine services, including vessel repairs and boat storage. The business requires a waterfront property.



- PCC Logistics – This business is highly dependent on the existing property due to its proximity to Port of Seattle terminals (Terminal 18 and Terminal 104), access to intermodal shipping infrastructure, and space for daily operations. Displacement could affect shipping schedules in the near-term, but Terminal 18 would not be impacted and could likely compensate for reduced capacity during relocation, with only short-term disruptions to operations.

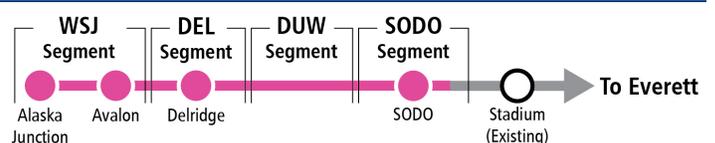
Option DUW-1b would displace the same water-dependent businesses as Preferred Alternative DUW-1a except for PCC Logistics. Option DUW-1b would also displace the following additional water-dependent businesses:

- General Construction Company – This business services in-water structures such as bridges, piers, marinas, dams, and ferry terminals. The property serves as Kiewit Corporation’s equipment yard and private local marine service. Over half of Kiewit’s vessels come to the property for service and maintenance. It is highly dependent on its existing location due to the existing infrastructure and proximity to Kiewit’s operations.
- Jim Clark Marina – This is a private recreational marina that rents slips to boaters. It is owned, managed, and maintained by an association of recreational boaters so moorage rates are below market rate. It is highly dependent on the existing property and proximity to West Seattle.
- Harbor Island Marina – This facility is owned and operated by the Port of Seattle and includes a marina with a separate administrative office. Liveaboards are allowed at this marina. It is highly dependent on the existing property and proximity to West Seattle.

There are also a few water-related businesses that would be displaced by Preferred Alternative DUW-1a and Option DUW-1b, including businesses within the Harbor Marina Corporate Center at Terminal 102, owned by Port of Seattle. This center supports maritime shipping and ancillary businesses and includes warehouse and light manufacturing tenants.

Alternative DUW-2 would displace the following water-dependent businesses:

- Maxum Petroleum – This business is a marine diesel oil and lubricant distributor that operates a fuel pier, tanker trucks, and bunkering vessels at Terminal 18 as well as warehouses where fuels and lubricants are blended and trucked to the fuel docks on Harbor Island. The warehouses would be displaced, which could affect fuel and lubricant delivery to Harbor Island facilities. This business requires intermodal access, including rail access, infrastructure for flammable materials storage and handling, and proximity to their facilities on Harbor Island.
- Puget Sound Packaging and Crating – This business is highly dependent on the existing property to serve their maritime customer base at nearby Port of Seattle shipping terminals. It requires a large warehouse with barge facilities and moorage.
- Sea-Pac Transport Services – This business provides cargo packaging services for rail and container ships and is dependent on their current location due to maritime customers at nearby shipping terminals and their co-location with Island Tug and Barge. It requires moorage and a moderately sized warehouse with intermodal loading access.
- Pacific Terminals Moorage – This business provides moorage for commercial shipping vessels and has an existing moorage agreement with Sea-Pac Transport Services, which supports warehouse operations. The auxiliary moorage would be displaced, but the warehouse would not be affected. Displacement and relocation of available berths could



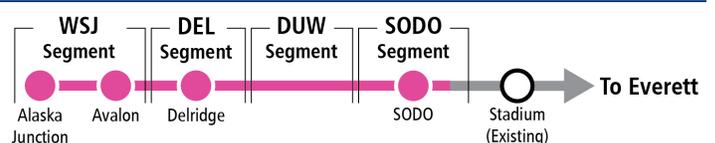
affect shipping schedules, and the business would require space to moor vessels along the waterway.

- Island Tug and Barge – This business includes moorage and a headquarters building, provides tug and barge services, and requires access to multiple modes of transportation. The company benefits from its co-location with Sea-Pac Transport Services and proximity to nearby maritime customers. They require access to multiple modes of transportation. This business requires proximity to its customers and transportation infrastructure.
- Tilbury Cement – This business is a commercial cement production and shipping business that also leases moorage to Western Towboat Barge. It is highly dependent on its current location due to the existing infrastructure and proximity to the Duwamish Waterway. This business requires a comparable location, adequate dock, infrastructure, and acreage for daily operations.
- Western Towboat Barge – This tug and barge service business is dependent on their existing moorage agreement with Tilbury Cement, as space along the waterway for large barges is very limited.
- Westway Feed Products – This business, which has operations in 28 North American manufacturing facilities, is located at Terminal 18 and requires access to shipping infrastructure and storage capacity for production and shipping of livestock feed supplements.
- Centerline Logistics – This business is a petroleum transport business that operates tugboats, bunker, and terminal barges. It is co-located with Olympic Tug and Barge and requires access to the Duwamish Waterway and moorage for daily operations. Displacement could affect fuel delivery to container ships and other large vessels in Elliott Bay in the near and long term.
- Olympic Tug and Barge – This business is dependent on its co-location with Centerline Logistics and requires access to the Duwamish Waterway and moorage to bunker in Elliott Bay and transport petroleum using the Centerline Logistics fleet. Displacement of this business could affect fuel delivery to container ships and other large vessels in Elliott Bay.

As described above, Alternative DUW-2 would displace the most water-dependent businesses and have the greatest impact on shipping of goods and services.

Preferred Alternative DUW-1a and Option DUW-1b would not affect the navigation channel for the West or East Duwamish Waterway and are not expected to have a direct economic effect related to navigation. See Section 3.9, West Seattle Link Extension Affected Environment and Impacts During Operation – Navigation, in Chapter 3 for further discussion of navigation on the Duwamish Waterway.

Alternative DUW-2 would introduce a new over-water structure north of the existing fixed Spokane Street Bridge, which is an existing restriction of the East Waterway navigation channel. Alternative DUW-2 would affect the vertical and horizontal clearance in this area. Because vessels that use this area typically require less vertical clearance than Alternative DUW-2, the change in vertical clearance is not anticipated to prevent current uses. However, the change in horizontal clearance could reduce the number of barges that are docked in this area, which could have some effect on maritime businesses. Alternative DUW-2 would not impact the navigation channel of the West Duwamish Waterway. It would not impact Port parking at Terminal 25, or access to Terminal 5 on the west side of the waterway.



Impacts to Tribal Treaty-Protected Fishing

The Muckleshoot Indian Tribe has treaty-protected fishing rights and Usual and Accustomed Areas in the Puget Sound region, which includes the Duwamish Waterway. The Muckleshoot Indian Tribe is signatory to both the Treaty of Point Elliott and the Treaty of Medicine Creek. The Suquamish Tribe of the Port Madison Reservation (the Suquamish Tribe) is signatory to the Treaty of Point Elliott and has treaty-protected fishing rights and Usual and Accustomed Areas in the Puget Sound region, which also includes the Duwamish Waterway. Some bridge types would require placement of guideway columns in water, which could interfere with Tribal treaty-protected fishing rights and access to the Usual and Accustomed Areas of the Muckleshoot Indian Tribe. Some bridge types could also interfere with Tribal treaty-protected fishing rights and access to the Usual and Accustomed Areas of the Suquamish Tribe. Preferred Alternative DUW-1a and Alternative DUW-2 could be constructed with bridge types that would avoid guideway columns in the water. Option DUW-1b would have guideway columns in the water with all bridge types.

4.2.3.3.4 Delridge Segment

Business and Employee Displacements

The businesses that would be affected in the Delridge Segment are primarily commercial. Preferred Alternative DEL-1a, Option DEL-1b, Preferred Alternative DEL-2a*, Option DEL-2b*, Alternative DEL-3, and Alternative DEL-4* would have a similar number of business and employee displacements. Alternative DEL-5 and Alternative DEL-6* would have the most business displacements. These alternatives would displace a business park, a health club, and other retail and local service businesses. Alternative DEL-5 would have the most employee displacements.

For the West Seattle and Ballard Link Extensions M.O.S., none of the Delridge Segment alternatives would need to acquire additional commercial, industrial, or institutional properties or displace any additional businesses.

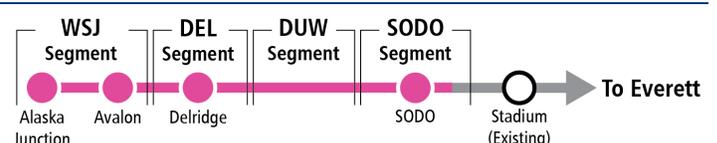
Impacts to Regional Transportation of Goods and Services and Freight Mobility and Access

None of the Delridge Segment alternatives would affect truck, rail, or marine networks. No commercial load zones would be affected.

4.2.3.3.5 West Seattle Junction Segment

Business and Employee Displacements

The properties that would be affected in the West Seattle Junction Segment are primarily commercial or mixed-use. Preferred Alternative WSJ-1 would have the most business and employee displacements because it would be closest to the main commercial and retail corridor in West Seattle. Preferred Alternative WSJ-2 would displace the fewest employees and would have a similar number of business displacements as Preferred Alternative WSJ-3a*, Alternative WSJ-4*, and Alternative WSJ-5*.



Impacts to Regional Transportation of Goods and Services and Freight Mobility and Access

None of the West Seattle Junction Segment alternatives would affect truck, rail, or marine networks. Up to three commercial load zones would be affected by any of the alternatives.

4.2.3.4 Environmental Impacts of the Build Alternatives during Construction

This section describes potential beneficial and adverse economic impacts common to all alternatives, and then describes impacts on businesses and freight during construction by segment. Segment-specific impacts discussed after Section 4.2.3.4.1, Impacts Common to All Alternatives, are focused on road closures that would result from construction of the West Seattle Link Extension. This type of impact affects retail and service businesses most directly because they generally rely on easy customer access. For some, the nearby construction activities could make the business less accessible to customers and ultimately affect business revenue as well as downstream tax revenues (such as 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 from project construction. Potential impacts on Tribal treaty-protected fishing during construction are also discussed for the Duwamish Segment.

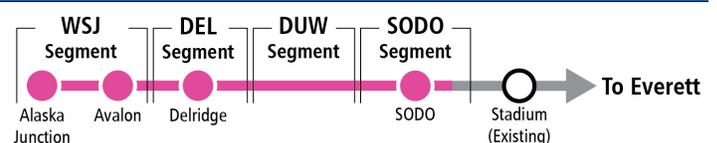
4.2.3.4.1 Impacts Common to All Alternatives

Construction activities often result in changes to the economy of the surrounding area. The benefits of construction mainly come in the form of construction and related spending entering the community via construction jobs, the purchase of local goods and services needed for construction, and construction employees spending money in the community. Negative effects of construction often include blocked visibility and reduction in access to businesses, traffic delays, noise, and rerouting traffic in ways that increase travel time.

Potential Beneficial Economic Impacts from Construction

The West Seattle Link Extension schedule estimates that project construction would begin in 2025 and be completed by 2032. Capital expenditures on light rail projects can help support regional economic activity through the purchase of goods and services, labor income and tax revenues in the study area. The economic contributions arising from construction projects are often temporary in nature and occur as construction spending unfolds. How much construction increases employment and spending depends on the source of project funding and the types of labor used during construction. Table 4.2.3-3 provides estimated direct expenditures and the estimated number of direct employees who would be hired for the highest and lowest cost combinations of Build Alternatives. The high-cost estimate is composed of Alternative SODO-2, Preferred Alternative DUW-1a, Option DEL-2b*, and Preferred Option WSJ-3b*. The low-cost estimate is composed of Preferred Alternative SODO-1a, Preferred Alternative DUW-1a, Alternative DEL-5, and Preferred Alternative WSJ-2.

The project would support economic activity in the region by increasing demand for inputs to the construction industry. The wages paid to workers in construction or supporting industries would support consumption in the region. The direct estimates represent spending and jobs directly related to the project Build Alternatives. The direct spending generates additional economic output and employment from secondary (supply-chain and consumption) effects associated with



each Build Alternative. These secondary effects are represented by economic multipliers, which reflect how spending is distributed across other industries to support regional economic activities.

Table 4.2.3-3. Estimated Direct Expenditures and Direct Employment from West Seattle Link Extension Construction

Cost Estimates and Employment	Project Construction ^a
High-cost estimate total direct expenditure (\$ millions)	\$1,829.83
High-cost estimate total employment (job years)	4,842
Low-cost estimate total direct expenditure (\$ millions)	\$1,234.93
Low-cost estimate total employment (job years)	3,247

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

Note: These estimates reflect updated cost estimates issued in June 2021.

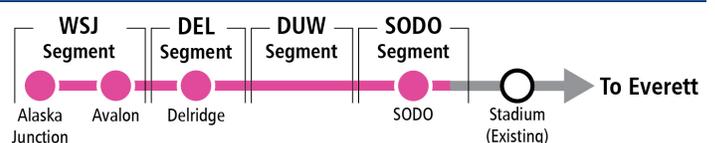
^a Does not include right-of-way, engineering, and contingency costs. A job year is defined as full-time employment for one person over the course of a year (assuming 2,080 hours of employment per year).

Based on the multipliers in the 2012 Washington Office of Financial Management Input-Output model (updated in February 2021), every \$1 million spent on construction activity supports an additional \$455,000 in economic output (Washington Office of Financial Management 2021). Numbers may be different than other Sound Transit reporting of project jobs supported by dollars spent on capital projects that is based on planning level budgets. Both estimates use the Washington State Input-Output model but may have different budget assumptions, depending on what cost estimates are available at the time of analysis. Construction projects can result in increased economic capacity, but only a short-term increase in output and jobs can be specifically attributable to the project. Construction effects generally decrease as project spending declines over the life of the project.

Potential Adverse Economic Impacts from Construction

Businesses in the study area near construction of the West Seattle Link Extension could be negatively affected by construction activities. Negative impacts might include reduced sales resulting from changes in traffic, access, parking, visibility, dust, and noise because patrons might choose to avoid construction areas or have greater difficulty accessing businesses near construction activity. Reduced sales could affect downstream tax revenues such as sales tax. This type of impact affects retail and service businesses most directly because they generally rely on easy customer access. 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 from construction.

For all West Seattle Link Extension segment alternatives, construction employment would increase localized demand for parking. Sound Transit anticipates that staging areas could be used for construction employee parking, but construction workers could also park on local streets and arterials where parking is unrestricted and in off-street pay parking lots or garages, which may affect the parking supply. Increased parking occupancy may reduce business patronage for those who travel by personal vehicle if they are not able to find parking or alternative ways to access the business. See Chapter 3 for more information on parking.



4.2.3.4.2 SODO Segment

Businesses in the SODO Segment that could be affected by construction activities are a mix of mostly industrial and commercial. General freight movement could be affected by closure of South Lander Street in this segment during construction as described in Section 3.10, West Seattle Link Extension Affected Environment and Impacts During Operation – Freight Mobility and Access.

4.2.3.4.3 Duwamish Segment

Potential Impacts on Businesses and Freight

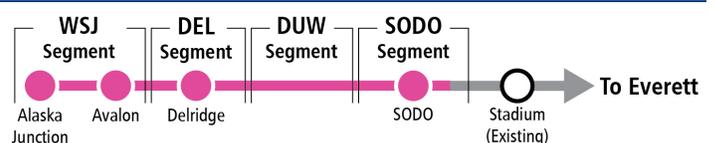
Businesses in the Duwamish Segment that could be affected by construction activities are primarily industrial, with a concentration of freight-related industries and the Port of Seattle on Harbor Island and along the Duwamish Waterway. The regional movement of freight and goods would be impacted by construction activities that cause short-term lane closures on key streets in the truck network (Spokane Street, State Route 99, East Marginal Way, and West Marginal Way) on nights and weekends when the guideway is built over those streets. All Duwamish Segment alternatives would require short-term closures of the navigation channel and could impact vessel movement outside the channel during construction. Lane closures and impacts to vessel movements could impact the movement of freight, thereby affecting the Port of Seattle and other freight-related businesses during construction. More detail about the existing freight use and potential impacts along the Interstate 5 corridor, waterways, and rail corridors is included in Sections 3.9 and 3.10 in Chapter 3.

Construction of Preferred Alternative DUW-1a would temporarily close the northern gangway from Harbor Island to the Harbor Island Marina commercial dock (Dock E), and Option DUW-1b would temporarily close the southern gangway. However, mariners could use the alternate access point for each of these alternatives. The northern 125 feet of the dock would also be closed during construction of Preferred Alternative DUW-1a, while the southern 300 feet of the dock would be restricted during overhead construction of Option DUW-1b. These closures and restrictions would temporarily displace commercial vessels. Finding replacement commercial moorage on the Duwamish Waterway would be unlikely. Sound Transit would coordinate with the Port of Seattle to minimize disruptions to land and water access.

Netting and scaffolding used during construction of all Duwamish Segment alternatives for all bridge types would temporarily reduce the vertical clearance of the East and West Duwamish Waterways. In the East Waterway, the remaining clearance would be high enough for commercial vessels that typically use this area. Commercial vessels that use the West Waterway are typically taller and could be affected.

Preferred Alternative DUW-1a and Option DUW-1b would result in temporary closures to tracks east of East Marginal Way South. Preferred Alternative DUW-1a would also include construction of a guideway column adjacent to the BNSF Railway bridge over the Duwamish Waterway, and the rail bridge could be affected by construction barges, cranes, and other heavy equipment crossing or in proximity to BNSF tracks. Option DUW-1b and Alternative DUW-2 would be far enough away from the Duwamish Waterway rail bridge not to affect rail operations. They would also not affect access to Terminal 18.

Alternative DUW-2 would span the lead rail track serving Harbor Island but is not expected to disrupt rail operations during construction. There would be a guideway column in the Terminal 18 employee parking lot just west of the Terminal 18 truck gate queue area, but it would not affect truck operations at the terminal. Access for construction vehicles to staging areas and



construction of the guideway itself could encroach into the gate area but is not expected to affect queue capacity or circulation within the terminal operations.

For all alternatives, access to construction of the guideway and columns could also temporarily affect the local business rail spurs on each side of the SODO Busway in the Duwamish Segment. Night and weekend closures of West Marginal Way with all alternatives could affect access to Terminal 5, but these impacts are expected to be minimal due the short duration and limited hours.

More detail about the existing freight use and potential impacts along the Interstate 5 corridor, waterways, and rail corridors is included in Chapter 3.

Impacts to Tribal Treaty-Protected Fishing

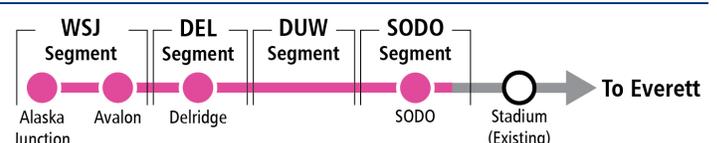
Tribal treaty-protected fishing rights and access to the Usual and Accustomed Areas of the Muckleshoot Indian Tribe may be affected by construction activities for bridges over this waterway if construction would occur during fishing seasons. Tribal treaty-protected fishing rights and access to the Usual and Accustomed Areas of the Suquamish Tribe may also be affected.

4.2.3.4.4 Delridge Segment

Businesses in the Delridge Segment that could be affected, primarily along Delridge Way Southwest, are a mix of service businesses and offices that serve the surrounding community as well as some that serve the larger West Seattle community. These businesses are more likely to be affected by construction nearby than other types of businesses that are not dependent on easy customer access. Potential impacts could occur to remaining service businesses along the west side of Delridge Way Southwest. During construction, Preferred Alternative DEL-1a, Option DEL-1b, and Alternative DEL-3 would fully close Southwest Genesee Street between 26th Avenue Southwest and Southwest Avalon Way. Other alternatives would require partial closures or night-time and weekend closures of this arterial that carries people between Delridge and other parts of West Seattle, and therefore these closures could affect businesses in Delridge. Nucor Steel is adjacent to two alternatives (Alternative DEL-5 and Alternative DEL-6*) that would require full closure of Southwest Andover Street between 26th Avenue Southwest and 28th Avenue Southwest, but access to Nucor by vehicle and rail would be maintained. Alternative DEL-3 and Alternative DEL-4* would require a multiple-year partial closure of Delridge Way Southwest from the West Seattle Bridge to south of Southwest Dakota Street. Although construction of these alternatives would temporarily disrupt local traffic, access to Nucor Steel would be maintained in both instances. Delridge segment alternatives connecting to Alternative DUW-2 in the Duwamish Segment would displace some employee parking, but Sound Transit would work with Nucor Steel to provide alternate parking if needed.

4.2.3.4.5 West Seattle Junction Segment

Businesses in the West Seattle Junction Segment that could be affected are primarily retail and service businesses that serve the surrounding community as well as the larger West Seattle community. These types of businesses would be more likely to be affected by construction nearby than other types of businesses that are not dependent on easy customer access. Preferred Alternative WSJ-3a*, Preferred Option WSJ-3b*, and Alternative WSJ-5* would have greater potential impacts to businesses along Fauntleroy Way Southwest than other alternatives in this segment because of the duration of roadway closures. The other West Seattle Junction Segment alternatives would have stations closer to the Alaska Junction retail district and



therefore would have greater potential impacts during construction to businesses there, but less potential impacts to businesses on Fauntleroy Way Southwest.

4.2.3.5 Indirect Impacts of the Build Alternatives

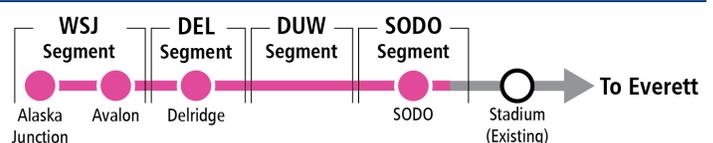
The West Seattle Link Extension could have indirect economic impacts to the surrounding area. These indirect impacts can be positive or negative. Increasing economic activity in and around the industrial areas may place redevelopment pressure on maritime users as they experience more traffic congestion and competition for scarce industrial sites located close to water access.

Development of the project would likely bring more dense and mixed-use land uses to station areas consistent with adopted land use plans, which could result in increased economic activity, increased development and redevelopment potential of surrounding properties, and increased property value of parcels near the station. As described in Section 4.2.2, Land Use, this increase in mixed land uses would support Seattle's Urban Village Strategy (City of Seattle 2018) by promoting compact, pedestrian-oriented development and reliable transit access accommodations. The project would also bring high-capacity transit opportunities and connections to new transportation corridors and increase access to locations around the region, especially for those with mobility challenges.

As the West Seattle Link Extension expands light rail access to the area, the convenience, visibility, and desirability of the surrounding residential and commercial properties would increase near stations. In addition, heavier pedestrian activity near surrounding stations and important nodes of economic activity would increase the number of potential customers to retail businesses in the area and synergy between businesses, which occurs when individual business benefit from clustering near each other, allowing customers to shop more efficiently. Convenient light rail access might also attract more employees who are interested in using public transportation instead of other modes such as driving.

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 near light rail stations (Transportation Research Board 2004, Nelson 2017), especially if pedestrian infrastructure is added (Bartholomew and Ewing 2011). In addition, higher-than-typical densities, consumer retail and services, and pedestrian amenities also serve as important traits of transit-oriented development (TOD). Gains in property value 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). Also, taxes on incremental new construction around station areas enabled by light rail access might increase property tax assessments in the immediate project vicinity in future years.

Benefits from the operation of the West Seattle Link Extension would not be automatic; these benefits would require a strong demand for real estate, location within a neighborhood with the appropriate zoning, increased infrastructure investment, and public policies that support TOD and transit system expansion. Moreover, property values might also be affected by external forces other than TOD, such as fluctuations in the economy, consumer confidence, and local development pressures. Property values might also take time to accrue since TOD would occur over a period of time. As described in Section 4.2.2, TOD benefits may not be uniformly realized at all station areas. The project may also have broader impacts on the industrial-, and specifically maritime-industries. Water-dependent commerce is highly specialized and dependent on being close to suppliers. Direct displacement of these uses can have indirect economic effects as demand for supply-chain services could shift to other areas within or outside the region when these specialized businesses are relocated. Therefore, some direct



business displacements can indirectly affect multiple other businesses if their goods or services are no longer needed in the area due to their primary customers being displaced. Generally, businesses prefer to be close to their markets.

Displacement of water-dependent uses could affect the regional economic capacity to support the movement of goods because these businesses might be difficult to relocate close enough to provide the same services. Therefore, the displacement of these businesses along the Duwamish Waterway might impair the operations of waterway transportation and shipment of goods and services, which could have negative effects on businesses that rely on the shipping terminals and support businesses that provide inputs for the maritime industry. As a result, it could have a broader effect on regional jobs and income than the jobs and businesses displaced directly by the project. When these firms are near each other, this helps support additional economic activity through the sharing of labor and supply-chain purchases, which contribute to a region's gross regional product.

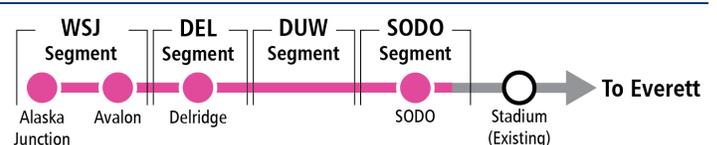
Businesses that support water-dependent activities can be found in a broad range of industries, including wholesale, real estate, engineering, and petroleum products. Water-dependent economic activities tend to purchase their business inputs from within the county, suggesting that the disruption to that industry might be more disruptive due to the impact on suppliers.

The acquisition of the parcels used to support the elevated guideway bridge might be disruptive to several businesses and the broader maritime industry along the Duwamish Waterway. Many of the maritime businesses along the Duwamish Waterway purchase goods and services from local suppliers (including other local maritime businesses) who would also lose revenue if displacement occurred. Most maritime businesses have close supply-chain relationships in industries that support warehousing, the broader transportation sector (including boatbuilding), and sign manufacturing. Alternative DUW-2 would likely be most disruptive to the existing maritime cluster, based on the extent of business and employee displacements and their relationship to maritime and freight movement industries in the region.

The project could also result in negative effects to surrounding properties along the West Seattle Link Extension. Negative operations effects could include impaired road access and traffic flow changes or restrictions, decreased parking, noise increases, and impaired visibility that could reduce patronage of a business. Indirect displacement might 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. Chapter 3 and Section 4.2.5, Visual and Aesthetic Resources, and Section 4.2.7, Noise and Vibration, address traffic, noise, and visual effects and describe these issues in more detail. Noise and reduced visibility would have to be noticeable greater than what currently exists for decreases in business patronage and property values to be expected.

4.2.3.6 Mitigation Measures

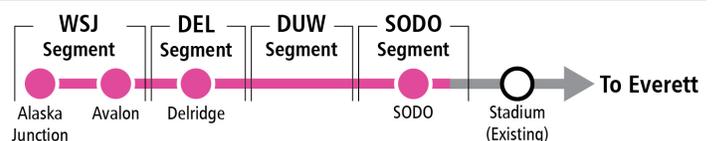
In most cases, with relocation assistance for business displacements discussed in Section 4.2.1, Acquisitions, Displacements, and Relocations, long-term operation of the West Seattle Link Extension is not anticipated to result in adverse effects that would require mitigation. Where feasible, Sound Transit would explore ways to maintain water-dependent business operations. Understanding that it may be challenging to relocate water-dependent uses due to their unique needs, Sound Transit would develop a plan identifying potential additional strategies that could be used to help support these unique needs for a successful relocation of these businesses. Potential strategies may include identifying federal, state, and local programs and leveraging Sound Transit relocation assistance with these programs and organizations.



Construction might cause adverse impacts on businesses due to reduced access or general construction activity. Mitigation measures presented in Chapter 3 and Sections 4.2.1, 4.2.5, and 4.2.7 would minimize these impacts. Construction management plans would be developed to address the needs of businesses and could include, but are not limited to, the following measures:

- Provide a 24-hour construction telephone hotline for community members to report issues to Sound Transit community engagement staff, who work with the construction team to resolve issues and respond to the community member.
- 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 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.
- Provide a community ombudsman consistent with Sound Transit policy. In the event that complaints arise about construction impacts that could not 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.

If the project design were to affect Tribal treaty-protected fishing rights and access to the Usual and Accustomed Areas of the Muckleshoot Indian Tribe, Sound Transit and the Federal Transit Administration would coordinate with the Muckleshoot Indian Tribe to avoid, minimize or mitigate for economic impacts from fishing disruption from permanent in-water guideway columns and construction. The same coordination would occur if the project design were to affect Tribal treaty-protected fishing rights and access to the Usual and Accustomed Areas of the Suquamish Tribe.



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4.2.4 Social Resources, Community Facilities, and Neighborhoods

4.2.4.1 Affected Environment

The study area for social impacts, community facilities, and neighborhoods is the area within a 0.5-mile radius from the alternative alignment centerlines. While the area of effects is expected to be smaller, the 0.5-mile study area reflects the distance residents and workers could easily walk to the new stations and is large enough to include areas that would be affected by the construction of the light rail facilities. The impact analysis for this section considers impacts identified in other Draft Environmental Impact Statement sections, with references to those sections included where appropriate. Appendix L4.4, Social Resources, lists all the social resources identified in the study area. Figure 4.2.4-1 identifies the locations of social resources in the West Seattle Link Extension study area. Figure 4.2.4-2 shows the neighborhoods in the West Seattle Link Extension study area. The Beacon Hill neighborhood on the east side of Interstate 5 is effectively cut off from the project by this barrier; therefore, this neighborhood is not discussed.

The West Seattle Link Extension study area contains four Seattle neighborhoods: Beacon Hill, Industrial District, Delridge, and West Seattle. The neighborhoods are described by segment in this section and are shown on Figure 4.2.4-2. The neighborhoods in the SODO and Duwamish segments are primarily commercial and industrial areas with very few residential uses. Residential communities are primarily found in the Delridge and West Seattle neighborhoods. The Delridge and West Seattle neighborhoods are in an area of Seattle that has seen considerable development in the last 10 years, focused on increasing residential density and new commercial buildings.

Section 4.2.14, Public Services, Safety, and Security, describes public services within the study area, including schools, libraries, fire stations, police stations, and hospitals. Section 4.2.17, Parks and Recreational Resources, provides additional information about parks within the study area.

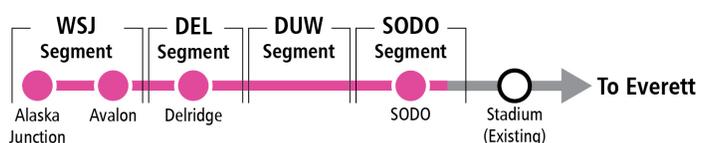
4.2.4.1.1 Neighborhood Cohesion and Social Resources

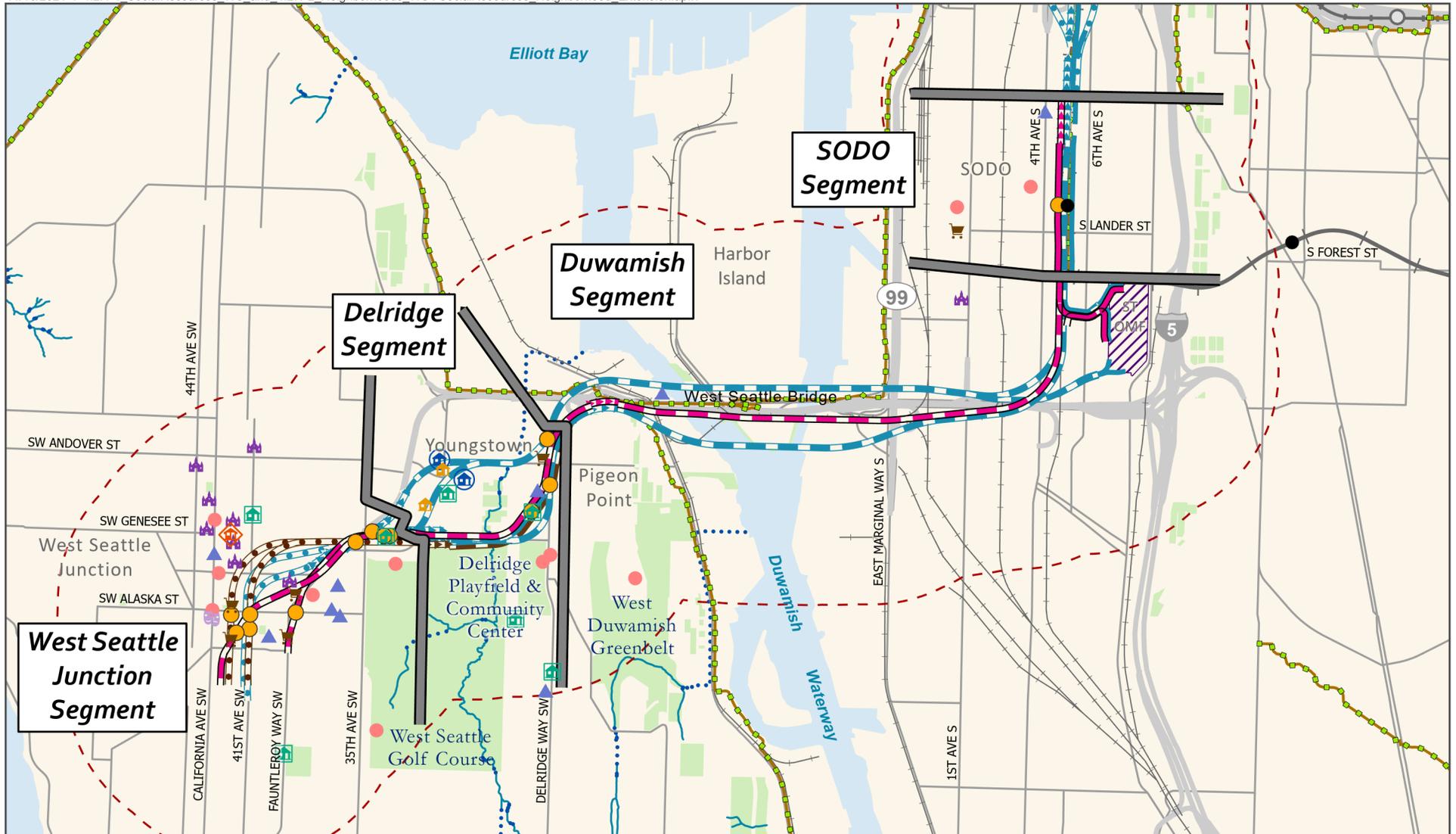
Neighborhood cohesion is qualitatively evaluated in terms of transportation network and services, linkages to community facilities and activity centers, patronage of businesses and cultural institutions, interaction of people (which considers locations where people interact and the likelihood of interaction at those locations), and neighborhood uniqueness. Based on the extent to which all or some of these factors are present in a neighborhood, Sound Transit categorized the neighborhood as having high, medium, or low cohesion.

Neighborhood cohesion is defined as the extent to which residents have a sense of belonging to their neighborhood. The level of cohesion considers the interactions between the residents and the resources in that neighborhood.

SODO Segment

The primary neighborhood in the SODO Segment is the Industrial District, with a small area of the Beacon Hill neighborhood on the eastern edge.



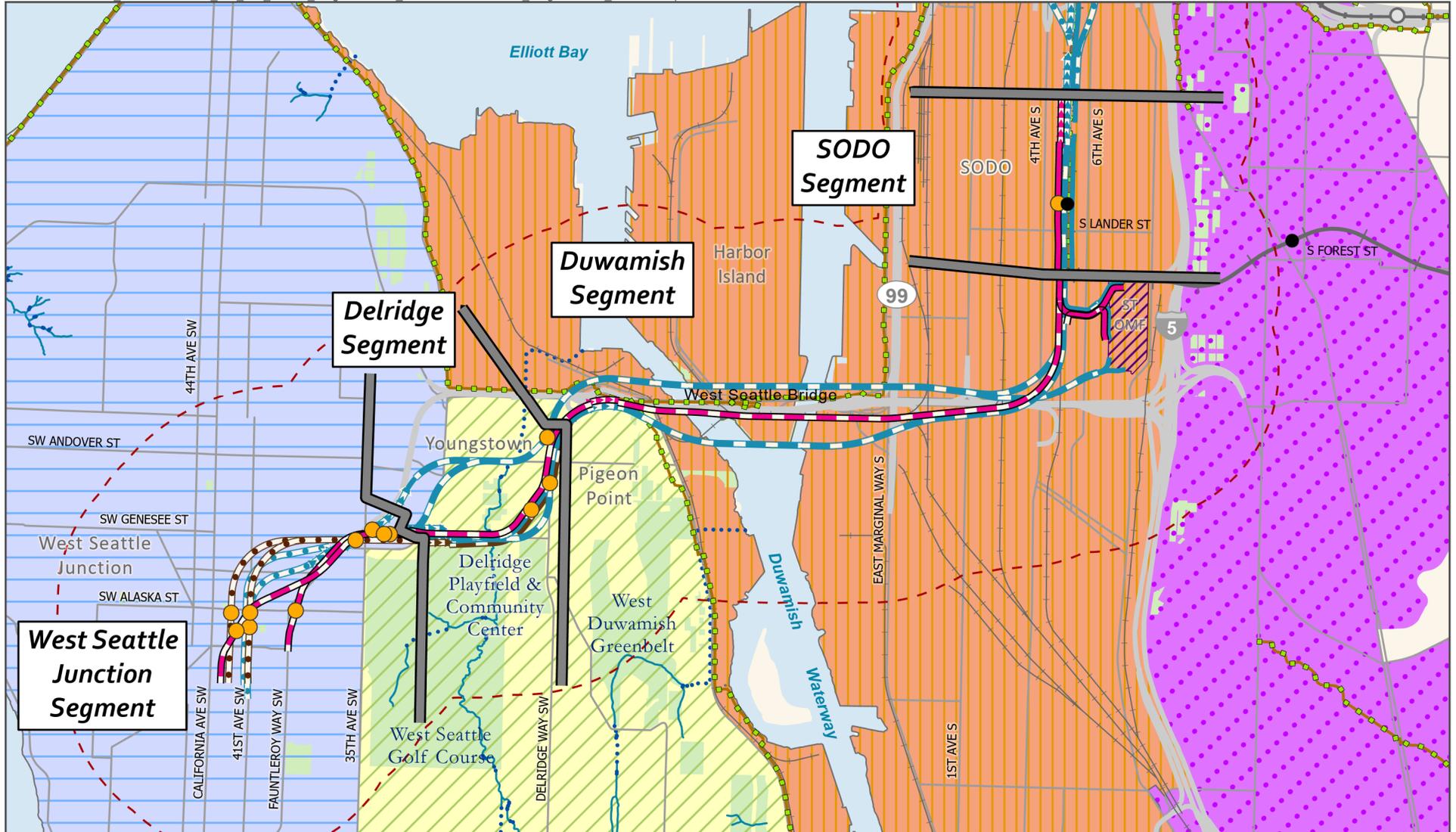


Source: City of Seattle, King County (2019, 2020, 2021).



FIGURE 4.2.4-1
Social Resources
 West Seattle Link Extension
West Seattle and Ballard Link Extensions





Source: City of Seattle, King County (2019, 2020, 2021).

Alternatives

- Preferred Alternative
- Preferred Alternative with Third-party Funding
- Other Alternatives

Alternative Profile

- Elevated
- Tunnel
- At-Grade
- Retained Cut

Station

- New
- Existing

Segment Line

Sound Transit Operations and Maintenance Facility (ST OMF)

Existing Link Light Rail

East Link Light Rail (Under Construction)

Railroad

— Stream

●●●● Piped Stream

— Trail

Park

Study Area

Beacon Hill

Industrial District

Delridge

West Seattle

FIGURE 4.2.4-2
Neighborhoods
 West Seattle Link Extension
West Seattle and Ballard Link Extensions



4.2.4 Social Resources, Community Facilities, and Neighborhoods

The Industrial District is characterized by industrial uses, with a mixture of commercial, warehouse, and office space throughout. It contains one of Seattle’s designated manufacturing industrial centers, the Duwamish Manufacturing/Industrial Center; the Port of Seattle; private marine terminals; BNSF Railway and Union Pacific Railroad rail yards; and the Sound Transit Operations and Maintenance Facility Central. This neighborhood also includes SODO, the area “south of Downtown,” with a mixture of commercial uses, including the Starbucks company headquarters, warehouse stores, businesses and the SODO Trail. The John Stanford Center for Educational Excellence, the Seattle Public School District’s central office, is also in SODO.

The Industrial District neighborhood primarily includes business and industry with very little residential community, except for some low-income housing. As a result, there are very few social resources present; there is one social service, a food bank, near the alignment, and two grocery stores farther from the alignment. Services in the area include restaurants, supply stores, a daycare, and a few community facilities that support the employees in the business and industry community. Although there are few residents in this industrial neighborhood, cohesion between businesses, services, and employees is high.

Duwamish Segment

The primary neighborhood in the Duwamish Segment is also the Industrial District, with small areas of Beacon Hill to the east and Delridge to the west.

As described for the SODO Segment, the Industrial District neighborhood is characterized by industrial uses, in particular water-based industrial uses along the Duwamish Waterway (also known as the Duwamish River) and on Harbor Island. Harbor Island is also home to a Port of Seattle shoreline access area, a park, and two marinas. The Harbor Island Marina allows live-aboard boats. Many of the businesses on Harbor Island are related to Port of Seattle operations. The Duwamish Waterway also supports recreational and Tribal treaty-protected fishing. The services present in this neighborhood are found primarily on the east side of the Duwamish Waterway and include restaurants, supply stores, the International Longshore and Warehouse Union Local 19, and equipment rental businesses that mostly support local industry. Neighborhood cohesion is medium and relates to access to work and the infrastructure and services to support business and industry.

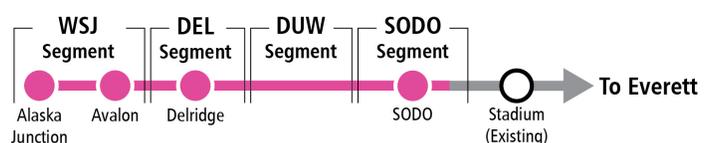
A portion of the Delridge neighborhood within the Duwamish segment includes the Pigeon Point and Riverside communities, both areas that residents describe as having a “small town” feel. There are several parks and a school, which provide opportunities for social interaction. Another social resource in this area is the West Duwamish Greenbelt, which is the largest greenbelt in the city and contains hiking trails to the south of the study area. Neighborhood cohesion is high in the Delridge neighborhood.

The Beacon Hill neighborhood characteristics described for the SODO Segment also apply to this segment. The connections across Interstate 5 to Beacon Hill are limited to South Spokane Street/South Columbian Way.

Delridge Segment

The primary neighborhood in the Delridge Segment is Delridge, which includes the Youngstown community in the Delridge valley. The segment also includes a small area of the Industrial District to the north (previously described) and part of West Seattle to the west (described below in the West Seattle Junction Segment).

The Delridge neighborhood is mostly single-family residential with some multi-family homes. Low-income and supportive housing in Delridge is discussed in Section 4.2.4.1.5, Income-



4.2.4 Social Resources, Community Facilities, and Neighborhoods

restricted and Supportive Housing. It has several parks and recreational areas, including the West Seattle Golf Course, Longfellow Creek Natural Area, and Delridge Playfield and Community Center. People use the Longfellow Creek Legacy Trail, which runs through the Longfellow Creek Natural Area. The West Seattle Golf Course is one of five public golf courses in the city. The Delridge Playfield and Community Center provides play, social, and activity space. Delridge is also home to the Youngstown Cultural Arts Center, which is focused on the arts, youth empowerment, and sustainable initiatives. Tenants at the cultural center include Arts Corps, Interagency Academy, Reel Grls, The Service Board, Totem Star, Twelfth Night Productions, and West Seattle Tool Library. The Indian Child Welfare Office, which is part of the Washington State Department of Children Youth and Families, is located in this neighborhood.

Residential uses (both single and multi-family) surround the parks and recreational areas, and residents in the study area can walk to the parks and other social resources on sidewalks. This area is dominated by homes and parks, with some community businesses and social resources such as cafes, a neighborhood deli-mart, a daycare, and other businesses that cater to residents and workers and provide opportunities for interaction. As described in the Duwamish Segment, neighborhood cohesion is high in the Delridge neighborhood.

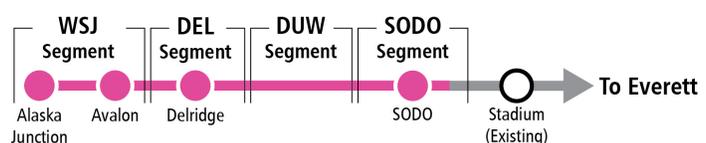
West Seattle Junction Segment

The primary neighborhood in the West Seattle Junction Segment is West Seattle, with a small part of Delridge (as described above in the Delridge Segment) to the east.

The community character of the West Seattle neighborhood, which includes the areas around the Avalon and Alaska Junction stations, reflects the City's goal of having a small-town community with its own distinct identity, composed of a large single-family residential community, some senior multi-family housing, and a vibrant mixed-use business and multi-family district. The West Seattle Junction, a City of Seattle-designated "hub urban village," is in this segment. Hub urban villages are areas where both housing and job growth are expected to occur. The West Seattle Junction hub urban village is a higher-density area comprising commercial businesses, offices, schools, multi-family residential housing, and services such as such as doctor's offices, banks, salons, and exercise studios. Grocery stores, churches, and private schools are all social resources that provide opportunity for social interaction in this area. Many of these resources draw people from the greater West Seattle area. West Seattle Junction hosts neighborhood events such as the weekly farmer's market and the West Seattle Summer Fest festival. Parks and recreational areas are also in the West Seattle Junction Segment, including Camp Long and the West Seattle Stadium in the eastern edge of this segment. There are several social resources in this neighborhood, including childcare facilities, a Y.M.C.A., and the Senior Center of West Seattle. The West Seattle Junction neighborhood has high neighborhood cohesion.

4.2.4.1.2 Demographics

Table 4.2.4-1 shows demographic information for the West Seattle Link Extension study area. The data is based on a geographical information system analysis of United States Census 2014 to 2018 American Community Survey data for the census block groups that intersect with the segment boundaries. The segment demographic information is presented alongside the demographic information for the entire West Seattle Link Extension study area and city of Seattle and Sound Transit Service District demographic information for context. See Appendix G, Environmental Justice for more detailed demographic data and maps. The term "minority" is used in Appendix G for consistency with the Environmental Justice Executive Order 12898. This section uses the term "communities of color" and "people of color."



4.2.4 Social Resources, Community Facilities, and Neighborhoods

Table 4.2.4-1. West Seattle Link Extension Study Area Demographics

Geographic Area	Total Population	People of Color	Low-Income Households ^a	Limited-English - Proficiency Households ^b	Under 18 Population	Over 65 Population	Households with No Vehicle	Median Household Income
Seattle	708,823	36%	24%	4%	15%	12%	17%	\$85,562
Sound Transit Service District ^c	3.2 million	39%	24%	5%	21%	13%	9%	\$88,018
West Seattle Link Extension Study Area	26,852	25%	15%	2%	9%	11%	11%	\$96,372
SODO Segment	1,788	47%	24%	8%	18%	11%	12%	\$102,330
Duwamish Segment	3,131	28%	25%	1%	14%	9%	11%	\$80,394
Delridge Segment	5,276	39%	16%	2%	18%	10%	11%	\$84,780
West Seattle Junction Segment	18,445	21%	13%	2%	16%	15%	11%	\$102,353

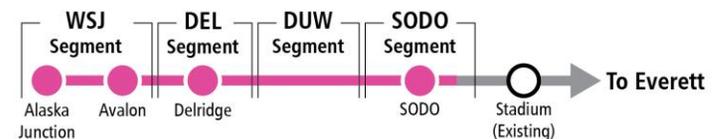
Source: 2018 American Community Survey 5-Year Estimates (United States Census Bureau 2020).

Note: Numbers rounded to nearest percentage point.

^a Sound Transit’s low-income threshold is defined as two times the federal Health and Human Services poverty level.

^b Speaks English “less than very well.”

^c The Sound Transit Service District includes portions of King, Pierce, and Snohomish counties.



Based on the information in the table, the SODO Segment's population has the highest percentage of people of color, limited-English-proficiency speakers, and households with no vehicles compared to the other West Seattle Link Extension segments. The percentage of people of color and limited-English proficiency speakers in the SODO Segment is also greater than the city and the Sound Transit Service District. However, the SODO Segment also has the fewest people living in it. The percentage of the population in the Duwamish Segment that is people of color is less than those of the city and the Sound Transit Service District. Low income percentages are highest in SODO and Duwamish for the West Seattle Link Extension Study area, but they are similar to the city and the Sound Transit Service District. The Delridge Segment has a lower percentage of low-income people than Seattle as a whole. People of color population percentages in this segment are similar to the Sound Transit District and the city of Seattle overall. The West Seattle Junction Segment is the most populated of the segments and has the lowest percentage of people of color and low-income people compared to the other segments, and these percentages are lower than the city and Sound Transit Service District average.

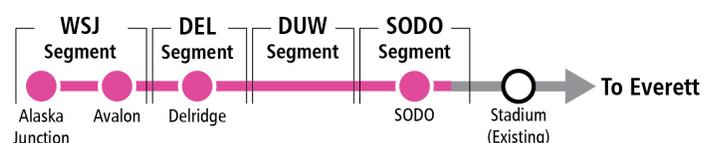
4.2.4.1.3 Transportation Linkages

There are transportation facilities throughout the study area. In the SODO Segment, a bus-transit-only roadway called the SODO Busway runs north-south through the segment. There are four bus stops on the SODO Busway that provide access to surrounding businesses and industries; two provide a transfer opportunity to light rail at the existing SODO Station at South Lander Street and the existing Stadium Station at South Royal Brougham Way. King County Metro Transit (Metro) and other bus transit providers use this busway for several routes providing connections to and from Downtown Seattle. The SODO Segment also has freight rail lines and truck routes to support the industrial businesses in the area. In the Duwamish Segment, the West Seattle Bridge is the primary transportation connection between West Seattle and the rest of Seattle. The Spokane Street Bridge also provides a connection to other parts of Seattle and access to Harbor Island, and a multi-use trail connects SODO to West Seattle via the Spokane Street Bridge in this segment. Bus service is not provided directly to or from Harbor Island. In the Delridge and West Seattle Junction segments, there are bicycle facilities, transit, and sidewalks that provide connections within West Seattle. Delridge Way South has several bus routes connecting to Downtown Seattle and locations south, including White Center. Metro also provides a passenger-only water taxi service between West Seattle (Alki area) and the Seattle waterfront (Colman Dock).

The existing roadway, bicycle, and pedestrian network and the presence of several bus transit routes provide connectivity to the jobs, public services, and facilities that support the communities within the study area. See Chapter 3, Transportation Environment and Consequences, for more information on the transportation infrastructure in the study area.

4.2.4.1.4 Social Equity

In support of the Seattle Comprehensive Plan update, the City of Seattle conducted an equity analysis to identify how growth within the city may benefit or burden marginalized populations (City of Seattle 2016). The City used demographic, economic, and physical factors to determine current displacement risk and access to opportunity for communities in Seattle. The City defined "displacement" as the involuntary relocation of marginalized populations from their current neighborhood. "Access to opportunity" was defined as access to services, amenities, and other key determinants of social, economic, and physical well-being (City of Seattle 2016). The City found that there is a low to medium displacement risk and low to medium access to opportunity



in the study area, depending on location. This analysis did not consider future light rail in the project corridor, which would increase access to opportunity and could increase displacement risk near stations. Access to light rail is one of 15 factors for displacement risk and 1 of 13 factors for access opportunity.

4.2.4.1.5 Income-restricted and Supportive Housing

Seattle has many organizations that provide income-restricted, transitional, or supportive housing, and some have housing in the study area. There are 12 Seattle Housing Authority complexes in the West Seattle Link Extension study area, and Transitional Resources owns and leases several properties within the study area. Transitional Resources is a non-profit organization in Delridge that provides behavioral health services and supportive housing to help people make a transition to stable living in the community. Two of its buildings include a total of 60 units of supportive housing, and an additional building has 15 units of supportive housing as well as outpatient behavioral health offices.

Seattle also has Mandatory Housing Affordability (M.H.A.) zoning in some neighborhoods in the project study area, which requires developers to either build affordable housing or contribute to an affordable housing fund. One building with M.H.A. units is under construction in the study area, and others could be developed here in the future. There is also one multi-family residential building in the study area with income-restricted units through Seattle's Incentive Zoning program. Figure 4.2.4-1 shows the housing resources described above.

Some multi-family residential buildings in the study area also currently have rent- or income-restricted units through Seattle's Multifamily Tax Exemption (M.F.T.E.) program, although buildings currently in the program will likely no longer qualify by the time the project opens in 2032. Additional properties in the study area could be built in the future under this program.

Incentive Zoning

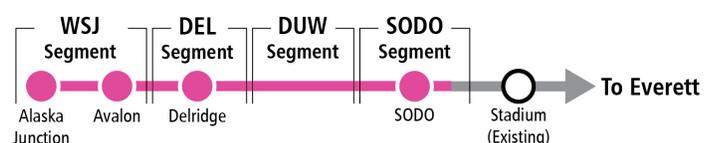
Incentive Zoning is a voluntary program in some Seattle land use zones that allows developers to achieve additional development capacity by contributing to or providing affordable housing units or other public amenities. Affordable housing units in this program remain restricted for a minimum of 50 years.

Multifamily Tax Exemption Program

The Multifamily Tax Exemption program, or M.F.T.E., is an incentive to create affordable housing in Seattle. Buildings participating in the M.F.T.E. program receive a property tax exemption for up to 12 years in exchange for lowering rents for tenants meeting income requirements. The M.F.T.E. program requires 20 or 25 percent of the apartments in a participating building to be affordable. Program rents are typically hundreds of dollars less per month than market rate.

4.2.4.2 Environmental Impacts of the No Build Alternative

The No Build Alternative would avoid the property acquisitions and other built environment impacts associated with building and operating light rail in an urban area. Those who reside in or travel to and from neighborhoods within the study area would not be provided with the reliability of light rail or increased transit accessibility. The neighborhoods and communities in the study area would develop according to adopted plans, dependent upon economic conditions, which could change the character of neighborhoods or neighborhood cohesion.



4.2.4.3 Environmental Impacts of the Build Alternatives during Operation

The analysis of potential impacts of the West Seattle Link Extension on neighborhoods considers changes in neighborhood quality, barriers to social interaction, impacts on social resources, and impacts on public services, safety, and security. Much of the impacts evaluation in this section is based on analyses conducted for other sections of the Draft Environmental Impact Statement, including Chapter 3; Section 4.2.1, Acquisitions, Displacements, and Relocations; Section 4.2.5, Visual and Aesthetic Resources; Section 4.2.7, Noise and Vibration; and Section 4.2.17. Impacts on other resources do not automatically constitute a social impact or impact on neighborhood cohesion. Instead, these impacts are evaluated collectively, with potential mitigation measures taken into account, for their effects on social resources and neighborhoods. Appendix G, Environmental Justice, addresses potential impacts and benefits to people of color and low-income people.

4.2.4.3.1 Impacts Common to All Alternatives

Introducing a new light rail facility within a densely populated urban area could result in benefits and impacts that would be common to all Build Alternatives.

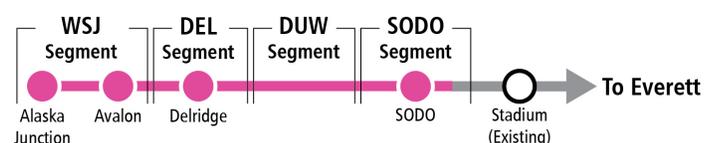
Benefits

Neighborhoods served by light rail stations would benefit from increased transit access to Downtown Seattle and other areas in the Puget Sound region accessible by light rail. Light rail service would be a fast, frequent, and reliable alternative to car travel and local bus service for many people in the travel corridor. Light rail access benefits include easier access to employment opportunities; educational facilities; cultural facilities and activities; medical, social and public service providers; sporting events and recreational activities; and other regional transportation terminals and hubs. The project would provide increased access to locations around the city for pedestrians, bicyclists, and those with mobility challenges. The station areas would include bus bays on adjacent streets, which would facilitate transfers between buses and light rail for people who live outside of the station's walkshed. Neighborhoods close to light rail stations could experience increased social activity due to improved access, residential and business redevelopment, or transit-oriented development (TOD) projects. Local businesses could experience greater patronage and an increased employment base.

Equitable Transit-Oriented Development

The City of Seattle has received a grant from FTA to support equitable TOD along the WSBLE Project corridor. The priorities of this grant-funded program are to advance racial equity and community agency in access, public realm, and TOD investments throughout the WSBLE corridor, and improve City of Seattle accountability and transparency regarding racial equity.

The project generally would have health benefits as the alternatives would increase the opportunity for physical activity by encouraging walking and biking to the stations through incentives such as limited parking around the stations, bicycle lockers at the stations, and bicycle racks on the trains. The project would also increase access to city parks and recreation destinations and new connections to bus transit routes at the light rail stations. The project would improve air quality by reducing vehicle miles traveled in the study area. Maintaining good health also depends on access to health services. The project would provide more frequent and reliable transit service throughout the study area and the region, which means that people would



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have better access to services that promote good health, such as healthcare providers, grocery stores, and gathering spaces.

Property Acquisitions and Land Use Changes/Neighborhood Cohesion

The project would result in property acquisitions. Some of these acquisitions would displace existing uses, while others would allow the existing use to continue. The project could also displace housing where tenants use Housing Choice vouchers; however, because vouchers are assigned to individuals rather than properties, the specific location of these units is not identified. Displacement of homes and businesses could change the neighborhood cohesion. The Build Alternatives would not displace existing or currently planned buildings with income-restricted M.H.A.

Housing Choice Vouchers

The Seattle Housing Authority helps low-income families, individuals, seniors, and people with disabilities to pay their monthly rent in eligible privately owned apartments or houses within the city through its Housing Choice Voucher program. Qualifying households typically earn 50 percent or less of the area median household income.

housing units. The manner in which a neighborhood changes in response to new light rail facilities could impact neighborhood cohesion positively or negatively. The street-level entrances to stations would be designed to fit in with the surrounding neighborhoods and would be designed with community input. Sound Transit would coordinate with the City of Seattle on design in station areas.

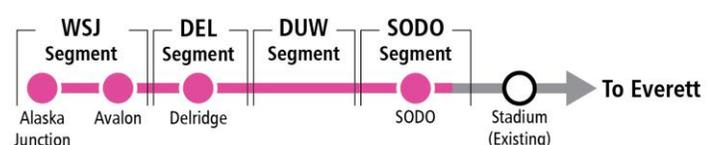
Section 4.2.1 discusses expected property acquisitions for each alternative and the relocation process. Appendix L4.1, Acquisitions, Displacements, and Relocations, shows potentially affected parcels. Section 4.2.2, Land Use, discusses the project's potential impacts on neighborhood land uses, and potential redevelopment and TOD opportunities.

Visual Impacts

Elevated guideways could result in visual impacts, including light from the trains and shading and visual intrusion from elevated guideways, to varying degrees on adjacent and nearby viewers. The height of the guideway and size of the light rail station and facilities would be factors in how visually intrusive the project would be within neighborhoods. Adding a visually intrusive element would change the visual character of the neighborhood, which could result in changes to the way neighbors perceive their surroundings and affect their everyday experience. The project would remove trees and vegetation as necessary, which would make a visible change. Where possible and consistent with light rail operation and maintenance needs, the removed trees and vegetation would be replaced. Section 4.2.5 discusses potential visual impacts and mitigation.

Transportation and Parking

The project would have localized impacts on property access and circulation associated with the placement of the light rail facility adjacent to or within existing roads. Affected property access points would be redesigned or relocated to maintain use of the property. Impacts to traffic circulation could include turn movement limitations, modified routing, new traffic signal movements, and new signalization at previously unsignalized intersections. Neighborhoods with stations could be affected by light rail riders using street parking in their neighborhoods. See Chapter 3 for discussion of this potential impact and mitigation measures.



Noise and Vibration

In general, operation of the new light rail facility would create a new source of noise and vibration in the community. Noise and vibration impacts would vary by segment with each alternative and are also dependent on the types of noise receivers adjacent to the project. Sound Transit would mitigate noise and vibration to levels below FTA impact criteria, as discussed in Section 4.2.7.

Safety and Security

Typically, crime around stations mirrors what is occurring in the neighborhood in which they are located (Moudon et al. 2018, Billings et al. 2011, City of Seattle 1999). WSBLE is not anticipated to have safety and security impacts. See Section 4.2.14 for additional information.

4.2.4.3.2 SODO Segment

In general, social resource and community impacts would be minor in the SODO Segment because it contains very few social resources; no social resources would be impacted by the project in this segment. There would be no impacts to neighborhood cohesion. The alternatives would not create barriers, hinder access to social resources, or notably change traffic patterns in a way that would make neighborhood access difficult.

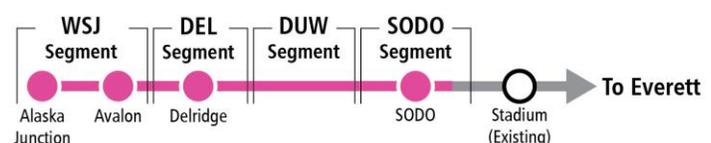
The addition of light rail in this segment would be consistent with the existing character of the area, which already contains a Link light rail line, a bus-transit-only roadway (SODO Busway), and freight and commuter trains. There would be no land use changes or displacements that would change the neighborhood quality.

All three SODO Segment alternatives would run parallel to the existing at-grade Link light rail line, with Preferred Alternative SODO-1a and Option SODO-1b converting the SODO Busway from bus and light rail use to light rail use only. If bus stops are removed, Metro would have to alter the routes that use the SODO Busway and bus riders would have to modify their access to bus stops. Chapter 3 discusses the impacts to the SODO Busway in more detail.

The addition of a new station in this segment would provide enhanced transit connectivity to and from West Seattle. Beacon Hill, a neighborhood on the east side of Interstate 5 and at the edge of the study area for this project, would benefit from the new connections made at the SODO Station. Each alternative includes design elements to enhance traffic flow for access to the station and circulation around the at-grade station area. Preferred Alternative SODO-1a and Option SODO-1b would include a new roadway overcrossing of South Lander Street, which would improve traffic circulation at that intersection.

4.2.4.3.3 Duwamish Segment

Social resources and community impacts would be minor in the Duwamish Segment, as there are very few social resources or community resources in the segment. All alternatives in this segment would have displacements. Preferred Alternative DUW-1a and Option DUW-1b would have a similar number of business and residential displacements and would also impact parks, which are social resources. Preferred Alternative DUW-1a and Option DUW-1b would span parts of the Port of Seattle Harbor Marina Corporate Center at Terminal 102 public access on Harbor Island, but would not impact the use of the public access. Option DUW-1b would have guideway columns that impact the Terminal 102 shoreline public access. These alternatives would also permanently acquire a part of the West Duwamish Greenbelt to accommodate the guideway, but the acquisition does not include areas with trail facilities or amenities, and the project would not alter the use of the remaining portions of the greenbelt. Alternative DUW-2 would avoid impacting the Harbor Marina Corporate Center at Terminal 102 shoreline public



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access and West Duwamish Greenbelt. Preferred Alternative DUW-1a and Option DUW-1b would displace the 22nd Avenue Southwest Street-end, which is an improved street-end in Pigeon Point.

The visual appearance of the alternatives would be consistent with existing views and land uses; industrial and commercial uses and the West Seattle Bridge shape the general character of the corridor. The elevated guideway and trains would be too low in elevation to be seen at the north end and area of highest elevation of Pigeon Point, but they would be visible from remaining residences at the lower-elevation area of Pigeon Point along 22nd Avenue Southwest and 23rd Avenue Southwest. The north end of Pigeon Point is currently adjacent to a large transportation corridor. The project would widen that corridor but would not create a new barrier that would impact neighborhood cohesion.

The project would not alter the overall land use or character of the neighborhoods, nor would it result in changes in neighborhood cohesion because the interactions and resources in this segment are largely related to business and industry. The alternatives would not create barriers, hinder access to social resources, or notably change traffic patterns in a way that would make neighborhood access difficult.

Some business displacements would occur, but much of the area would remain intact.

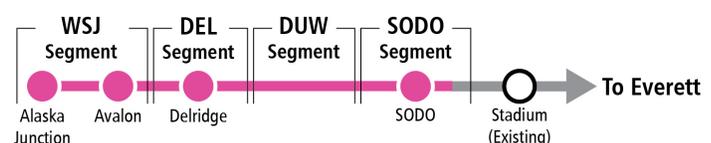
4.2.4.3.4 Delridge Segment

All alternatives in the Delridge Segment would affect residential communities and social resources, but to different degrees. All alternatives in this segment would displace a small business center that houses a neighborhood coffee shop, sandwich shop, and deli-mart. However, access to grocery stores near Alaska Junction and Avalon stations would increase.

Preferred Alternative DEL-1a, Option DEL-1b, Preferred Alternative DEL-2a*, and Option DEL-2b* would all displace approximately two residential blocks in the southeast corner of the Youngstown area for the elevated guideway and Delridge Station, including some Seattle Housing Authority residences. These alternatives would have the greatest impact on neighborhood character due to the location and extent of displacements and the extent of visual change. There are many older homes in the proposed station area. Station design and TOD development would likely be similar to the many newer multi-family developments that are being built in the area (particularly along Delridge Way Southwest). Newer development and the visual presence of an elevated guideway structure and facilities would dominate views from adjacent properties and would affect the character in the Youngstown neighborhood. Many homes that would remain would no longer have views of neighboring houses, but of light rail facilities, including elevated guideway columns and the station. These alternatives could also affect cohesion due to the isolation of the residences that would remain near the intersection of Delridge Way Southwest and Southwest Genesee Street.

Preferred Alternative DEL-1a, Option DEL-1b, Preferred Alternative DEL-2a*, Option DEL-2b*, Alternative DEL-3, and Alternative DEL-4* would displace the Washington State Department of Children, Youth, and Families office building. Preferred Alternative DEL-2a* and Alternative DEL-4* would both permanently impact the playable area of the West Seattle Golf Course, as detailed in Section 4.2.17.

Alternative DEL-3 and Alternative DEL-4* would also displace homes in the southeast corner of the Youngstown area, but there would be fewer displacements, and displacements would be closer to the arterial roads; therefore, neighborhood cohesion would not be affected. The elevated station and facilities would dominate views from adjacent properties. Station design and TOD development would likely be similar to the many newer multi-family developments that



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are being built along Delridge Way Southwest. Newer development and an elevated guideway would affect the character in Delridge, but due to their location, the affects for Alternatives DEL-3 and DEL-4 would be less than Preferred Alternative DEL-1a, Option DEL-1b, Preferred Alternative DEL-2a*, and Option DEL-2b*. The new station would be elevated above Delridge Way Southwest, with much of the station within the road right-of-way. Traffic operations on Delridge Way Southwest would be altered to accommodate station access. Although traffic patterns would be different than existing conditions, the surrounding community would retain access to roads around the station. These alternatives would also require acquisition of a small area in the northwest corner of the Delridge Playfield property but would not affect use of the property.

Alternative DEL-5 and Alternative DEL-6* would avoid impacting the residential blocks impacted by the other alternatives because their alignments generally follow existing arterials. These alternatives would have fewer residential property acquisitions and avoid impacts to the parks and recreational facilities in the segment. However, Alternative DEL-5 would displace a duplex owned by Transitional Resources, and Alternative DEL-6* would displace the Transitional Resources main office, onsite supportive housing, and adjacent apartment building.

The Delridge light rail stations would be next to existing residences in Youngstown and would result in more people passing through this community to get to and from the station. This is especially true for the Dakota Street station alternatives (Preferred Alternative DEL-1a, Option DEL-1b, Preferred Alternative DEL-2a*, and Option DEL-2b*), which are in the middle of the Youngstown community. Alternatives DEL-5 and DEL-6* would be at the edge of the residential area, and therefore the people passing to and from the light rail station would not be as noticeable to residents.

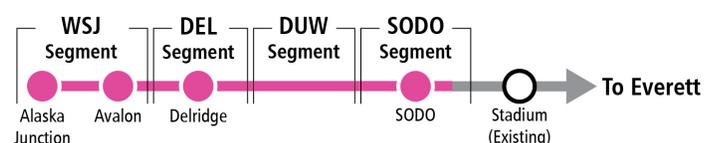
The Delridge Segment stations would provide increased connectivity and mobility for communities within West Seattle, including the communities to the south of the study areas. The communities to the south are ethnically diverse and generally have a lower income than the Delridge community. Bus routes would connect to this station, allowing riders to transfer from buses to more reliable and efficient light rail service to Downtown Seattle and other destinations served by the system. The mobility benefits of this station would be felt by the larger West Seattle community.

The West Seattle and Ballard Link Extensions Minimum Operable Segment (M.O.S.) would result in the Delridge Station becoming a transfer point to and from the more populated areas of West Seattle, which would introduce approximately twice as many buses and riders as the full-Build Alternatives. The West Seattle and Ballard Link Extensions M.O.S. with the Dakota Street station alternatives (Preferred Alternative DEL-1a, Option DEL-1b, Preferred Alternative DEL-2a*, and Option DEL-2b*) would have the most noticeable change in the number of people traveling through the Youngstown community due to the station location.

Buses that would serve the Avalon and Alaska Junction stations would be routed to the Delridge Station under the West Seattle and Ballard Link Extensions M.O.S. However, access to the Delridge Station would be less convenient for riders who would otherwise access Avalon or Alaska Junction stations via other modes. See Section 3.4, West Seattle Link Extension Affected Environment and Impacts during Operation - Transit, of Chapter 3 for more information.

4.2.4.3.5 West Seattle Junction Segment

The West Seattle Junction Segment is the densest segment in the West Seattle Link Extension study area and contains most of the social resources, including public and private schools, grocery stores, small parks, a senior center, and childcare facilities.



4.2.4 Social Resources, Community Facilities, and Neighborhoods

Preferred Alternatives WSJ-1 and WSJ-2 would have the most impact on the community because the guideway would be entirely elevated and primarily outside of public right-of-way. These alternatives would have the most visual impacts, and would displace a Seattle Housing Authority property.

Preferred Alternative WSJ-1 would permanently displace 44 rent- and income-restricted units at the Spruce West Seattle apartment complex, and Preferred Alternative WSJ-2 would permanently displace 22 rent- and income-restricted units at the Fauntleroy Way Apartments and 58 rent- and income-restricted units at the Maris Luxury Apartments. However, the income-restricted units in each building are commitments through their participation in the M.F.T.E. program and are assumed to expire 12 years after the building was constructed. These alternatives would affect these tenants and the inventory of income-restricted housing at the time the displacements occur. However, they would not affect the long-term inventory of income-restricted housing because it is assumed that these buildings would offer only market-rate rental units by the time the West Seattle Link Extension opens in 2032, based on the years that these buildings opened. Displaced tenants would receive relocation assistance as described in Section 4.2.1.7, Sound Transit Real Property Acquisition and Relocation Policy, Procedures, and Guidelines Summary.

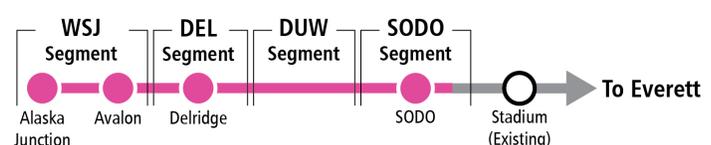
Preferred Alternative WSJ-1 would displace a Safeway grocery store and Trader Joe's grocery store, while Preferred Alternative WSJ-2 would displace only the Trader's Joe's store. The displacement of grocery stores would impact the neighborhood, as options to shop would be reduced. However, a QFC grocery store and a Whole Foods grocery store are located within three blocks of both stores. A Safeway is also located approximately 1.5 miles north and a Thriftway about the same distance south.

Preferred Alternatives WSJ-1 and WSJ-2 would also include a hi-rail access road for maintenance, which would start at-grade and transition to an elevated structure to reach the height of the guideway. Both the tail track and the hi-rail access road would have visual impacts on the surrounding neighborhood. Neighborhood character and cohesion would be affected due to the removal of businesses, the guideway location outside of the public right-of-way, and the visual impacts from the elevated guideway and stations.

Preferred Alternative WSJ-3a*, Preferred Option WSJ-3b*, Alternative WSJ-4*, and Alternative WSJ-5* would have fewer neighborhood impacts because the alternatives would be below-grade except for station entrances. Therefore, they would have only minor impacts on neighborhood character. Alternatives WSJ-4* and WSJ-5* would have greater neighborhood impacts than Preferred Alternative WSJ-3a* or Preferred Option WSJ-3b* because more of the alternative would be above-grade. Preferred Alternative WSJ-3a* (when connecting to Option DEL-2b), Preferred Option WSJ-3b*, Alternative WSJ-4*, and Alternative WSJ-5* would displace a Seattle Housing Authority property, and Preferred Option WSJ-3b* would displace a Safeway store and Junction Plaza Park. These impacts would not affect neighborhood character.

Alternative WSJ-5* would have a retained-cut Avalon Station, which would have minor visual impacts from the removal of homes and the presence of the station entrances and associated facilities. Alternative WSJ-4* would have an elevated Avalon Station with impacts similar to those described for Preferred Alternatives WSJ-1 and WSJ-2.

The Avalon light rail station would be next to existing single-family residential housing and would result in more people passing through the surrounding residential community to get to and from the station. This is especially true for the Preferred Alternatives WSJ-1 and WSJ-2 and



Alternative WSJ-4*, which are elevated adjacent to a residential community along 32nd Avenue Southwest.

The Avalon and Alaska Junction stations would provide increased connectivity and mobility for communities within West Seattle, including the communities to the south of the study areas. The communities to the south are ethnically diverse and generally have a lower income than the West Seattle Junction community. Bus routes would connect to these two stations, allowing riders to transfer from buses to more reliable and efficient light rail service to Downtown Seattle and other destinations served by the system. The mobility benefits of these stations would be felt by the larger West Seattle community.

4.2.4.4 Environmental Impacts of the Build Alternatives during Construction

4.2.4.4.1 Impacts Common to All Alternatives

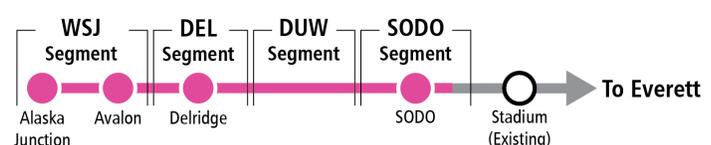
West Seattle Link Extension project construction would impact adjacent social resources and neighborhoods. Although the entire project would have an extended multiple year construction period, the impacts on specific adjacent neighborhoods would last a shorter duration while the project components in that area are built.

Construction activities that would temporarily affect neighborhood quality in adjacent areas would include:

- The presence and movement of equipment and materials to and from construction areas
- Clearing, grading, and exposure of soils
- Construction lighting for nighttime work
- Storage of construction materials onsite and at staging areas
- Road closures, access changes, and detours

Increases in noise, dust, and traffic congestion, as well as temporary road or lane closures and detours, would occur along the project alignment and at staging areas and may affect people using some community resources. Visual impacts of an active construction area, such as construction equipment and fencing, would occur. There would be impacts on some public parks and recreation facilities in the form of temporary access changes; see Section 4.2.17. Neighborhoods adjacent to the project could experience cut-through traffic due to road or lane closures and detours. These construction impacts would be felt primarily by those closest to the construction areas and could temporarily affect social interaction and neighborhood cohesion. In areas where the project alignment moves away from an existing arterial and into developed city blocks, these construction impacts may feel more intense for the neighborhood. Unsheltered people living near the project construction areas would experience increases in noise, dust, and vehicle exhaust; project construction may result in the need for them to move elsewhere.

Temporary road and lane closures on arterials would affect neighborhood circulation and access to and from study area neighborhoods. Durations of roadway construction closures would vary from nights and weekends to multi-year closures. See the discussion of key construction closures on arterials and local streets in Section 3.11, West Seattle Link Extension Construction Impacts, of Chapter 3, for further detail. Attachment N.1E, Construction-Related Roadway Modifications, of Appendix N.1, Transportation Technical Report, includes all proposed roadway closures by alternative. Major arterial closures are listed in the segment-specific discussions below. In some areas where major truck routes are not available, arterial and local streets would be used to access construction areas. People living in, working in, and traveling through these areas would experience construction traffic in their neighborhood.



As part of roadway closures during construction, sidewalks would be closed or the sidewalk width could be reduced within the construction areas along the impacted roadways. Sound Transit would provide protected sidewalks next to the construction area when detour routes are not feasible. In some locations, crosswalks may be closed for construction, although they would remain open to the extent feasible. The project may result in Americans with Disabilities Act-accessible curb ramps being removed temporarily to accommodate the project or to facilitate construction; however, there will be detours or temporary accessible facilities provided during construction. There might also be bicycle facility closures and reduced bicycle lane widths within or adjacent to construction areas.

Bus reliability could potentially degrade along arterials with lane and road closures needed for construction of the West Seattle Link Extension. In these locations, bus routes would need to use alternate pathways and temporary bus facilities may need to be installed. See the discussion of temporary construction impacts to transit in Section 3.11 of Chapter 3 for further detail. The availability of on-street parking could be reduced by construction workers driving to their worksite. Because the West Seattle Link Extension segments are in urban areas where parking may be limited or require payment, Sound Transit anticipates that staging areas could be used for construction employee parking but that construction workers could also park on local streets and arterials where parking is unrestricted and in off-street pay parking lots or garages, which may affect the parking supply.

See Section 2.6, Construction Approach, in Chapter 2 for a description of the construction activities for this project.

4.2.4.4.2 SODO Segment

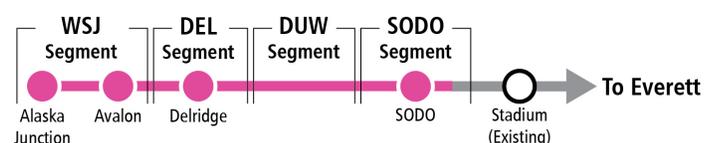
Construction activities would impact businesses and those who work near the construction area. Traffic and business access along South Lander Street between 4th Avenue South and 6th Avenue South would experience disruptions due to the roadway closure to construct the new overpass with Preferred Alternative SODO-1a and Option SODO-1b (see Table 3-13 for details on the road closures and durations of closures). For Alternative SODO-2, South Lander Street would be closed temporarily on nights and weekends for guideway construction over the roadway. Under all SODO Segment alternatives, the SODO Trail would be closed for the duration of construction between Royal Brougham Way and South Forest Street. During that closure, pedestrians and bicycles would be detoured to 6th Avenue South or 4th Avenue South, with east-west access maintained at adjacent street crossings.

4.2.4.4.3 Duwamish Segment

Adjacent businesses and industry would be impacted by the construction activities. On the west side of the waterway, the Pigeon Point community could be impacted by construction-related noise, visual changes, and construction traffic during construction of Preferred Alternative DUW-1a and Option DUW-1b. All alternatives would have closures on roadways used to access West Seattle; however, these closures would occur on nights and weekends, or would only be partial closures, and therefore, traffic impacts to the West Seattle community would be minimized. All alternatives would result in partial closures on the West Seattle Bridge or its ramps, but these closures would be limited to nights and weekends.

4.2.4.4.4 Delridge Segment

All the alternatives would have construction in residential areas, and nearby residences and social resources could be impacted by construction-related noise, visual changes, the presence of construction equipment, and construction traffic and road closures (see Table 3-14 for details



4.2.4 Social Resources, Community Facilities, and Neighborhoods

on the road closures and durations of closures). Preferred Alternative DEL-1a, Option DEL-1b, and Alternative DEL-3 would result in full closures on Southwest Genesee Street during construction. Preferred Alternative DEL-2a* would have full closures on Southwest Genesee Street during nights and weekends only. All alternatives, except for Alternatives DEL-5 and DEL-6* would result in partial closures to Delridge Way Southwest. Southwest Genesee Street and Delridge Way Southwest are arterials heavily used by residents in the adjacent neighborhoods and by those traveling through the Delridge neighborhood. Alternative DEL-5 and Alternative DEL-6* alignments follow Southwest Andover Street and would close sections of the street during construction. Southwest Avalon Way would be temporarily closed during construction of Alternative DEL-5 and closed on nights and weekends with construction of Alternative DEL-6*.

Tunnel portals for Preferred Alternative DEL-2a*, Option DEL-2b*, Alternative DEL-4*, and Alternative DEL-6* would result in neighborhood construction traffic near the edge of the West Seattle Golf Course.

4.2.4.4.5 West Seattle Junction Segment

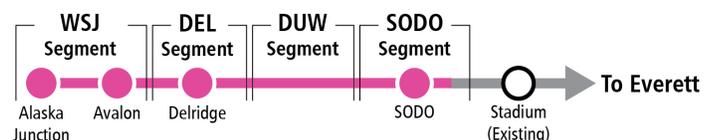
The West Seattle Junction Segment is denser than Delridge, so more people and businesses would be impacted by construction. Surface construction activities, including road closures and detours, could disrupt the West Seattle Junction area (see Table 3-15 for details on the road closures and durations of closures). Some of the events, activities, and services enjoyed by the larger community of West Seattle could be affected. For Preferred Alternatives WSJ-1 and WSJ-2, nearby homes, businesses, and social resources would experience construction noise, visual changes, and the presence of construction equipment. Fauntleroy Way Southwest would have full closures on nights and weekends and lane closures to construct the Preferred Alternative WSJ-1 guideway. Southwest Alaska Street between 38th Avenue Southwest and Fauntleroy Way Southwest would be fully closed to construct the Alaska Junction Station with Preferred Alternative WSJ-2, which would change travel patterns in this area and could affect access to social resources.

Preferred Alternative WSJ-3a*, Preferred Option WSJ-3b*, Alternative WSJ-4*, and Alternative WSJ-5* would reduce construction impacts on the community because much of the construction activity would be underground. However, station and tail track construction would have surface impacts, and Alternative WSJ-4* would have an elevated Avalon Station, which could result in the similar surface construction impacts described for Preferred Alternative WSJ-2. Preferred Alternative WSJ-3a*, Preferred Option WSJ-3b*, and Alternative WSJ-5* would require roadway closures on 35th Avenue Southwest between the West Seattle Bridge and Southwest Avalon Way. All of the tunnel alternatives would result in partial closures on Fauntleroy Way Southwest between the West Seattle Bridge and Southwest Avalon Way. Closures of main arterials would impact the ability to navigate the neighborhood, affecting neighborhood cohesion and could affect access to social resources.

Portals for the West Seattle Junction Segment tunnel alternatives (Preferred Alternative WSJ-3a*, Preferred Option WSJ-3b*, Alternative WSJ-4*, and Alternative WSJ-5*), and the station areas and tail tracks for all alternatives, including the elevated alternatives, would have neighborhood construction traffic in the West Seattle Junction.

4.2.4.5 Indirect Impacts of the Build Alternatives

Potential indirect impacts on social resources, community facilities, and neighborhoods would be changes in neighborhood composition or character over time due to the presence of the light

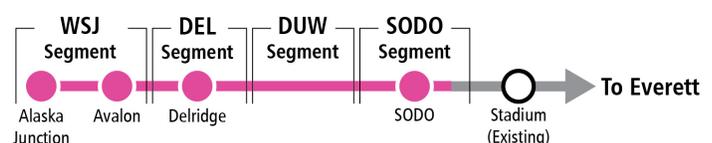


rail facilities. The manner in which a neighborhood changes in response to new light rail facilities could impact neighborhood cohesion positively or negatively. The project may encourage redevelopment in station areas (TOD), or the completion of missing transportation links, such as bicycle facilities, sidewalks, or trails. Station area improvements could provide new meeting places for nearby residents and employees, improving community cohesion. Station area redevelopment could promote economic activity by expanding neighborhood business districts consistent with zoning and could increase property values (refer to Section 4.2.3, Economics, for information on potential economic benefits). Increased property values could cause higher rents and property taxes, which could have a negative effect on existing renters, homeowners, and business owners, resulting in some deciding to move away from the neighborhoods. Light rail facilities that are not close to stations could also adversely affect property values.

Indirect impacts of potential TOD are discussed in Sections 4.2.2 and 4.2.3. Potential future transportation or mobility projects built to link to the project are discussed in Chapter 3.

4.2.4.6 Mitigation Measures

Mitigation measures to address project impacts to neighborhoods are discussed in the following sections: the Mitigation sections of Chapter 3 and Sections 4.2.1, Acquisitions, Displacements, and Relocations; 4.2.3, Economics; 4.2.5, Visual and Aesthetic Resources; 4.2.7, Noise and Vibration; 4.2.14, Public Services, Safety, and Security; and 4.2.17, Parks and Recreation.



4.2.5 Visual and Aesthetic Resources

4.2.5.1 Affected Environment

The study area for visual and aesthetic resources is the viewshed of the Build Alternatives. In many locations, views of the project components such as guideways, stations, and trains by sensitive viewers would be partially or completely blocked by vegetation, terrain, and buildings. In densely developed areas, the viewshed of the alternatives is frequently between 100 and 500 feet on either side of it. In areas where West Seattle Link Extension components would be higher than nearby buildings and vegetation, and in areas where bodies of water are crossed, the viewshed can extend out to approximately 0.5 mile. Given the developed urban nature of the areas the Build Alternatives would pass through, being able to see West Seattle Link Extension components beyond approximately 0.5 mile would not alter the visual character or visual quality of views beyond that distance.

The description of the affected environment focuses on visual character, visual quality, locations where there are concentrations of sensitive viewers, and views from City of Seattle Designated Scenic Routes. Sound Transit’s methodology draws upon established Federal Highway Administration guidelines (Federal Highway Administration 1988) with several key differences, such as the identification of viewer sensitivity, and the use of a qualitative rather than quantitative scale. See Appendix N.2, Visual and Aesthetics Technical Report, for additional information on visual methodology, affected environment, and project impacts. As described in the technical report, key observation points (KOPs) were selected to represent areas where there is a potential for visual impacts along the alignment of the Build Alternatives.

Visual Terminology

Visual character is an objective assessment of a landscape view that has various natural and human-built elements.

The **visual quality** of a landscape view reflects how well its character-defining features are composed.

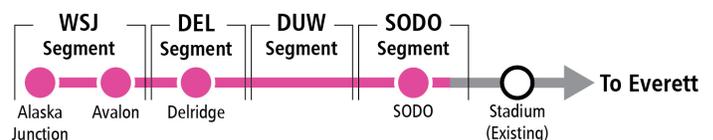
Vividness, intactness, and unity determine the visual quality of landscape views

Visual quality categories help assess how the project would change the visual environment. As a baseline, existing visual quality was categorized as low, average, or high.

Sensitive viewers are people for whom the landscape view is important. They are likely to notice, and be concerned with, changes to the viewed landscape. Residents and park users are more sensitive to changes in landscapes than office workers or motorists.

4.2.5.1.1 SODO and Duwamish Segments

The description of the affected environment focuses on areas that contain concentrations of sensitive viewers. The SODO Segment and the eastern parts of the Duwamish Segment do not contain areas with concentrations of sensitive viewers. The portion of the Duwamish Segment where there are concentrations of sensitive viewers is between Harbor Island and the boundary with the Delridge Segment. Harbor Island, the West Duwamish Waterway, and the flat area between the waterway and eastern end of Pigeon Point have an industrial-maritime visual character. The visual quality of views in most of this segment ranges from low to low average. Areas with views of average to high visual quality are found on top of Pigeon Point. Areas with concentrations of sensitive viewers are in residential areas and in three parks. The residential areas are along two streets (17th Avenue Southwest and 18th Avenue Southwest) in the Riverside neighborhood. They are also found in the Pigeon Point community along the top of Pigeon Point along Southwest Charleston Street and on 19th, 20th and 21st streets Southwest and along the west side of Pigeon Point on 21st, 22nd and 23rd avenues Southwest. The West Duwamish Greenbelt serves as a backdrop to all of these residential areas and blocks views of



industrial and commercial areas that lie below Pigeon Point from residences along the top and west side of Pigeon Point. Recreational areas include the Harbor Marina Corporate Center at Terminal 102, Terminal 18, and *tuʔəlaltx*^w Village Park and Shoreline Habitat parks along the West Duwamish Waterway.

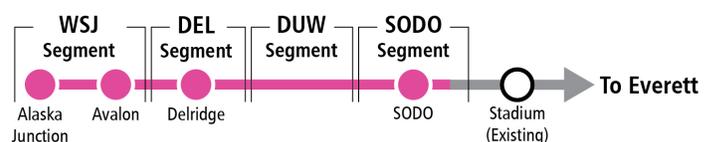
East Marginal Way South and the West Seattle Bridge are City of Seattle Designated Scenic Routes. East Marginal Way South begins in SODO at the south end of Alaskan Way South and travels south along Terminal 30 to the West Seattle Bridge. No key features can be seen by travelers along this route. The West Seattle Bridge connects SODO and West Seattle, passing over Harbor Island, the East and West Duwamish Waterways, and Longfellow Creek. Key visual features that can be seen from the West Seattle Bridge include the Cascade Mountains, Mount Rainier, Elliott Bay, and the Downtown Seattle skyline. From the West Seattle Bridge at the Longfellow Creek crossing, looking east, key visual features include views of the Downtown Seattle skyline and the Cascade Mountains, and partial views of Elliott Bay.

4.2.5.1.2 Delridge Segment

The Delridge Segment contains a mixture of land uses and visual character types. The visual character along the west side of Delridge Way Southwest (to Southwest Dakota Street) and the north sides of Southwest Andover Street and Southwest Yancy Street is commercial and industrial. The visual quality of views in this area ranges from low to average. This part of the segment does not contain concentrations of sensitive viewers. Areas with concentrations of sensitive viewers are found in residential areas along Delridge Way Southwest and the western boundary of this segment (Southwest Avalon Way). The area north of Southwest Genesee Street is residential in use and visual character, as is the area along Southwest Avalon Way and 32nd Avenue Southwest. Views from these areas generally have average visual quality. The heavily vegetated Longfellow Creek Natural Area passes from north to south through the center (and low elevation point) of the Delridge Segment and is an important visual feature. An entrance to the trail that follows the natural area (the Longfellow Creek Legacy Trail) is on the north side of Southwest Genesee Street and is used by recreationists (sensitive viewers) accessing the trail. The area south of Southwest Genesee Street contains Delridge Playfield and the West Seattle Golf Course (with residences found along the west side of 26th Avenue Southwest). These greenspaces, along with the mature trees that line edge of Southwest Genesee Street, greatly influence the appearance of this part of the segment and create an open-space park-like visual character that is seen by nearby residential and recreational sensitive viewers. The visual quality at the West Seattle Golf Course and Delridge Playfield is high. The visual quality of views from residences along Southwest Genesee Street is high average.

4.2.5.1.3 West Seattle Junction Segment

The north part of the West Seattle Junction Segment sweeps west through single-family residential neighborhoods that are found on the slope north of Fauntleroy Way Southwest. The segment then turns south to approach the Alaska Junction area. Fauntleroy Way Southwest travels from northeast to southwest through the segment and passes areas that are largely commercial in use and visual character (but does include the small triangular Fauntleroy Place park). The visual quality of views in this area is generally average. Large-scale mixed-use buildings, office buildings and multi-family complexes are found between low-rise commercial land uses. Alaska Junction is surrounded by residential areas with sensitive viewers including a single-family neighborhood between the junction and the segment's southern terminus at Southwest Dawson Street. The visual quality of views in these areas is average. Sensitive



viewers include residents in single-family residential areas north of Fauntleroy Way Southwest, park users at Fauntleroy Place and Junction Plaza Park (Southwest Alaska Street and 42nd Avenue Southwest), residents in multi-story multi-family residential buildings in the Alaska Junction area and residents in neighborhoods at the south end of the segment.

Three City of Seattle Designated Scenic Routes are in the West Seattle Junction Segment. They are the southwestern portion of the West Seattle Bridge (between 35th Avenue Southwest and the Longfellow Creek crossing), a portion of Fauntleroy Way Southwest from the off/on ramps with the West Seattle Bridge southwest through and past the West Seattle Junction Segment, and 35th Avenue Southwest. No key features can be seen from the portion of the West Seattle Bridge in this segment. Key features that can be seen from Fauntleroy Way Southwest are more limited because views are blocked by terrain, vegetation, and buildings, but, depending upon location, there are views of the Cascade Mountains, Elliott Bay, and the Downtown Seattle skyline. Along 35th Avenue Southwest, depending upon location along the southern end of this street, there are views of the Cascade Mountains and the downtown skyline.

4.2.5.2 Environmental Impacts of the No Build Alternative

With the No Build Alternative, the existing visual and aesthetic conditions found throughout the segments described in the affected environment would generally be maintained, subject to changes related to planned development. Light rail stations would not be built in the Delridge, Avalon, and Alaska Junction areas. Development would continue to occur in accordance with zoning and would evolve into denser multi-family development in Delridge, along Avalon Way, with more mixed use in the Alaska Junction area. It is likely that density in the West Seattle Junction area would continue to increase and that some of the less developed parcels of land would be redeveloped and would contribute to the increasingly urban character of the Alaska Junction area.

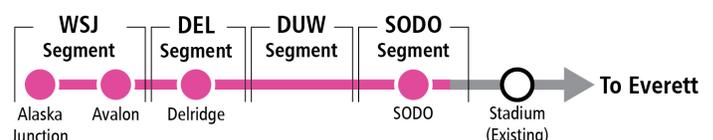
4.2.5.3 Environmental Impacts of the Build Alternatives during Operation

This section describes the visual and aesthetic impacts of the Build Alternatives during operation. Chapter 2, Alternatives Considered, and Appendix J, Conceptual Plans, detail each of the Build Alternatives. KOPs were selected to represent areas where there is a potential for visual impacts along the alignment of the Build Alternatives. This section shows the KOPs where simulations were developed to assist in assessing visual impacts, identifies areas along the Build Alternatives with concentrations of sensitive viewers, identifies areas where there would be visual impacts by one of more of the Build Alternatives, and discusses potential impacts to City of Seattle Designated Scenic Routes. Visual impacts occur when an existing visual quality category (high, average, or low) is reduced one or more categories. Visual impacts are in miles along the length of the alternative adjacent to concentrations of sensitive viewers.

4.2.5.3.1 Impacts Common to All Alternatives

All of the Build Alternatives would change the visual environment to varying degrees. Sound Transit has developed the following design measures that would be incorporated into the Build Alternatives.

- Sound Transit would develop specific design criteria for the West Seattle Link Extension that would guide project design through a balanced set of system-wide elements and contextual



elements, such as a consistent architectural theme for elevated elements and stations, consistent signage, and a system-wide art program. Interdisciplinary teams would develop these criteria with input from local communities, and the City of Seattle would integrate these criteria with existing plans, including plans for redevelopment.

- Sound Transit would coordinate with the City of Seattle and adjacent communities through design review, to promote visual unity in station areas.
- Sound Transit would surplus the remainder of the parcels not needed after construction, which could potentially be redeveloped consistent with Sound Transit's Transit Oriented Development Policies and City of Seattle plans.
- When possible, Sound Transit would preserve existing vegetation.
- Sound Transit would plant appropriate vegetation within and adjoining the project right-of-way to replace existing street trees and other visually important vegetation removed for the project, and/or to provide screening for sensitive visual environments and/or sensitive viewers. New plantings would be consistent with Sound Transit operations and maintenance requirements.
- Exterior lighting at stations, tail tracks, and hi-rail access would be designed to minimize height and use source shielding to avoid light bulbs that would be directly visible from residential areas, streets, and highways. Shielding would also limit spillover light and glare in residential areas.

4.2.5.3.2 SODO Segment

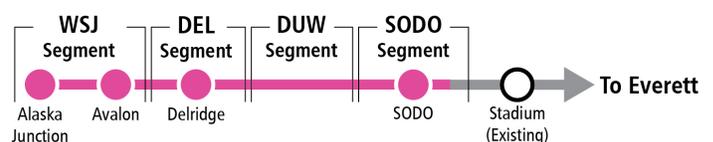
The SODO Segment does not contain areas with concentrations of sensitive viewers adjacent to the Build Alternatives; therefore, no visual impacts would occur.

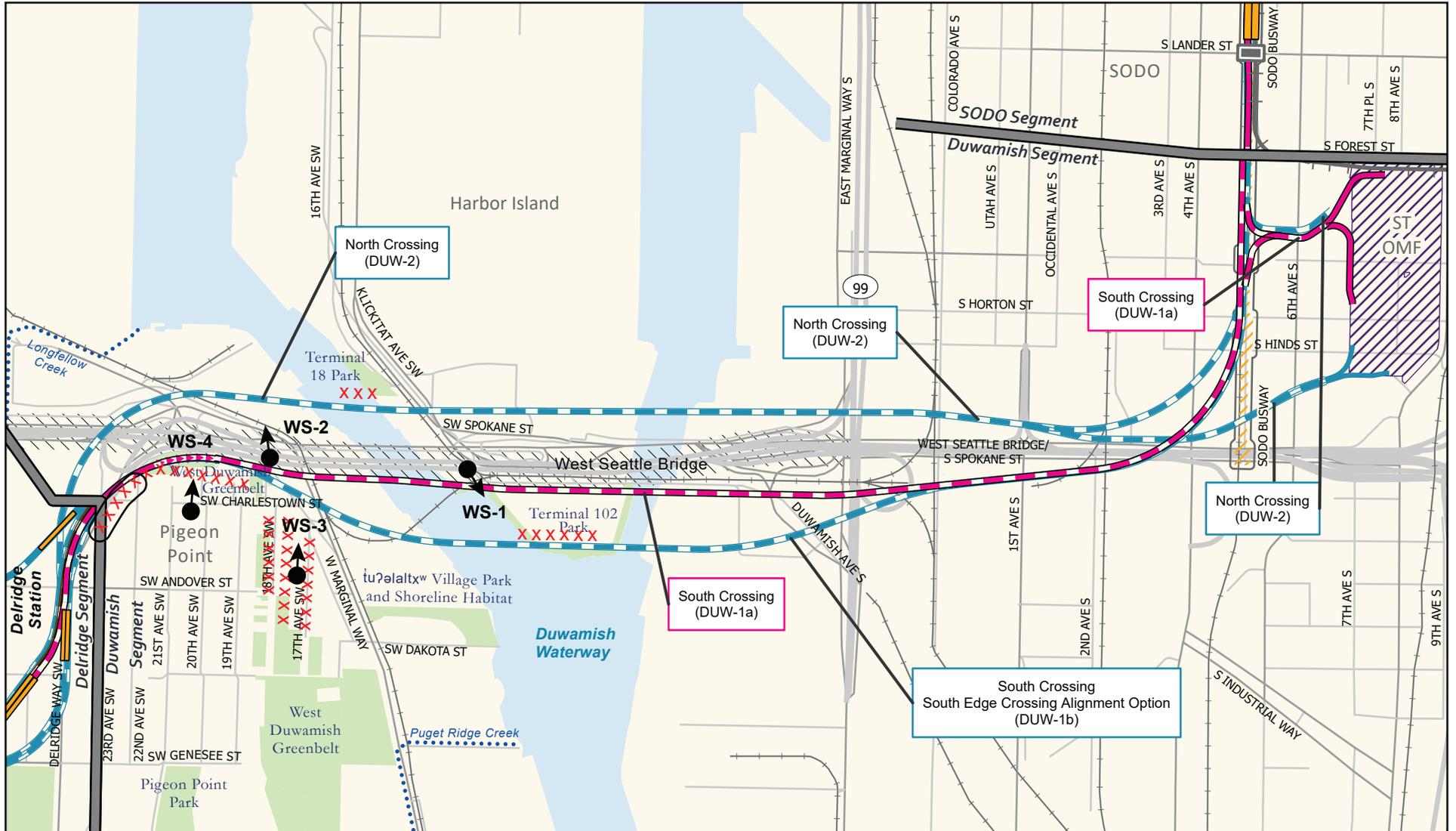
4.2.5.3.3 Duwamish Segment

The Duwamish Segment, which would have above-ground components, contains nearby concentrations of sensitive viewers in the western portion of the segment west of Harbor Island who could potentially be concerned with changes to the visual and aesthetic settings from the project. Figure 4.2.5-1 shows the KOPs where simulations were developed, identifies areas with concentrations of sensitive viewers, identifies areas where there would be visual impacts, and identifies City of Seattle Designated Scenic Routes.

Areas with Concentrations of Sensitive Viewers

Preferred Alternative DUW-1a and Option DUW-1b would pass south of the West Seattle Bridge and over the public shoreline access at Harbor Marina Corporate Center at Terminal 102, but in different locations. Both alternatives would place guideway columns either in or near the property. This addition of new large-scale transportation elements would somewhat change the character of the shoreline access, but would not further reduce the low visual quality of the views from it. Both Preferred Alternative DUW-1a and Option DUW-1b would be seen by Riverside area residences along 17th Avenue Southwest and 18th Avenue Southwest.



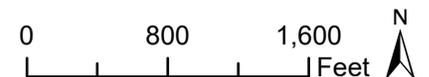


Source: City of Seattle, King County (2019, 2020), 2021.

- | | |
|--|--|
| Alternatives | Segment Line |
| Preferred Alternative | Existing Link Light Rail |
| Preferred Alternative with Third-party Funding | Railroad |
| Other Alternatives | SODO Busway |
| Alternative Profile | Proposed Overpass |
| Elevated | Sound Transit Operations and Maintenance Facility (ST OMF) |
| At-Grade | Piped Stream |
| Retained Cut | Park |
| Station | |
| New | |

- | |
|--|
| Key Observation Point (KOP) and View Direction |
| City of Seattle Designated Scenic Route |
| Location of impact to visual quality with one or more alternatives near areas with concentrations of sensitive viewers |
| Approximate Areas with Concentration of Sensitive Viewers |

FIGURE 4.2.5-1
Visual Setting and Impacts
 West Seattle Link Extension -
 Duwamish Segment
West Seattle and Ballard Link Extensions



Alternative DUW-2 would have the least change to the visual character in areas with concentrations of sensitive viewers and the least impact on visual quality of all the Duwamish Segment Build Alternatives. This alternative would pass north of the West Seattle Bridge. The only nearby area with concentrations of sensitive viewers would be Terminal 18 Park. This alternative would introduce another large-scale transportation element to views currently dominated by the West Seattle Bridge and the Duwamish Waterway (also known as the Duwamish River). This would not change the existing maritime transportation-oriented visual character of the views toward it from Terminal 18 Park or further reduce the low visual quality of the view from the park.

Sound Transit is considering several bridge types for crossing the Duwamish Waterway. In addition to the balanced cantilever segmental box girder bridge depicted in the simulations (see Attachment N.2A, Key Observation Point Analysis, to Appendix N.2, Visual and Aesthetics Technical Report), Sound Transit is considering other bridge types, including extradosed, truss, and cable-stayed. Each of these bridges would have different visual characteristics that would have different influences on the visual character of views toward the West Seattle Bridge. However, regardless of bridge type, the appearance of the alternatives' elevated structures would not change the existing low visual quality of views toward the bridge by Riverside area residences or recreationists in the parks.

Preferred Alternative DUW-1a and Option DUW-1b would pass north of residences on top of Pigeon Point. Both would remove trees in the adjacent West Duwamish Greenbelt and would remove some residences next to the greenbelt. The removal of trees within the greenbelt would be noticed, but the remaining residences would be too far back to see the industrial lands to the north toward Elliott Bay that the trees in the greenbelt currently screen. The project components (elevated guideways, overhead catenary system, or trains) associated with Preferred Alternative DUW-1a and Option DUW-1b would not be seen from most remaining residences. The lots where residences would be removed would be used by Sound Transit for construction of the guideway, and their visual character would change from residential to either transportation or unbuilt lot. These alternatives would reduce the high visual quality of views to the north from remaining residences to high average, which would not be a visual impact. From the top of Pigeon Point, trains associated with Alternative DUW-2 would be seen passing in the distance through existing vegetation that would not be removed in the West Duwamish Greenbelt, but would not change the residential visual character of the view or reduce its high visual quality.

The northwestern slope of Pigeon Point would be the only area in this segment where Preferred Alternative DUW-1a and Option DUW-1b would change visual character and impact visual quality. Removing trees would result in uninterrupted views from some residences along 21st Avenue Southwest, 22nd Avenue Southwest, and 23rd Avenue Southwest of industrial and commercial areas as well as the West Seattle Bridge and other streets. This would change the current residential and natural character of the views from these residences to industrial-commercial and bridge. In addition, components of the alternatives would be seen, depending on location. The existing average to high visual quality of views to the northwest from this area would be reduced to low, which would be an impact to visual quality. Alternative DUW-2 would not remove trees along the northwestern slope of Pigeon Point within the West Duwamish Greenbelt and would not change the existing visual character or lower visual quality of views in this area. Table 4.2.5-1 provides the visual quality impacts for each of the Duwamish Segment alternatives.

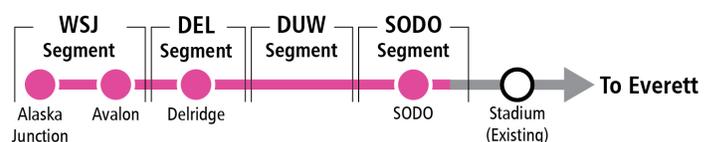


Table 4.2.5-1. Duwamish Segment Visual Impacts to Concentrations of Sensitive Viewers

Alternative	Visual Impacts (miles)	Areas Where Visual Impacts Would Occur
Preferred South Crossing (DUW-1a)	0.1	Residences along 21st Avenue Southwest, 22nd Avenue Southwest, and 23rd Avenue Southwest
South Crossing South Edge Crossing Alignment Option (DUW-1b)	0.1	Residences along 21st Avenue Southwest, 22nd Avenue Southwest, and 23rd Avenue Southwest
North Crossing (DUW-2)	0	None

City of Seattle Designated Scenic Routes and Public View Protection

East Marginal Way and the West Seattle Bridge are City of Seattle Designated Scenic Routes. For all of the Duwamish Segment alternatives, the elevated guideway in the foreground of the view from East Marginal Way looking directly south would be another overpass similar to those in the existing view. East Marginal Way primarily offers views of industrial lands and Port of Seattle terminal activities, and the Duwamish Segment alternatives would not intrude on any protected views from this stretch of East Marginal Way.

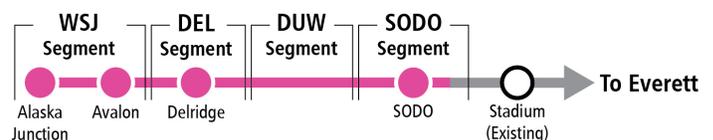
Views to the south from the West Seattle Bridge would be altered with the presence of the elevated guideway associated with the Preferred Alternative DUW-1a and Option DUW-1b. Preferred Alternative DUW-1a would be approximately 115 feet south of the West Seattle Bridge. In some locations, the new bridge would block travelers’ passing views of the Duwamish Waterway and Mount Rainier. Option DUW-1b would be about 400 feet farther south of the West Seattle Bridge than Preferred Alternative DUW-1a and, because of its greater distance, would intrude less upon passing travelers’ views of the Duwamish Waterway and Mount Rainier than would Preferred Alternative DUW-1a. Alternative DUW-2 would be approximately 350 feet north of the West Seattle Bridge and, in some locations, would alter or block short segments of passing travelers’ views to the north of features such as Elliott Bay, Puget Sound, and the Downtown Seattle skyline.

As described previously, Sound Transit is considering several bridge types for crossing the Duwamish Waterway. Each of these bridge types would have different visual characteristics. The balanced cantilever segmental box girder bridge (although narrower) would be similar to the existing West Seattle Bridge in scale, form, materials, and overall appearance. Its bridge deck would be supported by a series of guideway columns that are similar in appearance to those supporting the West Seattle Bridge. With an extradosed or cable-stayed bridge, travelers passing on the bridge would see cables (which would not block views), and the tall guideway columns would momentarily block north or south views. The many vertical support arms of a truss bridge would intrude upon views from the West Seattle Bridge more than a cable-stayed or extradosed bridge.

Other than the West Seattle Bridge, the Build Alternatives would not intrude upon views from City of Seattle specified viewpoints, parks, or view corridors of Mount Rainier, the Olympic and Cascade mountains, the Downtown Seattle skyline, or Puget Sound.

Light, Glare, and Shadows

As is the case with vehicles currently traveling on the West Seattle Bridge, passing trains from all Build Alternatives would produce lights and glare (from headlights and reflective surface materials) that would be seen from nearby areas. Lights and glare from trains associated with Preferred Alternative DUW-1a and Option DUW-1b would also be seen at locations such as



Harbor Marina Corporate Center at Terminal 102, Village Park and Shoreline Habitat, the West Duwamish Greenbelt, and the Riverside and Pigeon Point residential areas. Light and glare produced by trains would not impact motorists, pedestrians, or the surrounding area.

Shadows from a bridge built for any Build Alternative would add to existing shadows from the West Seattle Bridge on the Terminal 18 Park for short periods of time when winter sun angles are low. Preferred Alternative DUW-1a and Option DUW-1b would also cast additional shadows on West Duwamish Greenbelt. Only Option DUW-1b would add shadows to Harbor Marina Corporate Center at Terminal 102.

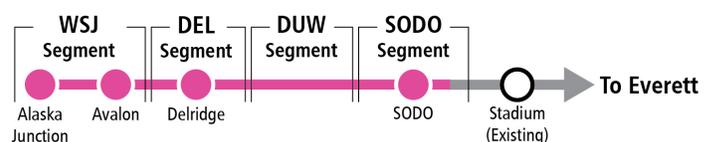
4.2.5.3.4 Delridge Segment

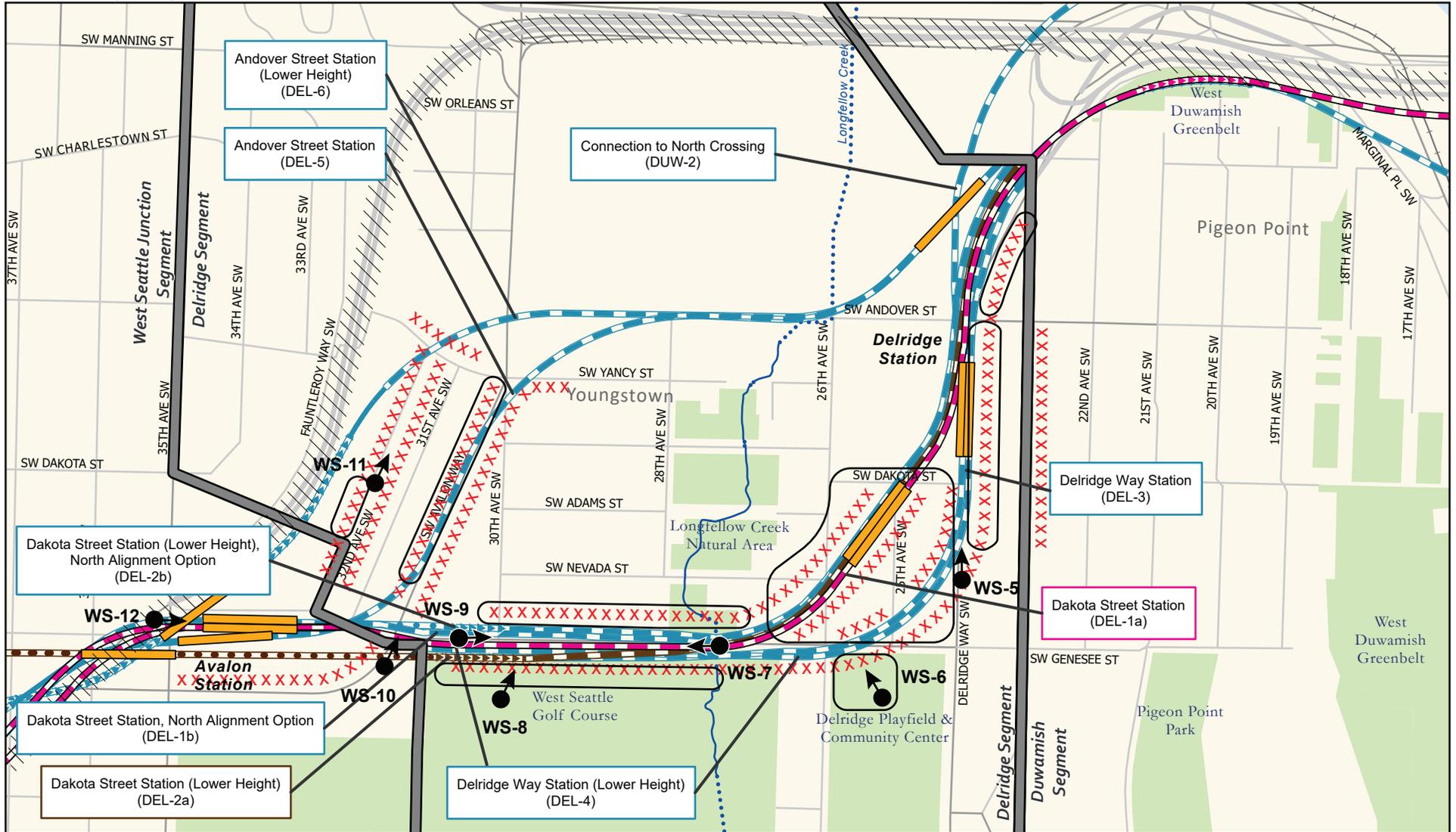
The Delridge Segment, which would have primarily above-ground components, contains nearby concentrations of sensitive viewers. Figure 4.2.5-2 shows KOPs where simulations were developed, identifies areas with concentrations of sensitive viewers, identifies where there would be visual impacts, and identifies City of Seattle Designated Scenic Routes. Cross sections and 3D views of some stations are shown in the following section to illustrate the general height, bulk, and scale of the stations (see Attachment N.2B, Station 3D Views and Cross Sections, to Appendix N.2, Visual and Aesthetics Technical Report, for the complete set).

Areas with Concentrations of Sensitive Viewers

The visual quality impacts of the Delridge Segment alternatives Preferred Alternative DEL-1a, Option DEL-1b, Preferred Alternative DEL-2a*, Option DEL-2b*, Alternative DEL-3, and Alternative DEL-4* would be similar to each other since they would generally follow the same route. However, there would be some differences between the alternatives, particularly in how visible changes would be to sensitive viewers due to their differences in heights and some variations in location. The Delridge Segment visual quality impacts to concentrations of sensitive viewers are provided in Table 4.2.5-2.

The elevated guideway heights with Preferred Alternative DEL-1a and Option DEL-1b would range from between approximately 60 and 70 feet to about 150 feet along Southwest Genesee Street. The height to the top of the Delridge Station associated with these two alternatives would be approximately 110 feet. For configuration, height, bulk, and scale of the station, see Figures 4.2.5-3 and 4.2.5-4, Delridge Station 3D view and cross section for Preferred Alternative DEL-1a and Option DEL-1b. Both alternatives would introduce a structure that would be taller than the current 30- to 35-foot height allowed by zoning. Both of these alternatives would remove residences in the neighborhood south of Southwest Dakota Street between Delridge Way Southwest on the east and 26th Avenue Southwest on the west. By removing the residences and introducing the elevated guideway and station, the current residential character of views from remaining nearby residences into this area would change to transportation. The elevated station and guideway would be noticeably higher in elevation than any other structures in this area, and the station would likely have a more contemporary design than many older nearby residential single-family buildings in the area. The new station design would likely be similar to the many newer multi-family developments that are increasingly being built in the area (particularly along Delridge Way Southwest).





Source: City of Seattle, King County (2019, 2020, 2021).

Alternatives

- Preferred Alternative
- Preferred Alternative with Third-party Funding
- Other Alternatives

Alternative Profile

- Elevated
- At-Grade
- Tunnel
- Retained Cut

Station

- New

- Segment Line
- Railroad
- Stream
- Piped Stream
- Park



Key Observation Point (KOP) and View Direction



City of Seattle Designated Scenic Route



Location of impact to visual quality with one or more alternatives near areas with concentrations of sensitive viewers



Approximate Areas with Concentration of Sensitive Viewers

FIGURE 4.2.5-2
Visual Setting and Impacts
 West Seattle Link Extension -
 Delridge Segment

*West Seattle and
 Ballard Link Extensions*

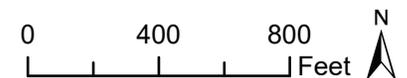


Table 4.2.5-2. Delridge Segment Visual Quality Impacts to Concentrations of Sensitive Viewers

Alternative	Visual Impacts (miles)	Where Visual Impacts Would Occur
Preferred Dakota Street Station (DEL-1a)	1.0	Residences along 23rd Avenue Southwest, 25th Avenue Southwest, 26th Avenue Southwest, Nevada Street, Delridge Way Southwest, and parts of Southwest Genesee Street and part of the Delridge Playfield, West Seattle Golf Course, and some locations within Longfellow Creek Natural Area.
Dakota Street Station North Alignment Option (DEL-1b)	1.0	Similar to Preferred Alternative DEL-1a; however, additional residences north of Southwest Genesee Street would be removed and therefore would not have visual impacts.
Preferred Dakota Street Station Lower Height (DEL-2a)*	1.0	Similar to Preferred Alternative DEL-1a but would impact views from fewer residences.
Dakota Street Station Lower Height Alternative North Alignment Option (DEL-2b)*	1.0	Similar to Preferred Alternative DEL-1a; however, additional residences north of Southwest Genesee Street would be removed and therefore would not have visual impacts.
Delridge Way Station (DEL-3)	1.0	Similar to Preferred Alternative DEL-1a.
Delridge Way Station Lower Height (DEL-4)*	1.0	Similar to Alternative DEL-1a.
Andover Street Station (DEL-5)	0.2	Residences along Southwest Avalon Way between Southwest Yancy Street and Southwest Genesee Street.
Andover Street Station Lower Height (DEL-6)*	0.1	Residences along a small section of 32nd Avenue Southwest.

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

The elevated station and guideway would reduce the current average degree of visual unity and integrity of views toward it to low. This reduction would result in a lowering of the current average visual quality to low, which would be considered a visual impact.

As Preferred Alternative DEL-1a would travel along the south side of Southwest Genesee Street, trees would be removed along both sides of the street and within the northern edge of the West Seattle Golf Course (Figure 4.2.5-5). This would change the visual character of views toward Southwest Genesee Street from both the golf course and the residences adjacent to the north side of Southwest Genesee Street to transportation. This change would also be seen from other locations within the study viewshed like the Delridge Playfield. The removal of trees and residences along with the scale and form of the elevated guideway would reduce the high average visual quality of residences along Southwest Genesee Street and the high visual quality at the West Seattle Golf Course and Delridge Playfield to low, which would be a visual impact (see Attachment N.2A, Key Observation Point Analysis). In the few areas along the Longfellow Creek Legacy Trail where the elevated guideway would be seen, the high visual quality of views would be reduced to average, which would be a visual impact.

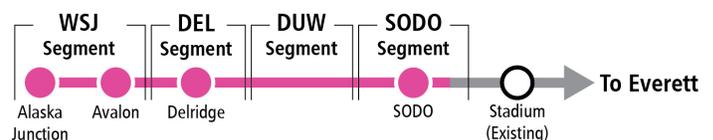


Figure 4.2.5-3. Delridge Station 3D View for Preferred Alternative DEL-1a and Option DEL-1b

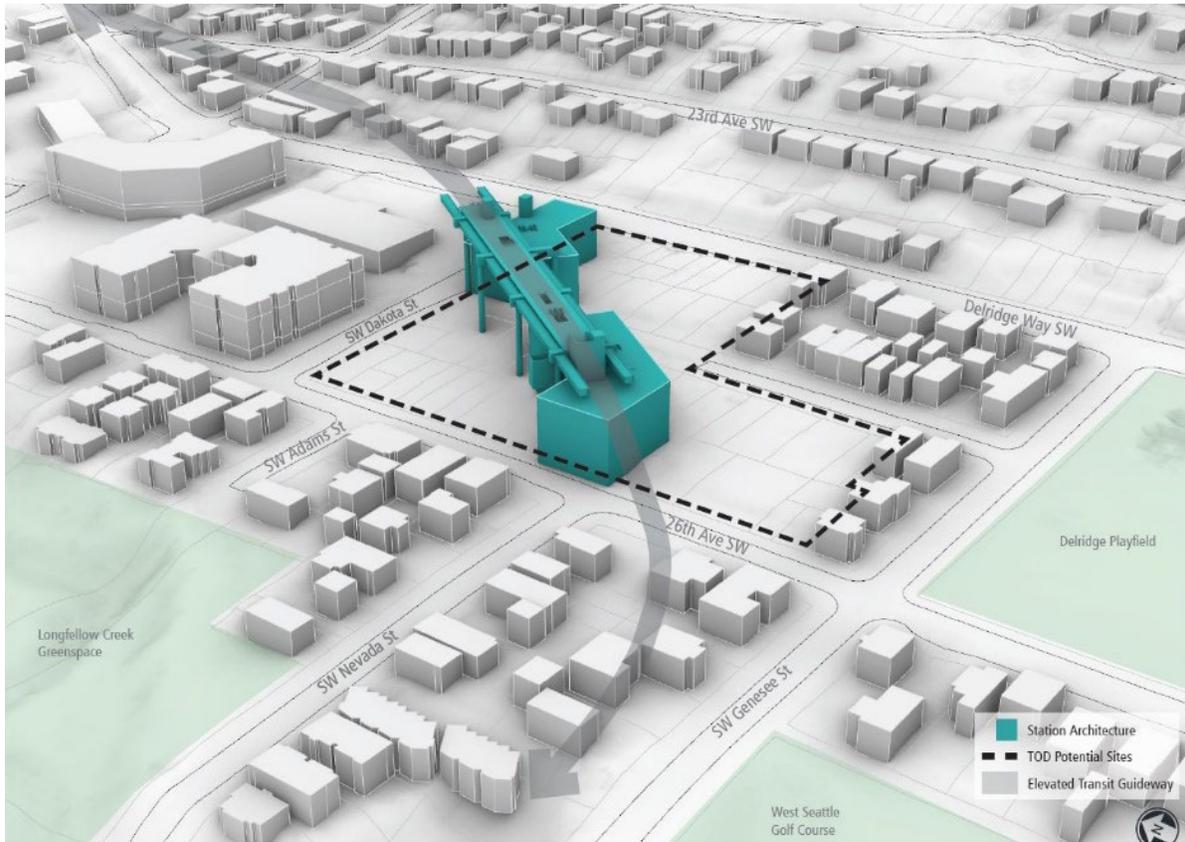
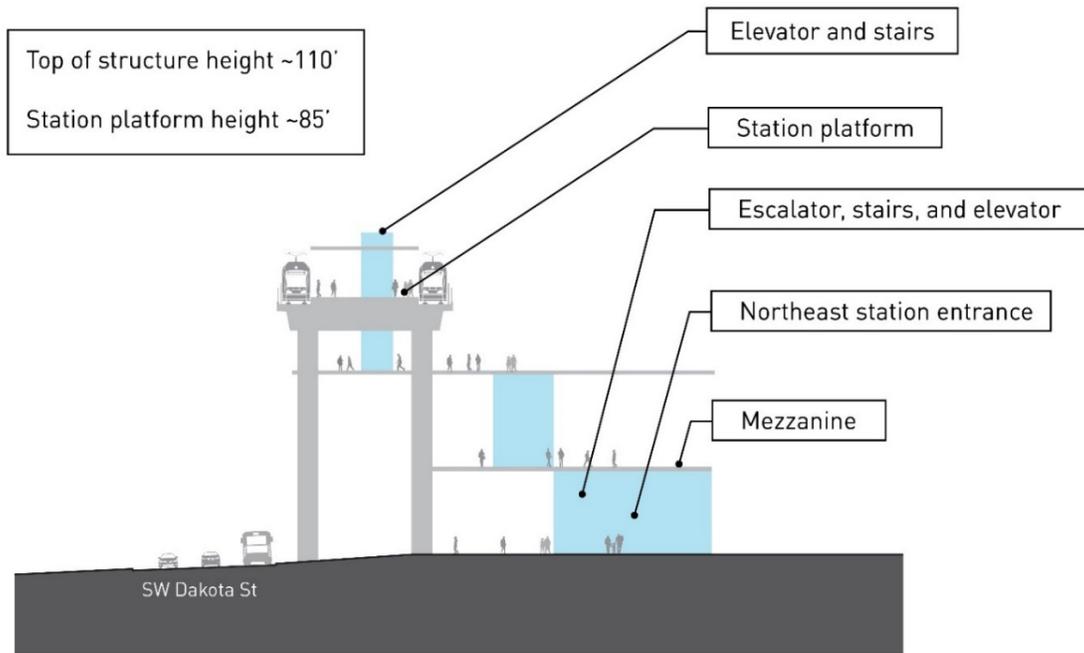


Figure 4.2.5-4. Delridge Station Cross Section for Preferred Alternative DEL-1a and Option DEL-1b



Option DEL-1b would have impacts similar to Preferred Alternative DEL-1a, but its alignment would pass along the north side of Southwest Genesee Street rather than along the north edge of the golf course on the south edge of Southwest Genesee Street (see Figure 4.2.5-5). This alternative would require removing all of the residences on the north side of Southwest Genesee Street. However, it would remove fewer trees along the south side of Southwest Genesee Street and the northern edge of the West Seattle Golf Course than Preferred Alternative DEL-1a. This alternative would reduce the high average visual quality of remaining residences north of those that would be removed along Southwest Genesee Street to low, which would be a visual impact. This reduction would also be a visual impact to northern views from the golf course and views from Delridge Playfield.

Preferred Alternative DEL-1a and Option DEL-1b would remove vegetation from the south edge of the Longfellow Creek Natural Area. Remaining trees would screen or partially screen views of the elevated guideways from most of the Longfellow Creek Legacy Trail. In the areas along the trail where the elevated guideway would be seen, the high visual quality of views would be reduced to average, which would be a visual impact.

From the eastern edge of the Delridge Segment to the east end of the West Seattle Golf Course, Preferred Alternative DEL-2a* would be similar to Preferred Alternative DEL-1a, except that it would be lower in height. The elevated guideway would be up to about 60 feet, and the station would be approximately 60 feet. This would be taller than the current 30- to 35-foot height allowed by zoning. The influence of this lower station on visual character would be very similar to that described for Preferred Alternative DEL-1a, but because Preferred Alternative DEL-2a* station would be about 50 feet lower than Alternative DEL-1a, it would be seen from fewer areas and therefore would change less of the residential visual character to a transportation visual character. The average visual quality of views toward the station would be reduced to low, which would be a visual impact. For configuration, height, bulk and scale of the station, see Figures 4.2.5-6 and 4.2.5-7, Delridge Station 3D view and cross section for Preferred Alternative DEL-2a* and Option DEL-2b*.

From Southwest Genesee Street, Preferred Alternative DEL-2a* would pass through the West Seattle Golf Course to a portal at the west end of the golf course and extend farther south into the West Seattle Golf Course than Preferred Alternative DEL-1a. The presence of Preferred Alternative DEL-2a* would change the recreational visual character of views toward it from within the golf course, from areas along the north side of Southwest Genesee Street (see Figure 4.2.5-5), and from other nearby areas like the Delridge Playfield to transportation in character. The removal of trees and presence of this alternative through the north end of the West Seattle Golf Course would lower the existing high unity and intactness of views in this area to average. It would reduce the high visual quality of views from within the West Seattle Golf Course and the Delridge Playfield to low average, which would be a visual impact.

Preferred Alternative DEL-2a* would also reduce the high average visual quality of views from along both sides of Southwest Genesee Street to low average, which would not be a visual impact. This alternative would remove some vegetation along the edge of the Longfellow Creek Natural Area. Trees would screen or partially screen views of the elevated guideways along most of the Longfellow Creek Legacy Trail. The elevated guideway would be seen from some locations along the trail, but its presence would not lower visual quality of views along the trail.

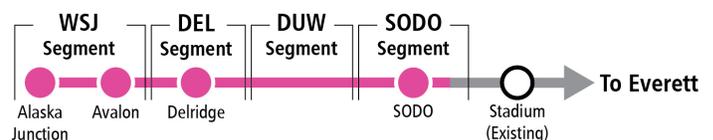


Figure 4.2.5-5. KOP WS-9: Looking East along Southwest Genesee Street from Southwest Avalon Way

Existing Condition



Preferred Dakota Street Station Alternative (DEL-1a)



Dakota Street Station North Alignment Option (DEL-1b)



Preferred Dakota Street Station Lower Height Alternative (DEL-2a*)



Dakota Street Station Lower Height North Alignment Option (DEL-2b)



Delridge Way Station Alternative (DEL-3)



Delridge Way Station Lower Height Alternative (DEL-4)

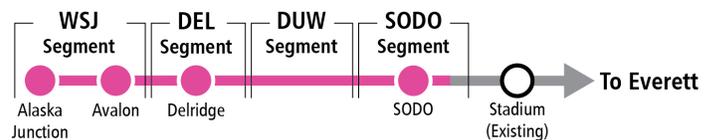


Figure 4.2.5-6. Delridge Station 3D View for Preferred Alternative DEL-2a* and Option DEL-2b*

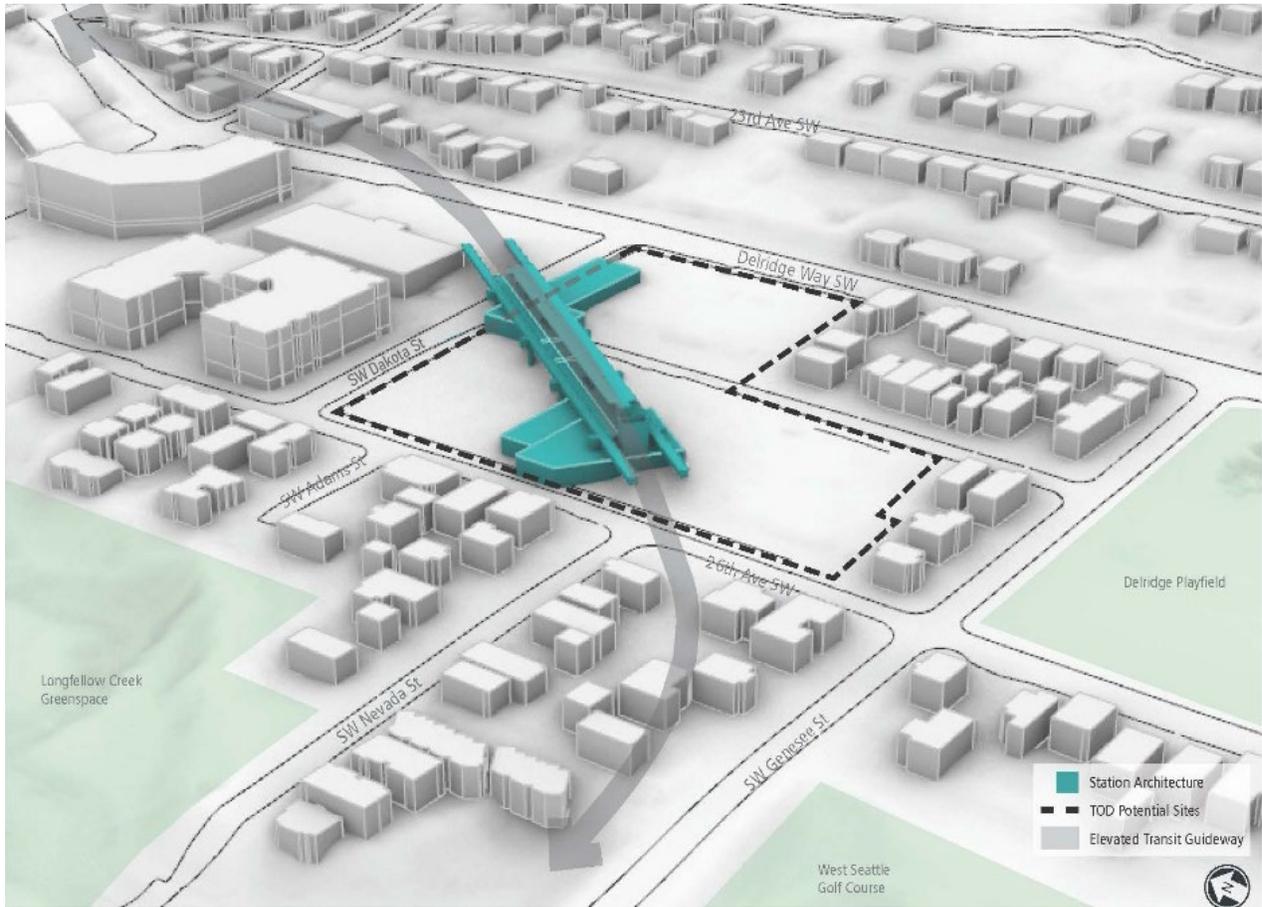
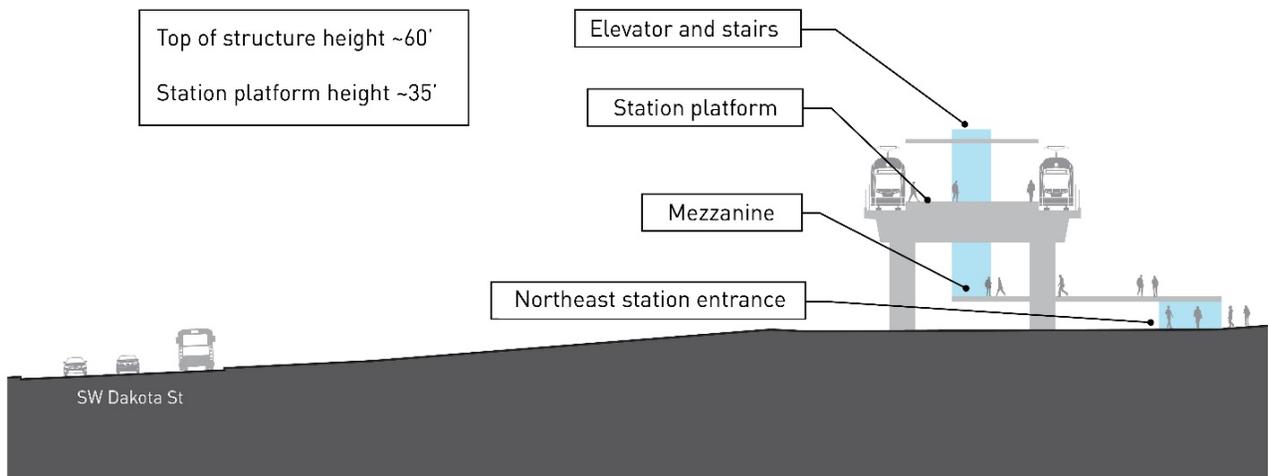


Figure 4.2.5-7. Delridge Station Cross Section for Preferred Alternative DEL-2a* and Option DEL-2b*



Up to the east end of the West Seattle Golf Course, the impacts associated with Option DEL-2b* would be essentially the same as those described for Preferred Alternative DEL-2a*. The Delridge Station for this alternative would also be about 60 feet high and have similar influences on the visual character and quality of views toward it from remaining residences. Unlike Option DEL-1b, Option DEL-2b* would only require the removal of trees at the east end of the West Seattle Golf Course. It would also be lower elevation and would have the least impact on views from the West Seattle Golf Course of the Delridge Segment alternatives that would pass along Southwest Genesee Street. With this alternative, the existing high visual quality of views from the West Seattle Golf Course would be reduced to average (which would be a visual impact). Residences north of Southwest Genesee Street would be removed and the alternative would have a visual impact on views toward it from remaining residences north of Southwest Genesee Street (see Figure 4.2.5-5). It would remove some vegetation along the edge of the Longfellow Creek Natural Area. Like Preferred Alternative DEL-1b trees within the Longfellow Creek Natural Area would generally screen views of the elevated guideway, and people on the Longfellow Creek Legacy Trail would see the elevated guideway from some locations along the trail. However, the elevated guideway would be lower in elevation than Preferred Alternative DEL-1a in this area; therefore, its presence would not lower the visual quality of views along the trail.

The height of the Alternative DEL-3 elevated guideway would range between approximately 50 and 150 feet, and the height at the top of the Delridge Station would be approximately 90 feet. Alternative DEL-4* would be lower, with a guideway that ranges between a tunnel and 60 feet high, and the height at the top of the Delridge Station would be approximately 90 feet. For station configuration, see Figure 4.2.5-8, Delridge Station Cross Section for Alternative DEL-3 and Alternative DEL-4*. The height bulk and scale of this station would be less than that shown for Preferred Alternative DEL-1a and Option DEL-1b in Figure 4.2.5-3.

These alternatives would pass through more of the residential area east of Delridge Way Southwest than would the other Delridge Segment alternatives and would change the visual character and impact the visual quality of views from residences on the hillside between the east side of Delridge Way Southwest and 23rd Avenue Southwest. These alternatives would remove the most residences and trees between these two streets, which would open up views to the west from remaining residences that are currently screened by trees and buildings. The new views would include commercial and industrial areas, the elevated guideway, and the Delridge Station, which would cross over the middle of Delridge Way Southwest. The removal of trees and buildings and the presence of these alternatives' components would decrease the average visual unity and intactness of views to the west from remaining residences along 23rd Avenue Southwest. This would reduce the average visual quality of views toward the alignment to low, which would be a visual impact.

Alternative DEL-3 would continue south along Delridge Way Southwest and follow it farther south than the other Delridge Segment alternatives before veering west mid-block through the residential area south of Southwest Dakota Street between Delridge Way Southwest and 26th Avenue Southwest. The elevated guideway passing through this area would change the residential character to transportation in character. The scale of the elevated guideway would lower the generally average visual quality of views from remaining residences toward it to low, which would be a visual impact.

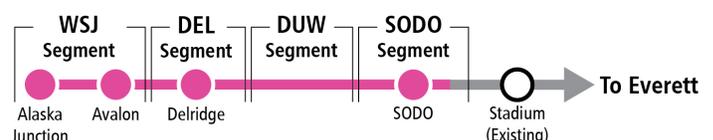
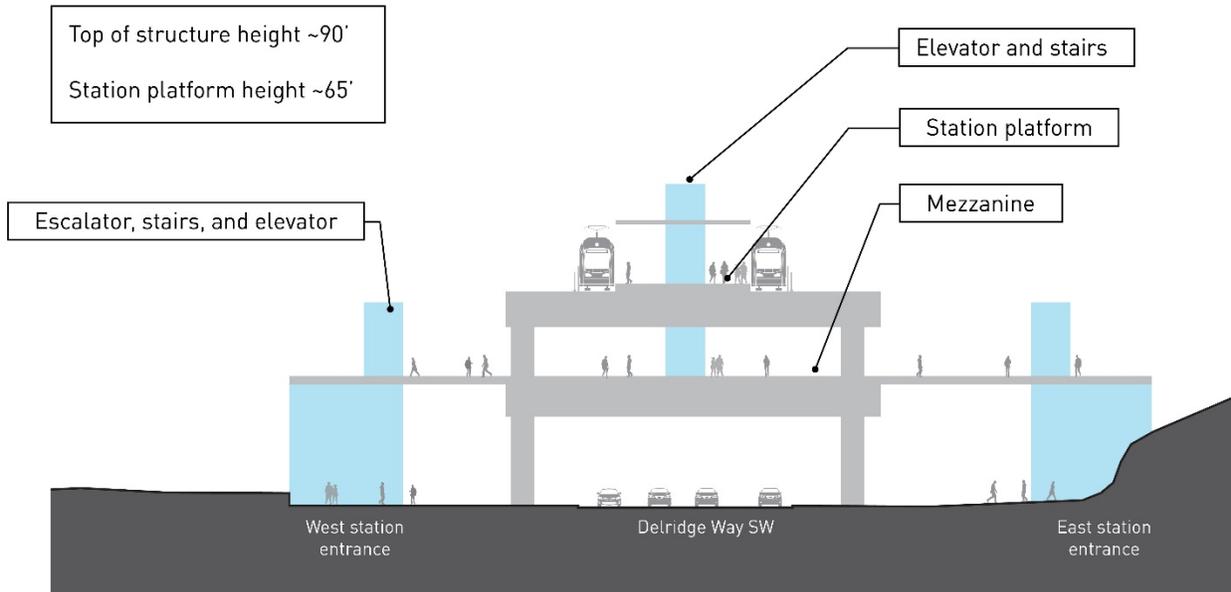


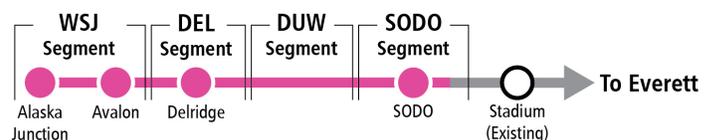
Figure 4.2.5-8. Delridge Station Cross Section for Alternative DEL-3 and Alternative DEL-4*



Alternative DEL-3 would pass along the south side of Southwest Genesee Street and require the removal of trees along the south side of the street along much of its alignment (see Figure 4.2.5-5; note that trees and residences on the north side of the portion of Southwest Genesee Street near Southwest Avalon Way depicted in the Alternative DEL-3 simulation would not be removed). This alternative would remove trees within the West Seattle Golf Course. Its appearance from the golf course, Delridge Playfield, and the remaining residences behind those that would be removed along Southwest Genesee Street would be similar to that of Preferred Alternative DEL-1a. The removal of trees, along with the presence of the elevated guideway, would reduce the high average visual quality of views toward the alignment from the residences to low; this would be a visual impact. The existing high visual quality of views toward the guideway from the Delridge Playfield and West Seattle Golf Course would be reduced to low average, which would also be a visual impact. Alternative DEL-3 would not remove vegetation from the edge of the Longfellow Creek Natural Area; however, due primarily to its height, it might be seen from a few points along the Longfellow Creek Legacy Trail, and where seen, would lower the high visual quality of views toward the guideway to average, which would be a visual impact.

Alternative DEL-4* would pass along the south side of Southwest Genesee Street and require the removal trees on the south side of the street. It would begin to enter into a tunnel near the northern part of the West Seattle Golf Course, where it would remove trees and some roads, paths, and greens. The part of the alternative passing through the West Seattle Golf Course would be very similar in appearance to that of Preferred Alternative DEL-2a* (Figure 4.2.5-5), as would its impact on visual character and visual quality.

Alternative DEL-5 would have the second least impact on visual quality. It would impact views from multi-family buildings along Southwest Avalon Way where buildings and existing street trees would be removed, and the elevated guideway would be seen along (and over) much of Southwest Avalon Way. The residential character of views along the street from residences would be changed to transportation. For configuration, height, bulk and scale of the station, see Figures 4.2.5-9 and 4.2.5-10, Delridge Station 3D view and cross section for Alternative DEL-5 and Alternative DEL-6*.



4.2.5 Visual and Aesthetic Resources

The scale of the elevated guideway from Alternative DEL-5 passing over Southwest Avalon Way through a corridor flanked with residences would reduce the average visual unity and intactness of views along it to low. These reductions would lower the average visual quality of views to low, which is a visual impact.

Alternative DEL-6* would have the least visual quality impacts of all the alternatives in the Delridge Segment. Its visual impacts would be restricted to a small area where residences and trees would be removed on the north side of Southwest Yancy Street and on the west side of 32nd Avenue Southwest. The removal of these residences (and the trees behind them that screen views of the West Seattle Bridge on-ramp) would change the character of views from the remaining residences toward the alignment from residential character to transportation. The removal of the residences and the trees would reduce the average unity of these views to low. As a result, the average visual quality of views from remaining residences would be reduced to low, which is a visual impact.

Figure 4.2.5-9. Delridge Station 3D View for Alternative DEL-5 and Alternative DEL 6*

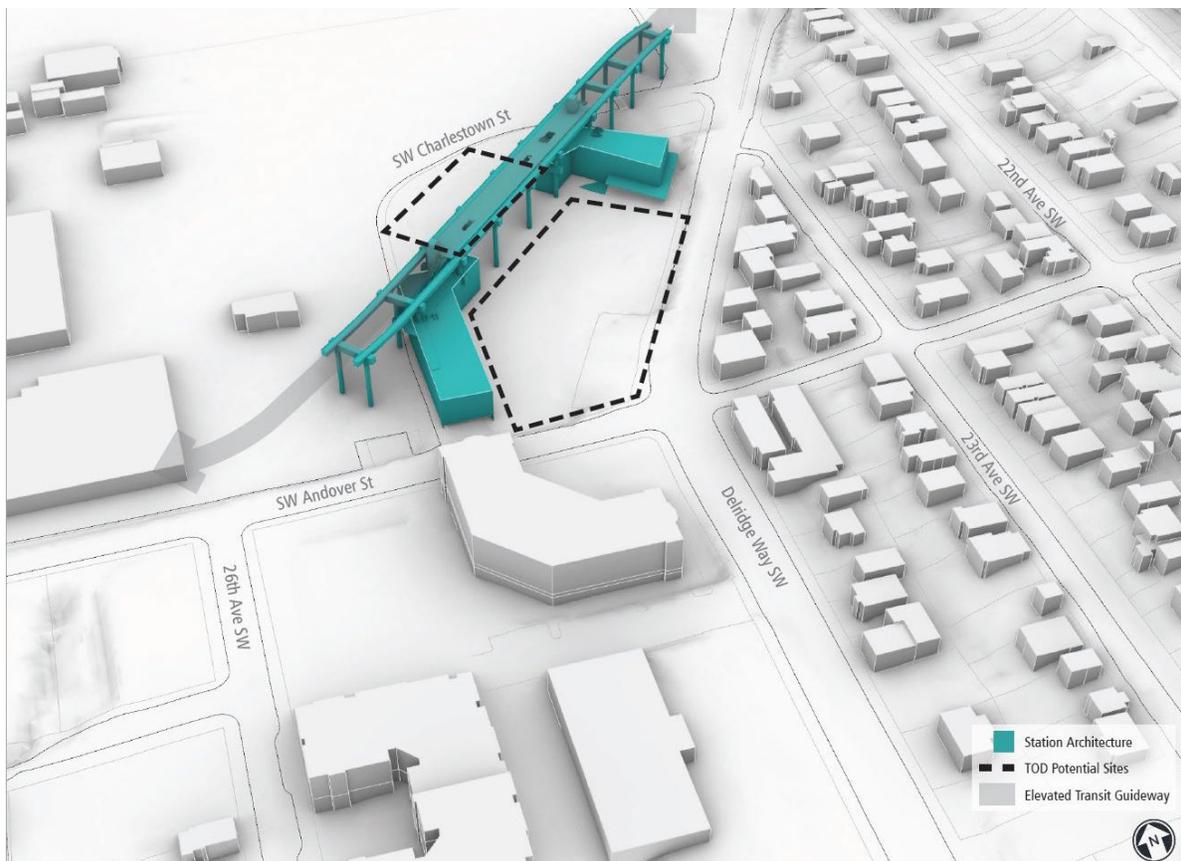
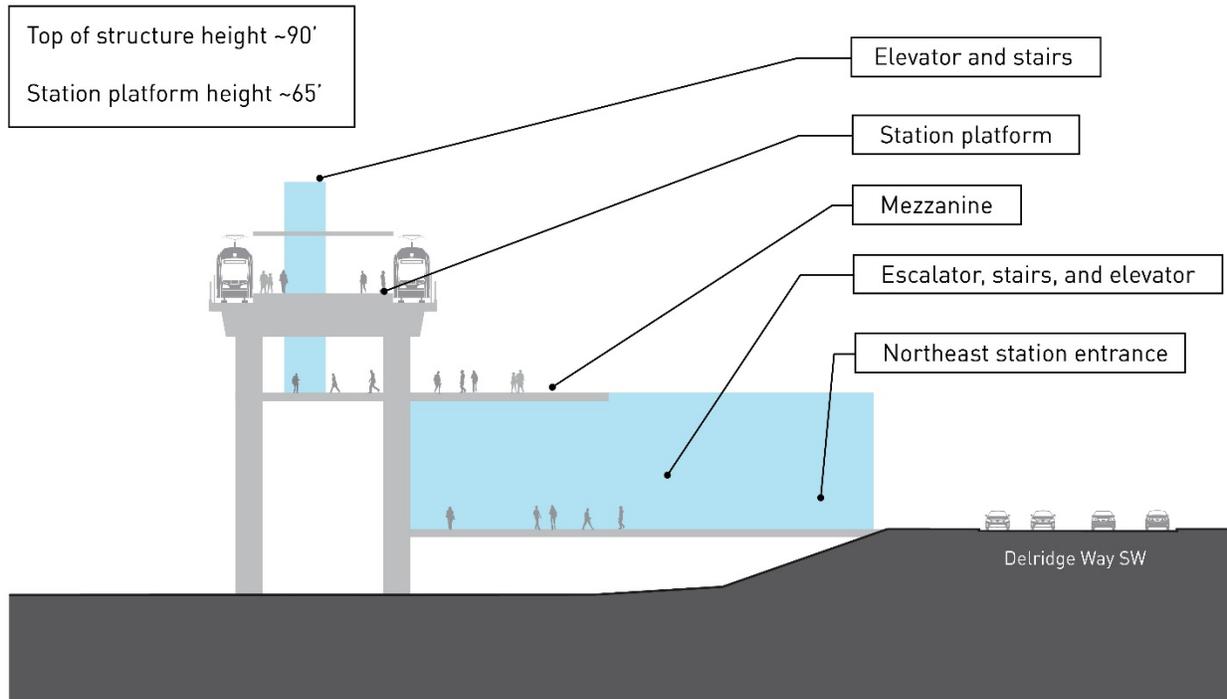


Figure 4.2.5-10. Delridge Station Cross Section for Alternative DEL-5 and Alternative DEL 6*



Note: Heights shown are for Alternative DEL-6*. The top of station height for Alternative DEL-5 would be about 100 feet.

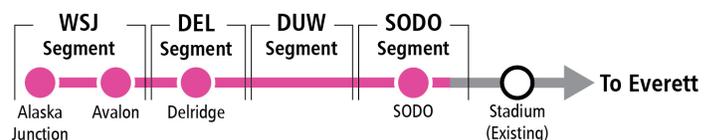
City of Seattle Designated Scenic Routes and Public View Protection

Alternative DEL-6* is the only alternative in the Delridge Segment that would be near a City of Seattle Designated Scenic Route (the West Seattle Bridge). Travelers would notice the removal of trees and buildings along the east side of the West Seattle Bridge with this alternative. The tree removals might open up views of the downtown skyline that are currently blocked. The elevated guideway might block or intrude on those views as travelers would pass by this part of the bridge.

With the exception of the West Seattle Golf Course, the Delridge Segment alternatives would not intrude upon views from City of Seattle specified viewpoints, parks, or view corridors of Mount Rainier, the Olympic and Cascade mountains, the downtown skyline, or Puget Sound. The West Seattle Golf Course was selected as a KOP, and views of the downtown skyline from this KOP would be partially blocked by Preferred Alternative DEL-2a*, Option DEL-2b*, Alternative DEL-3, and Alternative DEL-4*. Simulations of views from the West Seattle Golf Course can be seen in Attachment N.2A, Key Observation Point Analysis.

Light, Glare, and Shadows

Lights from the elevated Delridge Station would be designed in accordance with Sound Transit design measures and would not have an impact on the surrounding area. Light and glare for passing trains would be most visible with Preferred Alternative DEL-1a, Option DEL-1b, and Alternative DEL-3, particularly at night between Delridge Way Southwest and Southwest Avalon Way. Train lights would also be visible from the lower elevation guideways associated with the other Delridge Segment alternatives, but to a lesser degree. Light and glare from Alternative DEL-5 and Alternative DEL-6* would be seen from multi-story residences on Southwest



Andover Street and Southwest 32nd Street, respectively. Alternative DEL-6* would also remove trees next to the West Seattle Bridge on-ramp that would eliminate the screening value of the trees that now screen lights from vehicles on the on-ramp.

Preferred Alternative DEL-1a, Option DEL-1b, Preferred Alternative DEL-2a*, Option DEL-2b*, Alternative DEL-3, and Alternative DEL-4* would cast shadows on the southern edge the Longfellow Creek Natural Area adjacent to Southwest Genesee Street and the north end of the West Seattle Golf Course. Alternative DEL-5 and Alternative DEL-6* would not cast shadows on open spaces used by the public.

4.2.5.3.5 West Seattle Junction Segment

The West Seattle Junction Segment, which would have above-ground and below ground components, contains nearby concentrations of sensitive viewers. Figure 4.2.5-11 shows the KOPs where simulations were developed, identifies areas with concentrations of sensitive viewers, identifies areas where there would be visual impacts, and identifies City of Seattle Designated Scenic Routes. Cross sections and 3D views of some stations are shown in the following section to illustrate the general height, bulk and scale of the stations (see Attachment N.2B, Station 3D Views and Cross Sections, to Appendix N.2, Visual and Aesthetics Technical Report for the complete set).

Areas with Concentrations of Sensitive Viewers

The Preferred Alternative WSJ-1 and Preferred Alternative WSJ-2 elevated guideways would change the appearance of this area the most. The alternatives would connect with the Avalon Station, the top of which would be between approximately 60 and 80 feet high. Although this height would be much higher than the single-family residences that would remain north of Southwest Genesee Street, it would be similar to the five- to six-story multi-family residential buildings that line Southwest Avalon Street to the south of the Avalon Station. The scale and character of the stations and elevated guideways associated with these alternatives would be different than the residential character of areas to the north but would be similar to the dense urban scale and residential character of the area to the south.

Throughout the remainder of this segment, Preferred Alternative WSJ-2 would have the most visual quality impacts (Table 4.2.5-3). The removal of buildings and vegetation to accommodate the elevated guideway in the area northwest of Fauntleroy Way Southwest between 36th Avenue Southwest, 37th Avenue Southwest, and 38th Avenue Southwest would open up views to the south from remaining residences. Most views to the south in these areas are currently blocked by the buildings and trees that would be removed. The new open views to the south would include Fauntleroy Way Southwest and the elevated guideway (which would range from about 30 to 80 feet in height) which would change the residential character of most of the views to transportation. The existing average visual quality of views to the south from the remaining residences would be reduced to low, which would be a visual impact.

Preferred Alternative WSJ-1 would pass along the south side of Fauntleroy Way Southwest at heights of approximately 70 to 80 feet and would remove fewer buildings on the north side of this part of Fauntleroy Way Southwest compared to Preferred Alternative WSJ-2. It would not reduce the overall average visual quality of views to the south from areas with concentrations of sensitive residential viewers from these areas to low. The Fauntleroy Place park would be permanently removed with both Preferred Alternative WSJ-1 and Preferred Alternative WSJ-2, so there would be no visual impacts to views from the removed park.

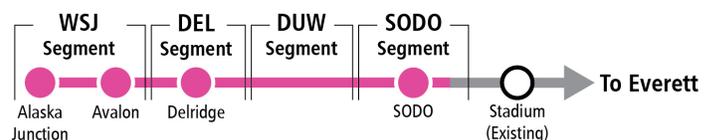


Table 4.2.5-3. West Seattle Junction Segment Visual Quality Impacts to Concentrations of Sensitive Viewers

Alternative	Visual Impacts (miles)	Where Visual Impacts Would Occur
Preferred Elevated 41st/42nd Avenue Station (WSJ-1)	0.1	Residences along 42nd Avenue Southwest, Southwest Hudson Street and California Avenue Southwest
Preferred Elevated Fauntleroy Way Station (WSJ-2)	0.2	Residences along 36th Avenue Southwest, 37th Avenue Southwest, 38th Avenue Southwest
Preferred Tunnel 41st Avenue Station (WSJ-3a)*	0	None
Preferred Tunnel 42nd Avenue Station Option (WSJ-3b)*	0	None
Short Tunnel 41st Avenue Station (WSJ-4)*	0	None
Medium Tunnel 41st Avenue Station (WSJ-5)*	0	None

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

Most of the impacts to visual quality from Preferred Alternative WSJ-1 would occur at the south end of the alignment, where the elevated tail track and hi-rail access would remove residences along the west side of 42nd Avenue Southwest between Southwest Edmonds Street and Southwest Hudson Street (Figure 4.2.5-12). Tail tracks would be needed to allow for the temporary layover of a train and could allow trains to switch tracks. Hi-rail access would be needed so that hi-rail vehicles (which can operate on both rail tracks and conventional roads) could reach the guideway for track inspection and maintenance.

Removal of these residences for the tail track and hi-rail access would change the visual character of this area from residential to transportation facility. The existing high average visual quality of views toward this area from remaining residential areas would be reduced to low, which would be a visual impact.

None of the Build Alternatives would impact visual quality in the Alaska Junction area north of Southwest Edmonds Street and south of Southwest Oregon Street. However, the alternatives with elevated guideways and stations would change the existing visual character of the area.

The Preferred Alternative WSJ-1 and Preferred Alternative WSJ-2 stations at Alaska Junction would remove buildings and would be approximately 60 to 80 feet high. The height, bulk, and scale of the stations might differ from some of the land uses that would remain next to them, but would be similar to the height, bulk, and scale of multi-story, mixed-use buildings that are being developed and will continue to be built in the area. Figures 4.2.5-13 and 4.2.5-14 show the configuration, height, bulk, and scale of the Alaska Junction Station for Preferred Alternative WSJ-2, which would be similar to Preferred Alternative WSJ-1. The stations would add urban elements into this area that would increase the visual vividness and improve visual quality slightly from average to high average.

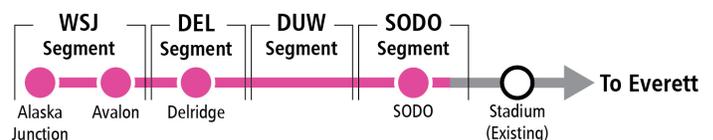


Figure 4.2.5-12. KOP WS-15: Looking North along 42nd Avenue Southwest near Southwest Hudson Street

Existing Condition



Preferred Elevated 41st/42nd Avenue Station
Alternative (WSJ-1)

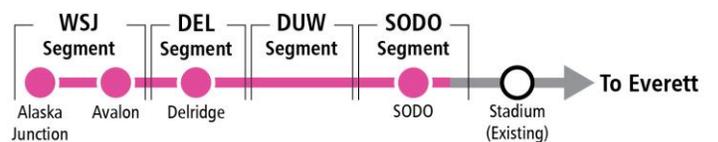


Figure 4.2.5-13. Alaska Junction Station 3D View for Preferred Alternative WSJ-2

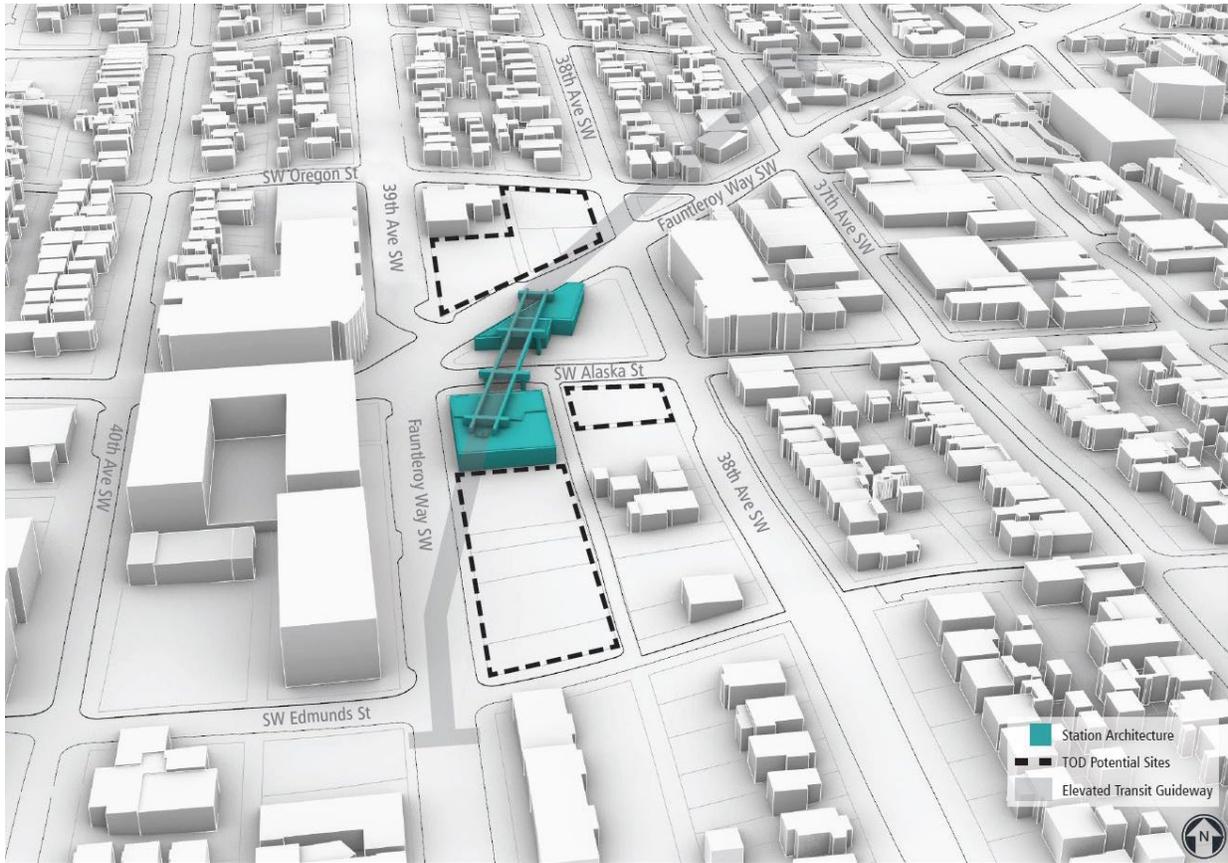
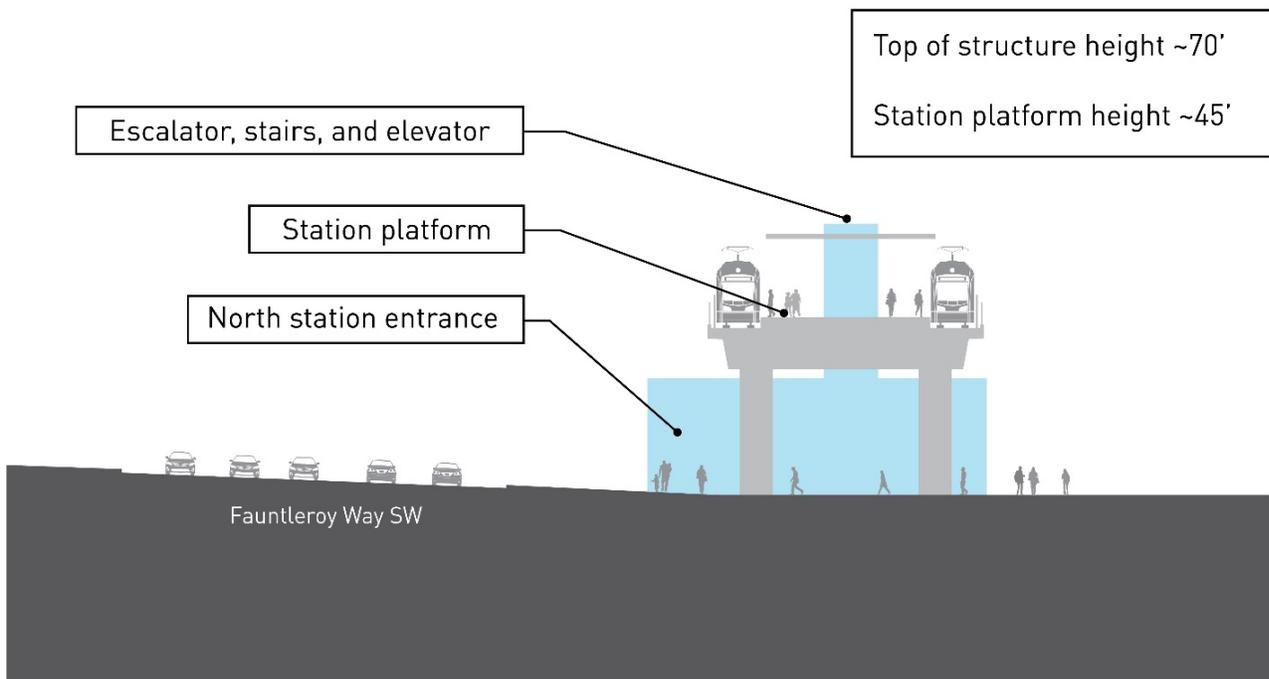


Figure 4.2.5-14. Alaska Junction Station Cross Section for Preferred Alternative WSJ-2



4.2.5 Visual and Aesthetic Resources

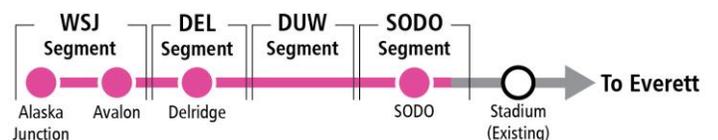
The Alaska Junction Station for Preferred Alternative WSJ-2 would be constructed in an area currently containing small commercial buildings, a gas station, and a parking lot (Figure 4.2.5-15).

Figure 4.2.5-15. KOP WS-14: Looking South along 39th Avenue Southwest toward Fautleroy Way Southwest

Existing Condition



Preferred Elevated Fautleroy Way Station
Alternative (WSJ-2)



The elevated station, plaza, and guideway would be more memorable elements in this view than the current mix of land uses and buildings. The height, bulk, and scale of the elevated Alaska Junction Station would be compatible with nearby buildings and follow the street pattern in this location. The station and its associated plaza would simplify the visually complex intersection area and add a unifying architectural element. The low visual quality of views toward the intersection that are seen by nearby residences would improve to average, which would be a beneficial change (see Figure 4.2.5-15).

Alternative WSJ-4* would have an Avalon Station about 60 to 70 feet high. The height, bulk, and scale of the station might differ from some of the land uses that would remain next to it, but would be similar to the height, bulk, and scale of multi-story, mixed-use buildings that are being developed and will continue to be built in the area. The Alternative WSJ-4* elevated guideway would be approximately 40 feet high, which would be closer in height to nearby multi-family buildings. Alternative WSJ-4* would remove single-family residences along either side of Southwest Genesee Street and, after passing over Fauntleroy Way Southwest, would remove buildings and vegetation north of Fauntleroy Way Southwest. The new open views to the south from remaining residences would include Fauntleroy Way Southwest and the elevated guideway, which would change the character of most of the views from residential to transportation. The average visual quality of views in these residential areas would be reduced to low average, which would not be a visual impact. This alternative would have an Alaska Junction Station in a tunnel, and the station entrances would be similar in height, bulk, and scale to the surrounding land uses.

Preferred Alternative WSJ-3a*, Preferred Option WSJ-3b*, and Alternative WSJ-5* would also remove some residences in the Southwest Genesee Street area near the Avalon Station and remove residences near the Alaska Junction Station. The removal of the residences would change the existing residential character of these areas to unbuilt lot. None of these tunnel alternatives (Preferred Alternative WSJ-3a*, Preferred Option WSJ-3b*, and Alternative WSJ-5*) would lower the average visual quality of views in these areas to low. Figures 4.2.5-16 and 4.2.5-17 show the configuration, height, bulk, and scale of the Alaska Junction Station for Preferred Alternative WSJ-3a as an example of a tunnel Alaska Junction Station.

City of Seattle Designated Scenic Routes and Public View Protection

Preferred Alternative WSJ-2 would twice pass over the section of Fauntleroy Way Southwest that is a City of Seattle Designated Scenic Route. The elevated guideway would not intrude upon or block views of notable features such as the Downtown Seattle skyline. These alternatives would not intrude upon views from City of Seattle specified viewpoints, parks, or view corridors of Mount Rainier, the Olympic and Cascade mountains, the downtown skyline, or Puget Sound.

The southwestern portion of the West Seattle Bridge does not have views of any City-specified notable features, so none of the alternatives would block important views. Alternative WSJ-5* would parallel the West Seattle Bridge, which is a City of Seattle Designated Scenic Route. Residences and some vegetation that currently screen views to the east from the bridge would be removed, and views to the east may be opened up.

Along 35th Avenue Southwest the distant presence of the elevated guideway of the Preferred Alternative WSJ-2 alignment in the background of the view looking north would not intrude on views of the Seattle skyline or Cascade Mountains beyond, due to the natural topography, existing buildings, and existing vegetation in the foreground.

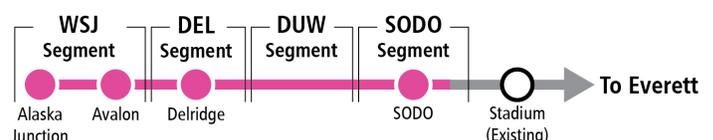


Figure 4.2.5-16. Alaska Junction Station 3D View for Preferred Alternative WSJ-3a*

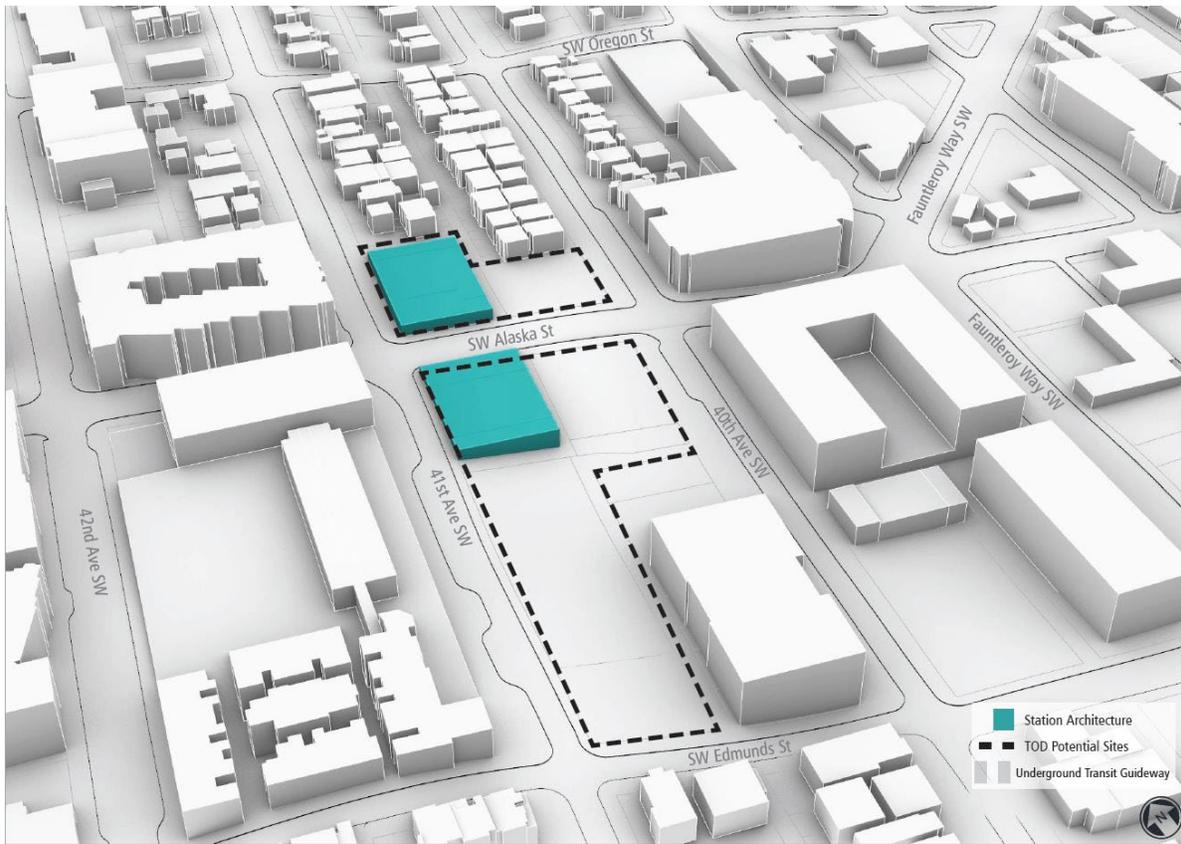
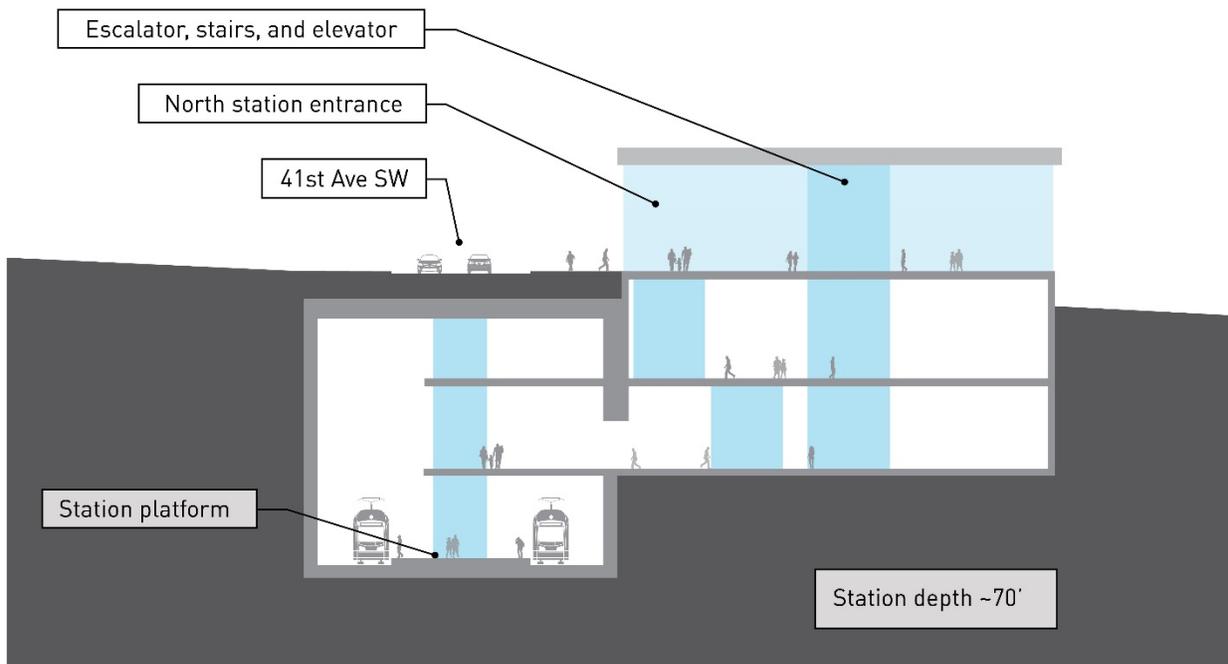


Figure 4.2.5-17. Alaska Junction Cross Section for Preferred Alternative WSJ-3a*



Light, Glare, and Shadows

Although vehicle lights along Fauntleroy Way Southwest and nearby streets are common sights along most of the West Seattle Junction Segment, lights on elevated light rail trains would be new additions seen by residents. Lights from elevated stations in this segment would be seen from nearby locations, including some buildings containing sensitive residential viewers. Lights from the elevated Avalon and Alaska Junction stations would be designed in accordance with Sound Transit design measures and would not have an impact on the surrounding area. The tail track and hi-rail vehicle access lighting would be seen from nearby residential areas. Views of lights from passing trains could be disturbing to some residents. Approaches to reduce potential light impacts are described in the design measures discussion in Section 4.2.5.3.1, Impacts Common to All Alternatives.

4.2.5.4 Environmental Impacts of the Build Alternatives during Construction

Activities related to building the West Seattle Link Extension would have temporary impacts on the visual environment. Section 2.6, Construction Approach, in Chapter 2, Alternatives Considered, provides an overview of potential construction activities and timing. Many of the construction activities would be seen by sensitive viewers. These activities would include moving and storing equipment and materials; exposing soils; glare and lights associated with nighttime construction; storing construction materials; and the presence of construction equipment such as cranes, in-water equipment, and barges for bridge construction. Guideway construction is estimated to take between 1 and 2 years, bridge construction over the Duwamish Waterway between 3 to 4 years, and station construction between 2 and 6 years. Tunnel and tunnel portal construction is expected to take 1.5 to 2 years. All of these activities would be seen by the public and some would be near and seen by sensitive viewers. Staging areas would be throughout the project corridor and would range in size from about 1 to 5 acres, depending on the location and construction activity. Views toward the West Seattle Link Extension by sensitive viewers would change during the construction period, and there would be impacts of varying degrees.

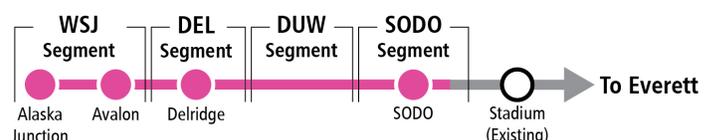
During construction, Sound Transit would provide visual screening along some areas where construction activities would be seen by nearby sensitive viewers. Visual screening would include construction of a barrier to screen ground-level views into construction areas where practical. Nighttime construction lighting would be shielded and directed downward to avoid light spillover onto adjacent sensitive uses.

4.2.5.5 Indirect Impacts of the Build Alternatives

The West Seattle Link Extension could support changes to nearby land uses, as allowed in adopted plans. Increases in the density of development as allowed by zoning could occur. This might result in changes to the visual setting of the areas where the West Seattle Link Extension would create changes and support new and more dense development around station areas.

4.2.5.6 Mitigation Measures

In addition to the design measures described in the Impacts Common to All Alternatives section, Sound Transit has developed mitigation measures for areas with visual impacts. Site-specific mitigation measures are described below by segment. The areas for each segment where there would be visual impacts are identified on Figures 4.2.5-1, 4.2.5-2, and 4.2.5-11 (shown with



ovals). Most of the visual quality impacts would be mitigated by planting screening vegetation where appropriate and where it meets the Sound Transit safety clear zone and setback requirements along the edge of construction footprints or within residential properties (if desired by residents). The vegetation would screen views of new project components and/or areas that are currently screened by vegetation that would be removed. Mitigation measures would be further refined if necessary in coordination with the City of Seattle as the project design advances.

It should be noted that the use of vegetation to buffer or screen views of Build Alternative elements would not provide immediate mitigation. Depending upon the vegetation's location in relationship to sensitive viewers, distance to Build Alternative elements, size of the elements, and the growth rates of the vegetation selected, effective screening of the elements could take between 5 years and 10 years and perhaps as many as 15 years. Impacts associated with some of the higher elements of the alternatives, such as bridges crossing the West Duwamish Waterway or the taller alternatives passing along Southwest Genesee Street, could not be completely mitigated by vegetative screening. The impacts of these elements on sensitive viewers could be lessened with the strategic planting of vegetation, but the elements themselves would be too large to screen and they would produce unavoidable impacts.

4.2.5.6.1 Duwamish Segment

Area 1: Residential Areas along 22nd Avenue Southwest and 23rd Avenue Southwest

Applies to Preferred Alternative DUW-1a and Option DUW-1b.

- Following construction, plant vegetation where appropriate to screen views of areas to the west, elevated guideway, and Delridge Way Southwest from remaining residences on 23rd Avenue Southwest.

4.2.5.6.2 Delridge Segment

Area 1: Residences along Delridge Way Southwest and 23rd Avenue Southwest from Eastern Edge of Segment to Southwest Andover Street

Applies to Preferred Alternative DEL-1a, Option DEL-1b, Preferred Alternative DEL-2a*, Option DEL-2b*, Alternative DEL-3, and Alternative DEL-4*.

- Following construction, plant vegetation where appropriate to screen views of areas to the west, the elevated guideway, and Delridge Way Southwest from remaining residences on 23rd Avenue Southwest.

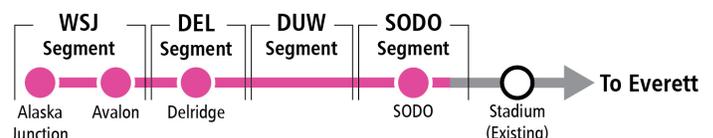
Area 2: 23rd Avenue Southwest South of Southwest Andover Street

Applies to Alternative DEL-3 and Alternative DEL-4*.

- Following construction, plant vegetation where appropriate to screen views of elevated guideway, Delridge Way Southwest, and views to the west from remaining residences on 23rd Avenue Southwest.

Area 3: Delridge Way Southwest, 25th Avenue Southwest, and 26th Avenue Southwest

Applies to Preferred Alternative DEL-1a, Option DEL-1b, Preferred Alternative DEL-2a*, Option DEL-2b*, Alternative DEL-3, and Alternative DEL-4*.



- Following construction, plant vegetation where appropriate to screen views of elevated guideway and station from remaining residences along Delridge Way Southwest, 25th Avenue Southwest and 26th Avenue Southwest.

Area 4: Delridge Playfield and Community Center

Applies to Preferred Alternative DEL-1a, Option DEL-1b, Option DEL-2b*, Alternative DEL-3, and Alternative DEL-4*.

- Following construction, plant screening vegetation where appropriate in the northwest edge of the park, if the City of Seattle desires, to screen views of the elevated guideway.

Area 5: West Seattle Golf Course

Applies to Preferred Alternative DEL-1a, Option DEL-1b, and Alternative DEL-3.

- Although the elevated guideways could not be screened by vegetation, following construction, plant vegetation where appropriate to screen views of Southwest Genesee Street and to frame views of the downtown skyline.
- Following construction, plant vegetation in a manner and pattern similar to the vegetation within the golf course removed for construction.

For Option DEL-2b*, no mitigation measures are proposed because there are no opportunities for screening views of the guideway.

Applies to Preferred Alternative DEL-2a* and Alternative DEL-4*.

- Redesign and revegetate the north end of the golf course that would be impacted and include vegetative screening where appropriate to block views of the elevated guideway, transition to the portal, and portal.

Area 6: Residential Areas North of Southwest Genesee Street and Longfellow Creek Natural Area

Applies to Preferred Alternative DEL-1a, Preferred Alternative DEL-2a*, Alternative DEL-3, and Alternative DEL-4*.

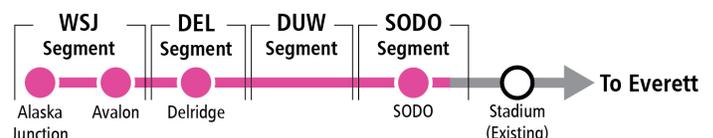
- Following construction, plant vegetation where appropriate that would not conflict with the light rail operations in front of remaining residences on north side of Southwest Genesee Street to replace vegetation removed for construction.
- Following construction, plant screening vegetation where appropriate along perimeter of stormwater detention facility to block views from adjacent residences.

Applies to Option DEL-1b and Option DEL-2b*.

- Following construction, replant vegetation that would not conflict with light rail operations in front of remaining residences on north side of Southwest Genesee Street to replace vegetation removed for construction.

Area 7: Southwest Avalon Way

Applies to Alternative DEL-5. An elevated guideway over the center of Southwest Avalon Way would be clearly seen by adjacent residents, but there would be no mitigation measures to reduce its impact. Therefore, no mitigation measures are proposed in this area.



Area 8: 32nd Avenue Southwest

Applies to Alternative DEL-6*.

- Following construction, plant vegetation where appropriate to help screen views of the elevated guideway from remaining residences on both sides of 32nd Street Southwest.

4.2.5.6.3 West Seattle Junction Segment

Area 1: North of Fauntleroy Way Southwest along 37th Avenue Southwest, 38th Avenue Southwest, and 39th Avenue Southwest

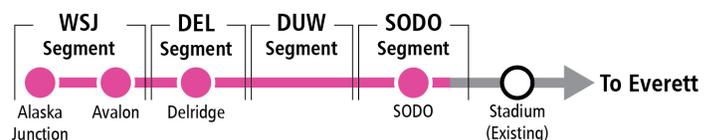
Applies to Preferred Alternative WSJ-2.

- Following construction, plant screening vegetation where appropriate along the edge of the construction footprint.

Area 2: Along 42nd Avenue Southwest and California Avenue Southwest.

Applies to Preferred Alternative WSJ-1.

- Following construction, plant screening vegetation where appropriate along the edge of the construction footprint.



4.2.6 Air Quality

4.2.6.1 Affected Environment

4.2.6.1.1 Regional Topography and Climate

The project is in the city of Seattle in King County within the Puget Sound Lowlands region. The climate in the region is a product of the interaction between large-scale wind and weather patterns and the complex topography of the region. Winter temperatures generally range from 10 degrees Fahrenheit to 45 degrees Fahrenheit, and summer temperatures generally range from 50 degrees Fahrenheit to 78 degrees Fahrenheit. 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 (Western Regional Climate Center 2019).

4.2.6.1.2 Criteria Pollutants

Air quality is affected by pollutants that are generated by both natural and human-made sources. In general, the largest human-made contributors to air emissions are fossil fuel combustion sources such as transportation and industrial operations. The largest contributors of pollution related to transportation are motor vehicles. Pollutants of concern for transportation typically include carbon monoxide; particulate matter with aerodynamic diameter equal to or smaller than 10 micrometers (PM_{10}) and particulate matter with aerodynamic diameter equal to or smaller than 2.5 micrometers ($PM_{2.5}$); ozone and its precursors including nitrogen oxides and volatile organic compounds; mobile source air toxics; and greenhouse gases.

4.2.6.1.3 Existing Air Quality

The United States Environmental Protection Agency has established National Ambient Air Quality Standards to protect public health and welfare, with an adequate margin of safety. The Puget Sound Clean Air Agency monitors criteria air pollutant concentrations at several locations in Seattle. The monitoring stations closest to the project corridor are at 4700 East Marginal Way, 4103 Beacon Hill South, and 10th Avenue South and South Weller Street in the Chinatown-International District. Appendix L4.6A summarizes the applicable laws, regulations and policies for this air quality analysis. Appendix L4.6B, Air Monitoring Data, shows the criteria air pollutant concentrations monitored at these stations during 2017 to 2019. Monitored concentrations of carbon monoxide, nitrogen oxides, PM_{10} , ozone, and sulfur dioxide are below the applicable National Ambient Air Quality Standards in all 3 years. Although the 98th-percentile 24-hour average concentrations of $PM_{2.5}$ measured in 2017 and 2018 are greater than the $PM_{2.5}$ standard of 35 micrograms per cubic meter, the 98th percentile of the daily concentrations of $PM_{2.5}$ averaged over 3 years is lower than the standard. Therefore, it is not considered a violation to the $PM_{2.5}$ National Ambient Air Quality Standard.

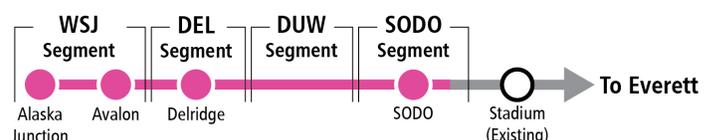
4.2.6.1.4 Attainment Status

The central Puget Sound region was classified as a nonattainment area by United States

Key Terms

A **nonattainment area** is an area that has not consistently met the clean air levels set by the United States Environmental Protection Agency in the National Ambient Air Quality Standards.

Transportation Conformity, for the purpose of the state air quality implementation plan, means that transportation activities will not cause new air quality violations, worsen existing violations, or delay timely attainment of the National Ambient Air Quality Standards.



Environmental Protection Agency for carbon monoxide in 1978. In 2016, the Puget Sound region reached the end of a 20-year maintenance period for carbon monoxide, and transportation conformity is no longer required for carbon monoxide in the region (Puget Sound Regional Council 2018).

Three areas in the Puget Sound region were designated as nonattainment for PM₁₀ in 1987, comprising the Seattle Duwamish Waterway industrial area, the Kent Valley, and the Tacoma Tideflats. In 2014, the United States Environmental Protection Agency approved a limited maintenance plan for these three areas, which ensures continued maintenance until 2021. The project study area is in attainment or unclassified for all other criteria pollutants.

4.2.6.1.5 Mobile Source Air Toxics

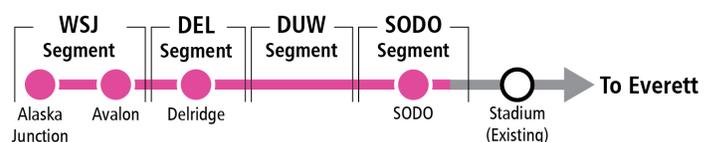
Mobile source air toxics are hazardous air pollutants emitted from on-road and non-road vehicles that can cause cancer and noncancer health risks. Transportation projects may affect the regional or local air toxic concentrations due to the mobile source air toxics emissions from vehicles. Nationwide mobile source air toxics emissions are expected to be lower than present levels in future years as a result of United States Environmental Protection Agency's national emissions control programs and fuel economy standards. Estimated emissions using the United States Environmental Protection Agency's MOVES 2014a model indicate that even if vehicle miles traveled increase by 45 percent from 2010 to 2050 as forecast, a combined reduction of 91 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 50 to 70 percent of all priority mobile source air toxics pollutants by mass, depending on calendar year (Federal Highway Administration 2016).

Washington State Department of Ecology began monitoring air toxics at the Seattle Beacon Hill monitoring station in 2000. Carbon tetrachloride presented the highest potential cancer risk from air toxics monitored at the Seattle Beacon Hill site. Carbon tetrachloride is relatively common and has a long half-life, and concentrations are similar in urban and rural areas. Benzene ranked second, and it comes from a variety of sources including vehicle exhaust, wood burning, evaporation of industrial solvent, and other combustion (Puget Sound Clean Air Agency 2018).

4.2.6.1.6 Greenhouse Gases

Greenhouse gases include both naturally occurring and human-made gases that trap heat in the earth's atmosphere. Greenhouse gases include, but are not limited to, carbon dioxide, methane, nitrous oxide, hydrochlorofluorocarbons, perfluorocarbons, and sulfur hexafluoride. These gases trap the energy from the sun and help maintain the temperature of the Earth's surface, creating a process known as the greenhouse effect. The accumulation of greenhouse gases in the atmosphere influences the long-term range of average atmospheric temperatures.

According to the greenhouse gas inventory for King County (ICLEI USA 2019), the "geographic-plus" greenhouse gas emissions totaled 20.1 million metric tons of carbon dioxide equivalent in the county in 2017. The geographic-plus inventory quantifies all emissions that physically occur in King County, plus emissions associated with electricity used in King County regardless of where it was produced. The largest sources of geographic-plus greenhouse gas emissions were the built environment (62 percent), dominated by greenhouse gas emissions from residential and commercial energy usage, and transportation (36 percent), dominated by greenhouse gas emissions from passenger vehicles. Emissions in King County decreased by 1.2 percent between 2007 and 2017.



4.2.6.1.7 Sensitive Receptors

Sensitive air quality receptors typically include land uses where people are most vulnerable to air pollutants, such as hospitals, schools, daycare facilities, elderly housing, and convalescent facilities. Table L4.6B-1 in Appendix L4.6B is representative of the existing air quality conditions experienced by sensitive receptors near the proposed project.

The land uses in the vicinity of the West Seattle Link Extension are commercial and industrial in the SODO and Duwamish segments with minimal sensitive receptors. Land uses in the Delridge and West Seattle Junction segments include mixed residential with some commercial uses. Sensitive receptors such as schools are present.

4.2.6.2 Environmental Impacts of the No Build Alternative

Under the No Build Alternative, vehicle miles traveled for cars and light trucks would increase over existing conditions by about 7 percent. However, pollutant emissions for all criteria pollutants would be lower than existing levels because of cleaner automobiles. There would be no construction-related greenhouse gas emissions because the project would not be built.

4.2.6.3 Environmental Impacts of the Build Alternatives during Operation

Long-term project impacts were evaluated based on the following analysis years and scenarios:

- 2019: existing condition
- 2032: No Build Alternative and Build Alternative (West Seattle Link Extension in operation)
- 2042: No Build Alternative and Build Alternatives (both West Seattle Link Extension and Ballard Link Extension in operation)

The Build Alternative evaluated is a combination of alternatives intended to represent the range of alternatives for the project. For the West Seattle Link Extension, it included Preferred Alternative SODO-1a, Preferred Alternative DUW-1a, Preferred Alternative DEL-1a, Preferred Alternative WSJ-1, Preferred Alternative WSJ-2, Preferred Alternative WSJ-3a*, and Preferred Option WSJ-3b*. For the 2042 scenario, the Ballard Link Extension included Preferred Alternative SODO-1a, Alternative CID-1a*, Preferred Alternative DT-1, Preferred Alternative SIB-1, Preferred Alternative IBB-1a, Preferred Alternative IBB-2a*, and Preferred Option IBB-2b*.

The Build Alternative for 2042 includes the Ballard Link Extension, as well as other Sound Transit 3 planned projects, due to the cumulative nature of the air quality analysis.

4.2.6.3.1 Criteria Pollutants

Vehicle emissions were evaluated based on the trend of the vehicle miles traveled in the Puget Sound region under the No Build Alternative and project Build Alternatives. Vehicle emissions in the region would decrease when the region's vehicle miles traveled decreases. In the long-term, as shown in Table 4.2.6-1, regional vehicle miles traveled and average daily traffic in 2042 for the Build Alternatives would be lower than the No Build Alternative when some people switch from driving to using light rail, thereby reducing regional vehicle emissions of criteria pollutants, mobile source air toxics, and greenhouse gases. Regional passenger vehicle average daily traffic would decrease, while vehicle miles traveled or average daily traffic of heavy duty trucks would not change.

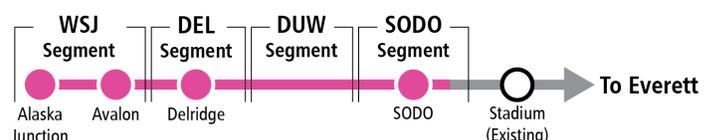


Table 4.2.6-1. Regional Vehicle Miles Traveled and Average Daily Traffic Change

Parameter	2019 Existing Condition	2032 No Build and Build ^a	2042 No Build	2042 Build	Difference in 2042 Build versus 2042 No Build
Cars and light trucks (regional vehicle miles traveled per day)	79,532,000	82,623,000	85,364,000	85,247,000	-117,000
Heavy duty trucks (regional vehicle miles traveled per day)	9,012,000	10,208,000	11,269,000	11,269,000	0
Transit buses (regional vehicle miles traveled per day)	205,100	231,697	257,700	259,900 ^b	2,200
Streetcar (regional vehicle miles traveled per day)	700	2,300	3,500	3,500	0
Cars/light trucks (average daily traffic)	10,433,000	11,251,000	11,995,000	11,977,000	-18,000
Heavy duty trucks (average daily traffic)	502,000	567,000	625,000	625,000	0
Transit buses (average daily traffic)	10,500	12,100	13,400	13,300	-100
Streetcar (average daily traffic)	200	200	400	400	0

^a There are no meaningful differences between vehicle miles traveled for 2032 No Build and 2032 Build Alternatives.

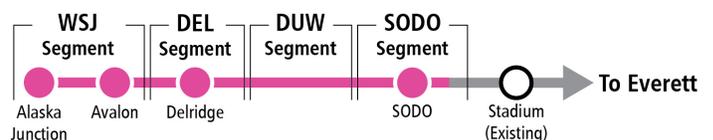
^b Because of the shift from cars and trucks to light rail and transit buses, the Build Alternatives would result in an increase in transit bus miles compared to the No Build Alternative.

There would be a slight increase in transit bus vehicle miles traveled with operation of the Build Alternatives because more people would use transit buses to travel to and from the light rail stations, but the increase would be minor compared to the reduction of vehicle miles traveled from passenger vehicles. Therefore, the overall regional vehicle emissions are expected to decrease with the Build Alternatives, and the project is expected to have long-term benefits to regional air quality by reducing pollutants emissions.

4.2.6.3.2 Mobile Source Air Toxics

Sound Transit evaluated potential mobile source air toxics effects from project operation following the Federal Highway Administration’s memorandum, *Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA* [National Environmental Policy Act] *Documents* (Federal Highway Administration 2016). Although there are no established criteria for determining when mobile source air toxics emissions related to transit projects should be considered a problem, the Federal Highway Administration guidance provides an approved approach to evaluating potential effects. According to the guidance, projects that improve operations of highway, transit, or freight without adding substantial new capacity or without creating a facility that has meaningfully increased mobile source air toxics emissions are considered to have low potential mobile source air toxics effects.

The new light rail would be powered by electricity; therefore, there would be no direct emissions of mobile source air toxics from the light rail operation. Because the project is expected to reduce regional vehicle miles traveled and would not involve adding diesel vehicle travel into the



region, high levels of mobile source air toxics impacts are unlikely. However, the project may change localized vehicle traffic patterns at some locations, such as near the stations, which has low potential for mobile source air toxics effects.

The amount of mobile source air toxics emitted from vehicles traveling on roadways is proportional to the number of vehicle miles traveled, assuming other variables such as the roadway vehicle mix or light rail power source do not change. As shown in Section 4.2.6.3.3, Greenhouse Gases, the vehicle miles traveled for the Build Alternatives in the region would be lower than those for the No Build Alternative. Therefore, the overall mobile source air toxics emissions from the Build Alternatives would decrease compared to No Build Alternative due to the removal of vehicles from roadways when people switch from driving to take light rail transit.

Light rail operations would have the potential to increase mobile source air toxics emissions when vehicles drive to or from the light rail stations. Therefore, under the Build Alternatives there may be localized areas where ambient concentrations of mobile source air toxics would be higher than under the No Build Alternative. However, the magnitude and the duration of these potential effects cannot be reliably quantified due to incomplete or unavailable information in forecasting project-specific health impacts. Also, on a region-wide basis, the United States Environmental Protection Agency's vehicle and fuel regulations, coupled with fleet turnover, will cause substantial reductions over time such that in almost all areas the mobile source air toxics levels in the future will be substantially lower than today. Local conditions may differ from these national projections in terms of fleet mix and turnover, vehicle-miles-traveled growth rates, and local control measures. However, the United States Environmental Protection Agency projected reductions are so substantial (even after accounting for vehicle-miles-traveled growth) that mobile source air toxics emissions in the study area are likely to be lower in the future as well.

The mobile source air toxics analysis above is a basic analysis of the likely mobile source air toxics impacts of the proposed project. The limitations of information and methodology of the analysis is discussed Appendix L4.6C, Limitations of the Mobile Source Air Toxics Analysis.

4.2.6.3.3 Greenhouse Gases

Greenhouse gas effects from project operation would be different between the No Build Alternative and the Build Alternatives due to emissions from regional vehicle miles traveled and light rail energy consumption. Greenhouse gas emissions from regional vehicle miles traveled were estimated using emission factors derived from the United States Environmental Protection Agency's MOVES 2014b model. The MOVES model estimates the direct emissions from vehicles. The embodied greenhouse gases associated with producing fuel were calculated using the Federal Highway Administration fuel-cycle factor of 0.27 (Washington State Department of Transportation 2018). The fuel cycle includes emissions released through extraction, refining, and transportation of fuels used by vehicles traveling in the study area. Detailed emissions calculations are included in Appendix L4.6D, Greenhouse Gas Emissions Calculations.

As shown in Table 4.2.6-2, in the project horizon year of 2042, the Build Alternatives would have lower greenhouse gas emissions compared to the No Build Alternative due to the increase in light rail ridership and the subsequent reduction in regional vehicle miles traveled.

The light rail trains would be electrically powered; therefore, the project would not have direct greenhouse gas emissions. Indirect emissions of greenhouse gases associated with the energy use of the light rail operation are discussed under Section 4.2.6.5, Indirect Impacts of the Build Alternatives.

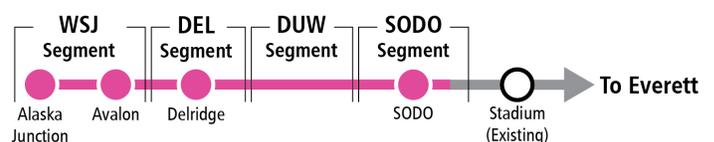


Table 4.2.6-2. Greenhouse Gas Operational Emissions from Regional Vehicle Miles Traveled

Parameter	2019 Existing Condition	2032 No Build and Build ^a	2042 No Build	2042 Build	Difference in 2042 Build versus 2042 No Build
Vehicle miles traveled (miles per day) ^b	88,749,100	93,062,697	96,890,700	96,775,900	-114,800
Carbon dioxide equivalent (metric tons per year)	21,411,936	19,486,794	17,955,605	17,944,663	-10,941

^a Information is provided as one number because the 2032 No Build and 2032 Build Alternatives would have the same results.

^b Vehicle miles traveled include cars, trucks, and transit buses.

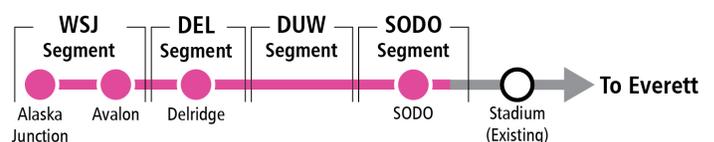
4.2.6.3.4 Conformity Determination

As discussed in Section 4.2.6.1.4, Attainment Status, because the area is under a limited PM₁₀ maintenance plan, a regional emissions analysis is no longer required to demonstrate conformity. However, the project is subject to project-level PM₁₀ conformity requirements.

The West Seattle and Ballard Link Extensions are listed in Puget Sound Regional Council’s long-range transportation plan, *The Regional Transportation Plan – 2018* (Puget Sound Regional Council 2018). Conformity demonstration of the plan is included in Appendix D of the 2018 Regional Transportation Plan. Inclusion of the project in the Regional Transportation Plan demonstrated that the project would be consistent with the regional Transportation Improvement Program and would not cause substantial adverse regional air quality impacts.

Potential localized PM₁₀ impacts of the project were analyzed following the criteria listed in *Transportation Conformity Guidance for Quantitative Hot-spot Analyses in PM_{2.5} and PM₁₀ Nonattainment and Maintenance Areas* (United States Environmental Protection Agency 2015). According to this guidance, the first step in the PM₁₀ hot-spot evaluation is to determine if the project is a “project of air quality concern.” A project that is not a project of air quality concern is unlikely to cause localized PM₁₀ hot-spot impacts.

United States Environmental Protection Agency specified in Code of Federal Regulations Title 40, Section 93.123(b)(1) that projects of air quality concern are certain highway and transit projects involving significant levels of diesel vehicle traffic, such as major highway projects and projects at congested intersections that handle significant diesel traffic, or any other project identified in the PM_{2.5} or PM₁₀ Transportation Improvement Program as a localized air quality concern. A preliminary evaluation of PM₁₀ hot-spot impacts was conducted for the project following the criteria described in Code of Federal Regulations Title 40, Section 93.123. Sound Transit determined that the project would not be a project of air quality concern based on the United States Environmental Protection Agency criteria discussed above, because it would not attract diesel traffic into the project study area or cause a large amount of diesel traffic aggregating at a single location. Therefore, the project is not expected to cause or contribute to new localized PM₁₀ violations or increase frequency or severity of existing violations. As such, the project meets the conformity requirements. Additional information on the project not being a project of air quality concern is included in Appendix L4.6E, Evaluation of PM₁₀ Hot Spots Impacts.



4.2.6.3.5 Minimum Operable Segment

With the West Seattle and Ballard Link Extensions Minimum Operable Segment (M.O.S.) and the Ballard Link Extension-only M.O.S., the long-term reduction in pollutants and greenhouse gases would occur as described in Sections 4.2.6.3.1 and 4.2.6.3.3 because vehicle miles traveled would be reduced as people switch from personal vehicles to light rail.¹ However, because there would be fewer stations with each M.O.S. than with the full Build Alternatives, there would be less of a reduction in vehicle miles traveled and, consequently, less of a reduction of pollutants and greenhouse gases. Because each M.O.S. would be shorter than the full Build Alternatives, they would also have fewer air quality impacts during construction. Additional information about the M.O.S. is provided in Section 2.4, Minimum Operable Segment and Interim Terminus, in Chapter 2, Alternatives Considered.

4.2.6.4 Environmental Impacts of the Build Alternatives during Construction

4.2.6.4.1 Criteria Pollutants

Project construction activities could result in short-term increases in dust and equipment-related emissions in and around the project construction area. Exhaust emissions during construction would be generated by fuel combustion in motor vehicles and construction equipment, and particulate emissions would result from soil disturbance, earthwork, and other construction activities. 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. Best management practices would be implemented to ensure that concentrations of air pollutants are minimized during the construction phase.

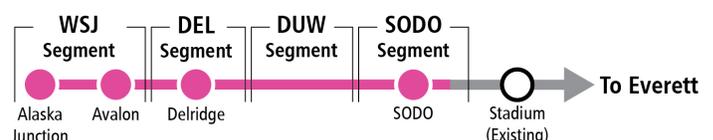
According to Code of Federal Regulations Title 40, Section 93.123(c)(5), because the duration of major construction activities for the project would not exceed 5 years in any one location, construction emissions are considered a temporary impact and a project-level conformity analysis is not required.

Lower levels of criteria pollutant emissions would occur from construction of the M.O.S.

4.2.6.4.2 Greenhouse Gases

Project construction would have the potential to emit greenhouse gases from the construction equipment and vehicles. Greenhouse gas emissions from the West Seattle Link Extension project construction were estimated using the methodology and emission factors of the Federal Transit Administration (FTA) *Greenhouse Gas Estimator* (FTA 2021), based on related construction activities on a per track mile basis by profile (at-grade, tunnel, or elevated). Because energy use and the associated greenhouse gas emissions are correlated to total project costs, the analysis compared the greenhouse gas emissions for both the overall low- and high-cost project scenarios of the Build Alternative. Table 4.2.6-3 shows the estimated minimum and maximum construction-related greenhouse gas emissions for the low-cost and high-cost project scenarios. The low-cost scenario includes Preferred Alternative SODO-1a, Preferred Alternative DUW-1a, Alternative DEL-5, and Preferred Alternative WSJ-2. The high-

¹ A West Seattle Link Extension-only M.O.S. from SODO to Delridge was not identified for analysis as, absent the Ballard Link Extension, it would only consist of two stations, requiring most riders to transfer at either end.



cost includes Alternative SODO-2, Preferred Alternative DUW-1a, Option DEL-2b*, and Preferred Option WSJ-3b*. Detailed emissions calculations are provided in Appendix L4.6D.

Table 4.2.6-3. Greenhouse Gas Emissions during Construction

Scenario	Carbon Dioxide Equivalent (metric tons)
West Seattle Link Extension Build Alternative: Low Cost	158,067
West Seattle Link Extension Build Alternative: High Cost	614,461

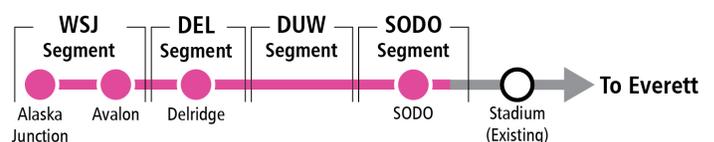
The short-term greenhouse gas emissions during the construction period of the project’s Build Alternative would be temporary, and the implementation of best management practices, such as using energy-efficient construction equipment and limiting the equipment and vehicle idling time during construction, would reduce greenhouse gas emissions from construction activities. In addition, the greenhouse gas emissions from the construction phase of the project would be offset by the emission reduction during project operation, well within the project’s life span, due to the reduction of regional vehicle miles traveled, as indicated in Table 4.2.6-2. Lower levels of greenhouse gas emissions would occur for construction of the M.O.S.

4.2.6.5 Indirect Impacts of the Build Alternatives

Indirect air quality impacts from a light rail project are usually related to the power generation that supplies the electricity to the light rail operation. The project would use electricity supplied by Seattle City Light that has achieved zero net greenhouse gas emissions since 2005. In addition, Sound Transit’s 2019 *Sustainability Plan Update* (Sound Transit 2019) and the Sound Transit 3 Plan (Sound Transit 2016) committed the agency to reduce greenhouse gas emissions, expand the use of renewable energy, and make all facilities and electricity sources carbon neutral by 2030. Because the project would be completed in 2032, operation of the light rail would use 100 percent carbon-neutral energy. Therefore, there would be no indirect greenhouse gas emissions associated with the electricity use of the light rail operation.

4.2.6.6 Mitigation Measures

Operation and construction of the project would comply with federal, state, and regional regulations related to air quality. Potential impacts to air quality would be minimized or avoided through project planning, design, and the application of required best management practices during operation and construction, as described in Appendix L4.6F, Air Quality Best Management Practices. The air pollutant and greenhouse gas emissions analyses demonstrated that no substantial air quality impacts are expected to occur during the operation and construction of the project; therefore, no mitigation measures would be required.



4.2.7 Noise and Vibration

4.2.7.1 Affected Environment

4.2.7.1.1 Background Information on Noise and Vibration Analysis

Noise

Sound Transit modeled noise from light rail operations using the methods described in the FTA guidance manual (FTA 2018). There are multiple noise sources associated with a light rail project, including noise from light rail operation (wheel/rail rolling noise), warning bells (used at stations), wheel squeal (on tight radius curves), special trackwork (crossovers and storage tracks), and ancillary facilities, like maintenance and storage areas. The noise model does not assume wheel squeal because Sound Transit requires curves with a radius of less than 600 feet near noise-sensitive properties must have track lubricators installed as part of the project. Curves with a radius of 600 feet to 1,250 feet must be built to allow for subsequent lubrication if needed. The noise analysis also considers the added noise radiated from elevated structures, far track acoustical shielding provided by elevated structures at some locations, and acoustical shielding from retained cuts and existing buildings between noise sensitive properties and the light rail tracks. Noise from changes in traffic is also considered where the project constructs new roadways, modifies existing roadways, or removes shielding. More details on acoustics and the transmission of noise from light rail operations are provided in Appendix N.3, Noise and Vibration Technical Report. A brief introduction to noise, how it is measured, and typical noise levels follows.

Noise is defined as unwanted sound. It is measured in terms of sound pressure level and usually expressed in decibels, a conversion of the air pressure to a unit of measurement that represents the way humans hear sounds. The human ear is less sensitive to higher and lower frequencies than it is to mid-range frequencies. To provide a measurement meaningful to humans, a weighting system was developed that reduces the sound level of higher and lower frequency sounds, similar to what the human ear does. This filtering system, known as “A-weighted,” is used in virtually all noise ordinances. Measurements taken with the A-weighted filter are referred to as A-weighted decibel (dBA) readings.

Two primary noise measurement descriptors are used to assess noise impacts from operations of traffic and transit projects: the equivalent sound level (Leq) and the day-night sound level (Ldn). The Leq is the level of a constant sound for a specified period of time that has the same sound energy as an actual fluctuating noise over the same period of time (typically 1 hour). The Ldn is an Leq over a 24-hour period, with a 10-dBA “penalty” added to nighttime sound levels (between 10 p.m. and 7 a.m.) to account for the greater sensitivity and lower background sound levels during this time. The Leq is used for all traffic noise analysis and for light rail analysis on sites that have mainly daytime use, including schools, libraries, and daycare centers. The Ldn is used for analysis of light rail noise for land use with nighttime sensitivity to noise, including residences, hotels, hospitals, fire stations with sleeping areas, and other land uses with sleeping quarters. Table 4.2.7-1 provides a range of Ldn noise levels and what types of land uses are associated with various noise levels.

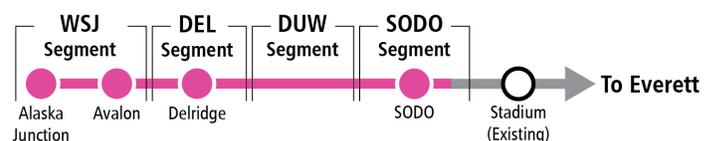


Table 4.2.7-1. Typical 24-hour Day-night Sound Levels and Land Use Compatibility

Day-Night Equivalent Noise Level in A-weighted Decibels	Description of Typical and Acceptable Land Use
Ldn below 50 dBA	Typically found in rural areas with no major roadways or other major noise sources nearby. Compatible with all noise-sensitive properties.
Ldn of 50 to 55 dBA	Typically found in quiet suburban residential neighborhoods not close to any major roadways and with little nighttime activity. Compatible with all noise-sensitive properties.
Ldn of 55 to 60 dBA	Typically found in many residential areas with minor arterial roadways nearby, typical of many close in suburban and some urban residential areas. Compatible with all noise-sensitive properties.
Ldn of 60 to 65 dBA	Relatively noisy residential area. Usually a major road or airport is nearby. Considered normally acceptable for residential land use.
Ldn of 65 to 70 dBA	Noise levels in this range are typical for a noisy residential area that is close to a major freeway or the end of an airport runway. Considered marginally acceptable for a residential area.
Ldn of 70 to 75 dBA	Typical for areas directly adjacent to a major freeway or very near an airport. Not normally acceptable for residential use without noise mitigation measures.
Ldn greater than 75 dBA	Noise levels above 75 dBA Ldn are not acceptable for residential use and are only found near the ends of airport runways and adjacent to major highways.

Source: Adapted from FTA 2018.

Short-term construction noise was also evaluated based on types of construction and proximity to noise-sensitive land uses.

Vibration

Vibration is an oscillatory (back-and-forth) motion that is often characterized by the velocity of the motion and the frequency. Velocity is the measure used for evaluating vibration from transit projects that corresponds best with human sensitivity. Vibration is expressed in terms of the root-mean-square vibration velocity level in decibels (VdB). The abbreviation VdB is used in place of decibels to avoid confusing vibration decibels with sound decibels. Building vibration might cause groundborne noise, which is a low-volume, low-frequency rumble inside buildings resulting when ground vibration causes the walls of the building to resonate and generate noise. When light rail is in a tunnel or deep retained cut, airborne noise emissions are low or imperceptible and groundborne noise becomes the main potential noise source from light rail operations.

The vibration analysis accounts for vibration at buildings near the light rail guideway as well as vibration-generated groundborne noise inside buildings caused by the passing light rail. Groundborne noise and vibration differ from airborne noise in that they consist of energy transmitted through the earth rather than through air.

Table 4.2.7-2 presents typical vibration velocity levels for common sources, as well as thresholds for human and structural response to groundborne vibration. The relevant range is approximately 50 to 100 VdB (from imperceptible background vibration to the threshold of damage). The approximate threshold of human perception to vibration is 65 VdB. Humans generally do not find vibration from light rail operations annoying until the vibration exceeds 70 to 75 VdB.

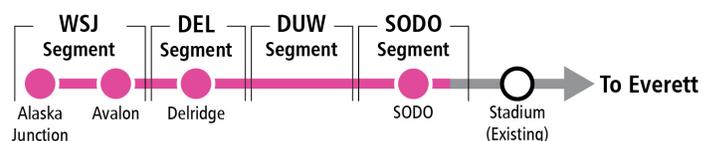


Table 4.2.7-2. Typical Vibration Level in Decibels and Human/Structural Responses

Vibration Level in VdB	Description of Typical Sources 50 Feet from Source and Human/Structural Response
Below 60	Typical background vibration levels.
60 to 70	Light rail transit on a normal track; bus or truck on a smooth roadway. Approximate threshold of human perception and limit for vibration-sensitive equipment.
70 to 80	Light rail transit near a crossover; bus or truck over pothole. Residential annoyance from infrequent events (e.g., commuter trains), residential annoyance from occasional events, and residential annoyance from frequent events (e.g., light rail transit).
80 to 90	Bulldozers and other heavy tracked vehicles and freight trains. The typical human response would be difficulty with tasks such as reading a computer screen.
90 to 100	Blasting from construction projects. This is the threshold for minor cosmetic damage.

Source: Adapted from FTA 2018.

Groundborne vibration generated from light rail train operations is transmitted from the tracks through the soil and into nearby buildings. Vibration from light rail operations is generated by motion at the wheel and rail interface and is affected by rail condition or roughness, track geometry and structure type, vehicle characteristics, train speed, soil conditions, and special trackwork. Vibration above certain levels can interfere with the use of sensitive equipment, such as microscopes or magnetic resonance imaging (M.R.I.) machines, and annoy people within buildings. Transit systems rarely generate vibration with sufficient magnitude to cause structural damage.

Short-term construction vibration could cause cosmetic damage to nearby structures. Most construction processes involve vibration well below the levels that could cause building damage, even if vibration is felt. Analysis based on potential annoyance to building occupants is not required because construction activities are short-term in duration. The exception is groundborne noise and vibration from tunnel muck and support trains, which are evaluated to meet the FTA criteria for operations based on annoyance because the tunnel support trains may run continuously over several years.

Noise and Vibration Impact Criteria

Sound Transit evaluates light rail noise and vibration impacts for transit projects according to the Federal Transit Administration (FTA) *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018). The FTA criteria use the existing noise levels to determine the project’s impact criteria, which requires a set of ambient noise measurements throughout the project corridors. The FTA criteria are based on land use categories, and the amount of transit noise that can be added to an area is reduced as the existing noise levels increase. Figure 4.2.7-1 shows the FTA impact criteria graphically. More detail on the FTA criteria, including tables and examples of the how the criteria are applied, can be found in Appendix N.3. Table 4.2.7-3 summarizes the FTA land use categories used for this noise and vibration analysis.

Sensitive Receivers
 Sensitive receivers are locations that may have sensitivities to project-generated noise or vibration. FTA-defined noise- and vibration-sensitive land uses are shown in Table 4.2.7-3.

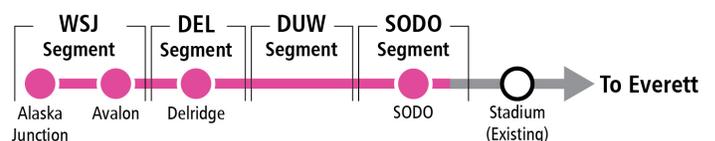
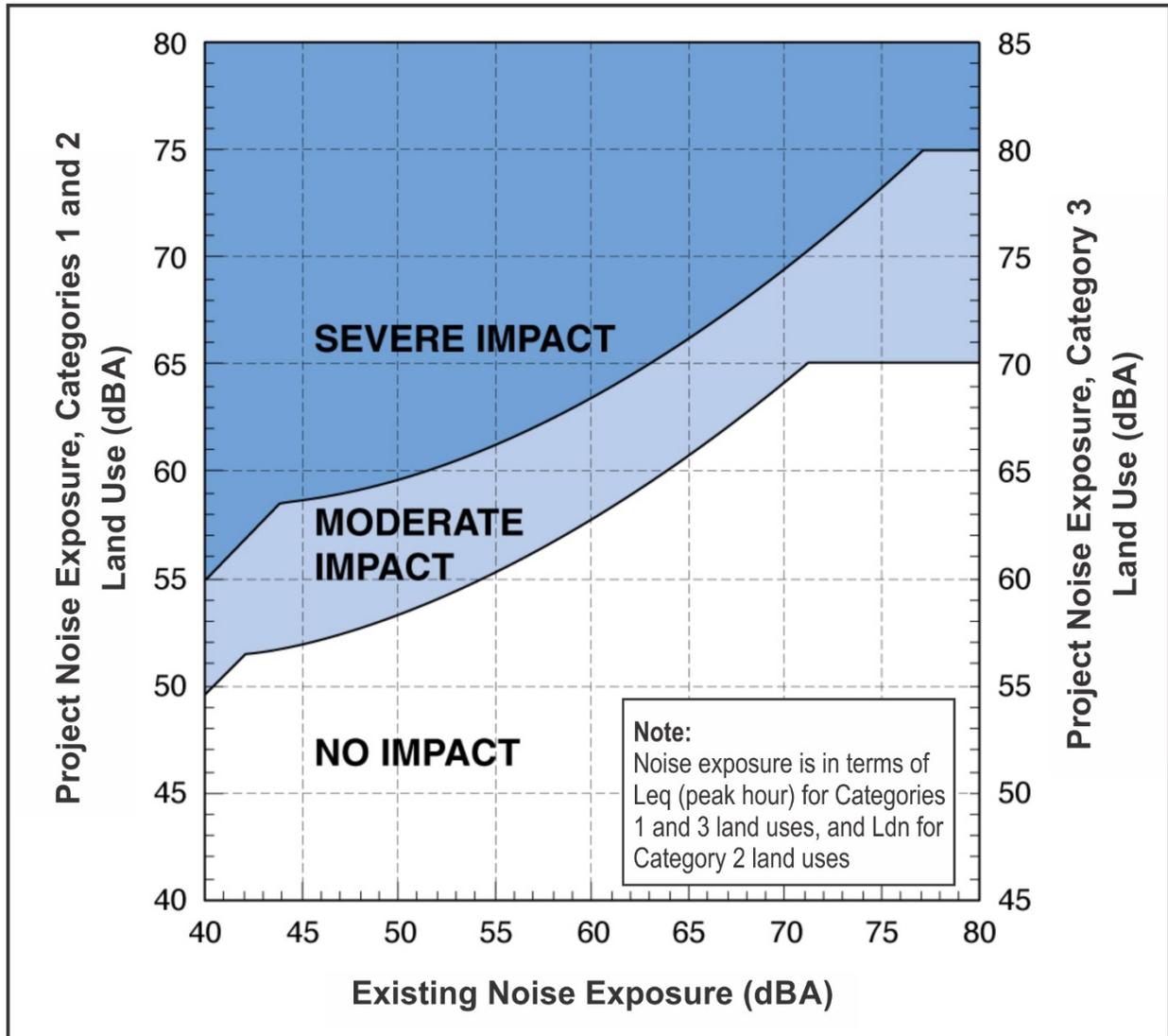


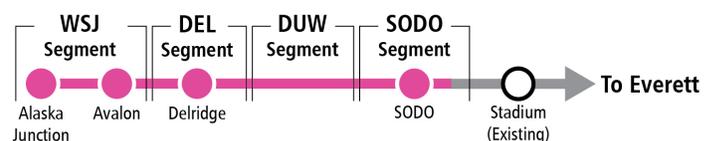
Figure 4.2.7-1. FTA Noise Impact Criteria



As previously described, the Ldn is used to characterize noise exposure in areas with nighttime sensitivity (e.g., residences, hospitals, and other sleeping areas). For other noise-sensitive land uses, such as outdoor amphitheatres and school buildings, the maximum 1 hour Leq during the facility’s operating period is used. The FTA also has two levels of noise impact, as follows:

- Moderate impacts, where the change in the cumulative noise level is noticeable to most people but might not be sufficient to cause strong, adverse reactions from the community
- Severe impacts, where project-generated noise can be expected to cause a large percentage of people to be highly annoyed

Sound Transit also considered the potential for increased traffic noise at noise-sensitive land uses where roadways are modified or constructed, or where structures that shield traffic noise would be removed as part of the project. The impact criteria for traffic noise are taken from the Federal Highway Administration regulations. Traffic noise impacts occur if the peak hour traffic noise levels meet or exceed 66 dBA Leq for residences, churches, schools, and similar areas and meet or exceed 71 dBA Leq for hotels, motels, offices, restaurants, and other developed



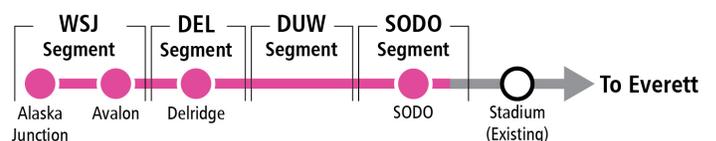
lands uses. As with the FTA criteria, there are no noise impact criteria for many commercial or any industrial types of land uses.

Table 4.2.7-3. Noise and Vibration Land Use Categories for Assessment

Land Use Type	Noise Land Use Category	Vibration Land Use Category
Special Buildings	This category is not applicable to noise.	This vibration category includes special-use facilities that are very sensitive to vibration and groundborne noise (e.g., concert halls or theaters) that are not included in the categories below and require special consideration.
Category 1 – High Sensitivity	This noise category includes tracts of land where quiet is an essential element in their intended purpose. This category includes lands set aside for serenity and quiet and such land uses as outdoor amphitheaters and concert pavilions, as well as National Historic Landmarks with significant outdoor use. Also included in this category are recording studios and concert halls. This noise category is measured using the outdoor Leq for the loudest hour of project-related activity.	This vibration category includes buildings where vibration levels, including those below the threshold of human annoyance, would interfere with operations within the building. Examples include buildings with vibration-sensitive research and manufacturing equipment, hospitals with vibration-sensitive equipment, and universities conducting physical research operations. The building’s degree of sensitivity to vibration is dependent on the specific equipment that would be affected by the vibration.
Category 2 – Residential	This noise category includes residences and buildings where people normally sleep. This category includes homes, hospitals, and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance. This noise category is measured with the outdoor 24-hour Ldn.	This vibration category includes all residential land uses and buildings where people normally sleep, such as hotels and hospitals. Transit-generated groundborne vibration and noise from subways or surface running trains are considered to have a similar effect on receivers.
Category 3 – Institutional	This noise category includes institutions with primarily daytime and evening use. This category includes 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 considered to be in this category. Certain historical sites and parks are also included, but their sensitivity to noise must be related to their defining characteristics, and generally parks with active recreational facilities are not considered noise-sensitive. This noise category is measured using the outdoor Leq for the loudest hour of project related-activity.	This vibration category includes institutions and offices, such as schools, churches, doctors’ offices, that have vibration-sensitive equipment and have potential for activity interference. Commercial or industrial locations, including office buildings, are not included in this category unless there is vibration-sensitive activity or equipment within the building. As with noise, the use of the building determines the vibration sensitivity.

Source: FTA 2018.

Sound Transit also analyzed vibration using the FTA *Transit Noise and Vibration Impact Assessment Manual*. Unlike the noise analysis, the vibration criteria do not depend on existing vibration levels. Because existing environmental vibration is usually below human perception, a limited ambient vibration survey is sufficient even for a detailed vibration analysis.



A general assessment of construction noise and vibration levels was performed as described in Chapter 7, Noise and Vibration during Construction, of the FTA *Transit Noise and Vibration Impact Assessment Manual*, with noise metrics that can be compared with the Washington Administrative Code noise control ordinance (Chapter 173-60). The Seattle Municipal Code Chapter 25.08 was used for the criteria for construction noise level limits, along with noise allowances from the Seattle Noise Ordinance for construction activities.

For potential vibration effects during construction, the FTA’s recommendation on vibration levels was used because there are no state, county, or city vibration regulations. Category 1 and special building land uses have the same limits for assessing construction impacts as for assessing long-term impacts based on the sensitivity of equipment to vibration. The potential for construction vibration impacts at Category 2 and Category 3 land uses is based on the structural damage criteria in Section 7 of the FTA *Transit Noise and Vibration Impact Assessment Manual*. Sound Transit assessed potential construction vibration effects to structures using peak particle velocity, which is the maximum velocity recorded during a particular event, such as from a jackhammer.

4.2.7.1.2 Existing Noise and Vibration Sensitive Land Uses

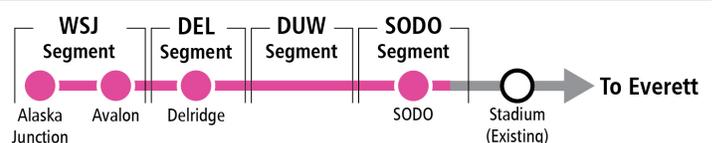
This section summarizes sensitive land uses and the existing noise and vibration levels within the West Seattle Link Extension study area. The study area for noise is based on measured noise levels of the existing fleet of Sound Transit light rail vehicles, operational schedule, and train speeds, and is large enough to capture all potential noise impacts from system operations. Because the system is primarily elevated or in tunnels, there are no at-grade crossings with vehicles, which eliminates the need for warning horns and gated crossing bells. Warning bells are only used when the light rail arrives and departs stations, which is included in the light rail noise predictions in Attachment N.3F, Tables of Noise Predictions. The study area for noise is at least 500 feet from the track alignments, and the vibration study area is 450 feet for Category 1 land uses and 200 feet for Category 2 and 3 land uses. Over 1,500 noise and/or vibration sensitive properties were identified within the study area.

Noise- and vibration-sensitive land uses in the West Seattle Link Extension study area include FTA Category 1 (highly noise- and vibration-sensitive, such as research facilities and performance or recording venues), FTA Category 2 residential (single- and multi-family and fire stations), FTA Category 3 institutional (schools, including daycares with educational components) and some parks.

Land uses in the SODO Segment are mostly industrial and commercial, and no noise-sensitive or vibration-sensitive properties were identified in the SODO Segment study area.

In the Duwamish Segment, there are two Category 1 noise- or vibration-sensitive land uses. Secret Studio Records/Studio 1208 recording studio is both noise- and vibration-sensitive. Harbor Island Machine Works, a precision manufacturing company, is a Category 1 vibration-sensitive land use with vibration-sensitive equipment on Harbor Island. Category 2 noise and vibration-sensitive land uses include residential areas at the west edge of the segment, as well as Fire Stations 14 and 36. A portion of the West Duwamish Greenbelt is located near Pigeon Point, but because of existing noise levels and because it is not designed to provide public access, it is not considered noise-sensitive under FTA criteria. A public staircase connects Southwest Marginal Place to Southwest Charlestown Street in this area, but it does not connect to or provide access to the trail system within the greenbelt. No other noise-sensitive land uses were identified in this segment.

In the Delridge Segment, there are no Category 1 noise- or vibration- sensitive land uses. Category 2 noise- and vibration-sensitive land uses include residential areas. Category 3 noise-



and vibration-sensitive land uses include the Alki Beach Academy Daycare, Mode Music Studios, Youngstown Cultural Arts Center, and the Longfellow Creek Natural Area. Active outdoor uses include the West Seattle Golf Course and Delridge Playfield and Community Center. Because the active outdoor facilities are in areas with high levels of existing background noise or are used for sporting activities, they are not considered noise-sensitive. No other noise- or vibration-sensitive land uses were identified in this segment.

In the West Seattle Junction Segment, there are no Category 1 noise- or vibration-sensitive land uses. Category 2 noise- and vibration-sensitive land uses include residential areas and Fire Station 32. Category 3 noise- and vibration-sensitive land uses include Eastridge Church, Calvary Chapel West Seattle, and childcare centers on Fauntleroy Way Southwest, Southwest Alaska Street, and California Avenue Southwest. The West Seattle Stadium is also located in this segment; however, under FTA criteria, active sports complexes are not considered noise- or vibration-sensitive. No other noise- or vibration-sensitive land uses were identified in this segment.

Noise- and vibration-sensitive land uses are shown on maps in Attachment N.3D, Maps of Noise Impact Assessment, and Attachment N.3E, Maps of Vibration Impact Assessment, to Appendix N.3. More detail on land uses in the study area is discussed in Section 4.2.2, Land Use.

4.2.7.1.3 Noise Measurements

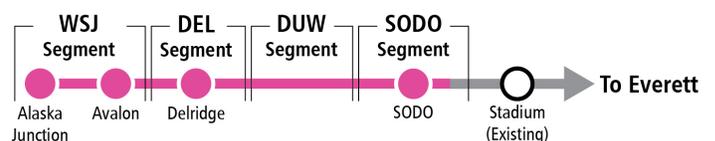
To establish the existing noise environment, onsite noise monitoring was performed at 21 locations shown on Figure 4.2.7-2 (14 long-term sites for 48 hours or more and 7 short-term sites twice daily for 15 minutes with traffic counts). Noise levels along the West Seattle Link Extension project corridor are dominated by transportation-related noise sources, including traffic on the West Seattle Bridge, Fauntleroy Way Southwest, and other arterial roadways. Freight-related facilities in the Duwamish Segment include several noise sources, such as loading and unloading ships, foghorns, heavy truck traffic, and heavy rail service. Lesser contributors to the noise environment include aircraft overflights, commercial and residential activities, and unrelated construction activities.

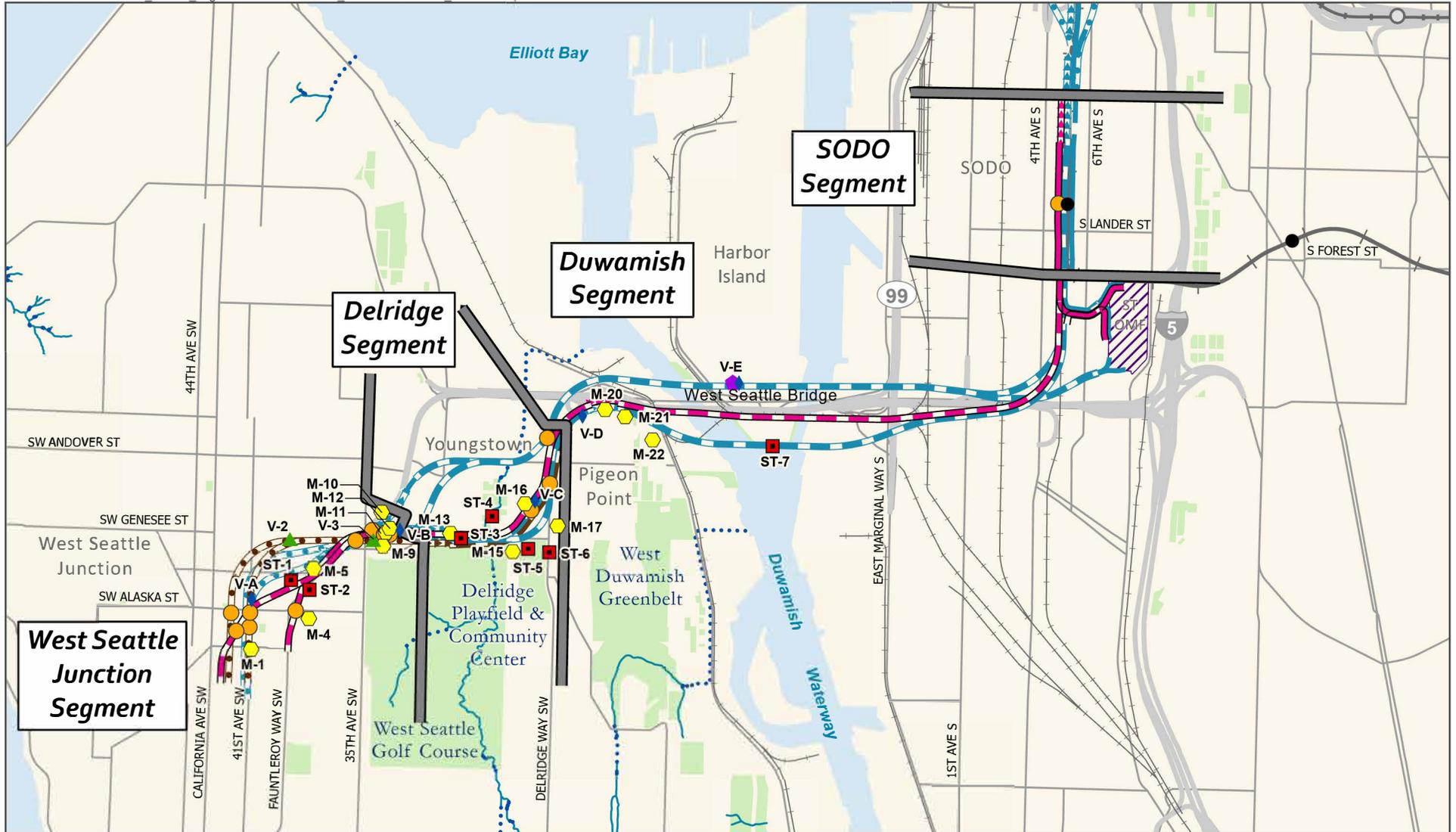
The Ldn noise levels near noise-sensitive uses in West Seattle Link Extension study area typically range from 45 and 75 dBA, with a few locations not near any major roadways with noise levels below this range. Daytime average hourly Leq sound levels range from 47 to 74 dBA, and average nighttime Leq levels range between 42 and 67 dBA. Median daytime Leq sound levels in the West Seattle Link Extension study area are 66 dBA, and median nighttime sound levels are 53 dBA. Complete data summaries and tables, along with photographs of the noise monitoring sites, are provided in Attachment N.3A, Noise Measurement Data, Site Details, and Photographs, to Appendix N.3.

4.2.7.1.4 Vibration Testing and Measurements

As shown on Figure 4.2.7-2, Sound Transit performed vibration propagation tests at five at-grade sites and two below-grade sites to determine how vibration levels would change as vibration travels through the ground.

Data from the propagation tests were used in the vibration prediction model. An existing vibration measurement was completed at Harbor Island Machine Works, which is a Category 1 vibration-sensitive building with precision manufacturing equipment that could be affected by high vibration levels. Detailed results of testing and measurements are provided in Attachment N.3H, Vibration Analysis of Category 1 Uses and Special Buildings, to Appendix N.3.





Source: City of Seattle, King County (2019, 2020, 2021).

Alternatives

- Preferred Alternative
- Preferred Alternative with Third-party Funding
- Other Alternatives

Alternative Profile

- Elevated
- Tunnel
- At-Grade
- Retained Cut

Station

- New
- Existing

Segment Line

- Sound Transit Operations and Maintenance Facility (ST OMF)
- Existing Link Light Rail
- East Link Light Rail (Under Construction)
- Railroad
- Stream
- Piped Stream
- Park

Noise Monitoring Sites

- Short Term Monitoring Site
- Long Term Monitoring Site

Vibration Measurement Sites

- ◆ Existing Vibration Measurement
- ◆ At-grade Vibration Propagation
- ▲ Below-grade Vibration Propagation

FIGURE 4.2.7-2
Noise and Vibration
Measurement Sites
 West Seattle Link Extension

*West Seattle and
 Ballard Link Extensions*



4.2.7.2 Environmental Impacts of the No Build Alternative

Under the No Build Alternative, there would be no light rail constructed. Noise along the West Seattle Link Extension project corridor would continue to be dominated by traffic and various industrial, commercial, and construction activities; therefore, no light rail-related noise or vibration impacts would occur. Modeled traffic noise levels under existing conditions and the No Build Alternative are provided in Appendix N.3.

4.2.7.3 Environmental Impacts of the Build Alternatives during Operation

Sound Transit modeled noise from light rail operations using the methods described in the FTA guidance manual (FTA 2018). Noise levels were predicted at over 1,500 independent locations along the different alternative alignments in the West Seattle Link Extension study area, representing all noise-sensitive properties in the study area. Vibration levels were also predicted for all sensitive receivers in the West Seattle Link Extension study area where a potential for vibration impacts could occur.

Figures 4.2.7-3 through 4.2.7-5 summarize the noise and vibration impacts with the West Seattle Link Extension Build Alternatives. The following sections discuss key differences between alternatives. Appendix N.3 includes attachments that summarize the following:

- Noise measurement locations and results with site photographs (Attachment N.3A)
- Vibration measurement site photographs and maps (Attachment N.3B)
- Vibration propagation measurement results (Attachment N.3C)
- Maps of noise impacts before mitigation and proposed mitigation (Attachment N.3D)
- Maps of vibration and groundborne noise impacts before mitigation and proposed mitigation (Attachment N.3E)
- Tables of noise predictions and proposed mitigation (Attachment N.3F)
- Tables of vibration predictions (Attachment N.3G)
- Vibration analysis of Category 1 land uses and special buildings (Attachment N.3H)

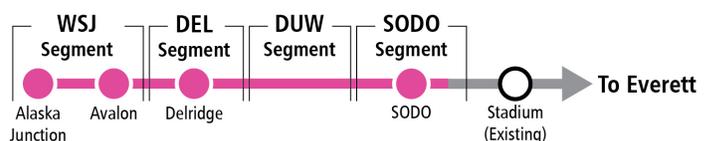
Potential noise impacts on fish and wildlife are described in Section 4.2.9, Ecosystems.

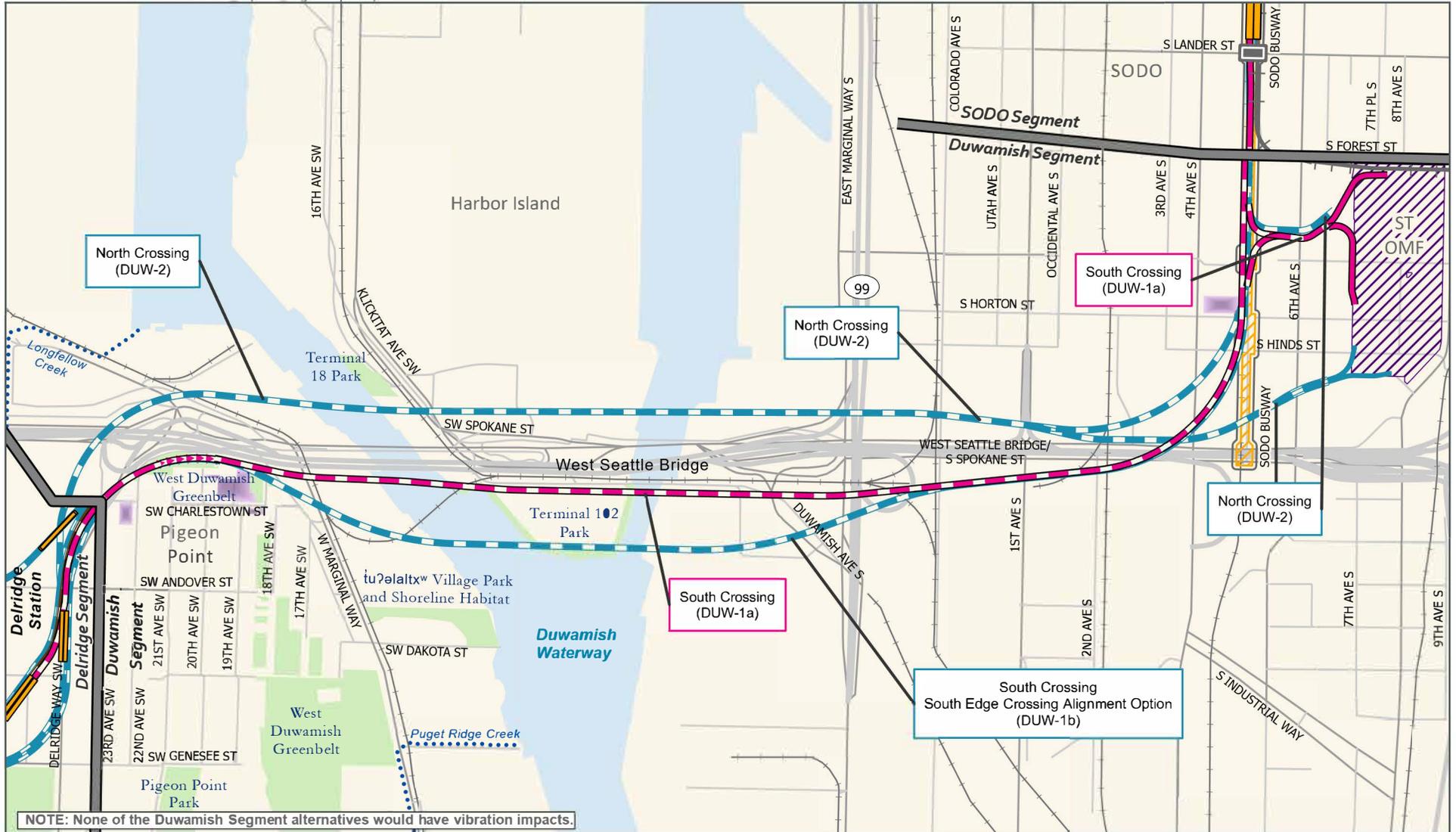
Project Noise and Background Noise: An Example

Given the complex nature of the FTA criteria, the following example is provided to clarify how impacts are identified.

Consider a residential land use (FTA Category 2) with an existing Ldn of 65 dBA. If the noise from light rail operations is below 61 dBA, there is no noise impact. A moderate impact would occur if light rail noise levels were between 61 and 66 dBA, and a severe noise impact would occur if light rail noise were above 66 dBA. If noise from the light rail is 62 dBA Ldn (a moderate impact), the total future noise would be rounded up to 67 dBA Ldn, for a 2-decibel increase in the overall noise (adding the existing 65 dBA Ldn with the light rail noise of 62 dBA Ldn = 66.8 dBA Ldn). Typically, for transportation noise sources, an increase of less than 3 dBA is not perceptible to an average person. More importantly, although the 2 dBA increase may not be perceptible, it would still be identified as an impact under FTA criteria and mitigation would be considered.

This example shows how the light rail noise level could be lower than the existing noise levels, and still result in a noise impact. It also shows how the FTA criteria help to prevent increasing noise levels in areas that already have high levels of background noise. Section 2.1.2 in Appendix N.3, Noise and Vibration Technical Report, provides information on how total sound level with the project and ambient noise is calculated.



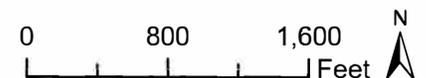


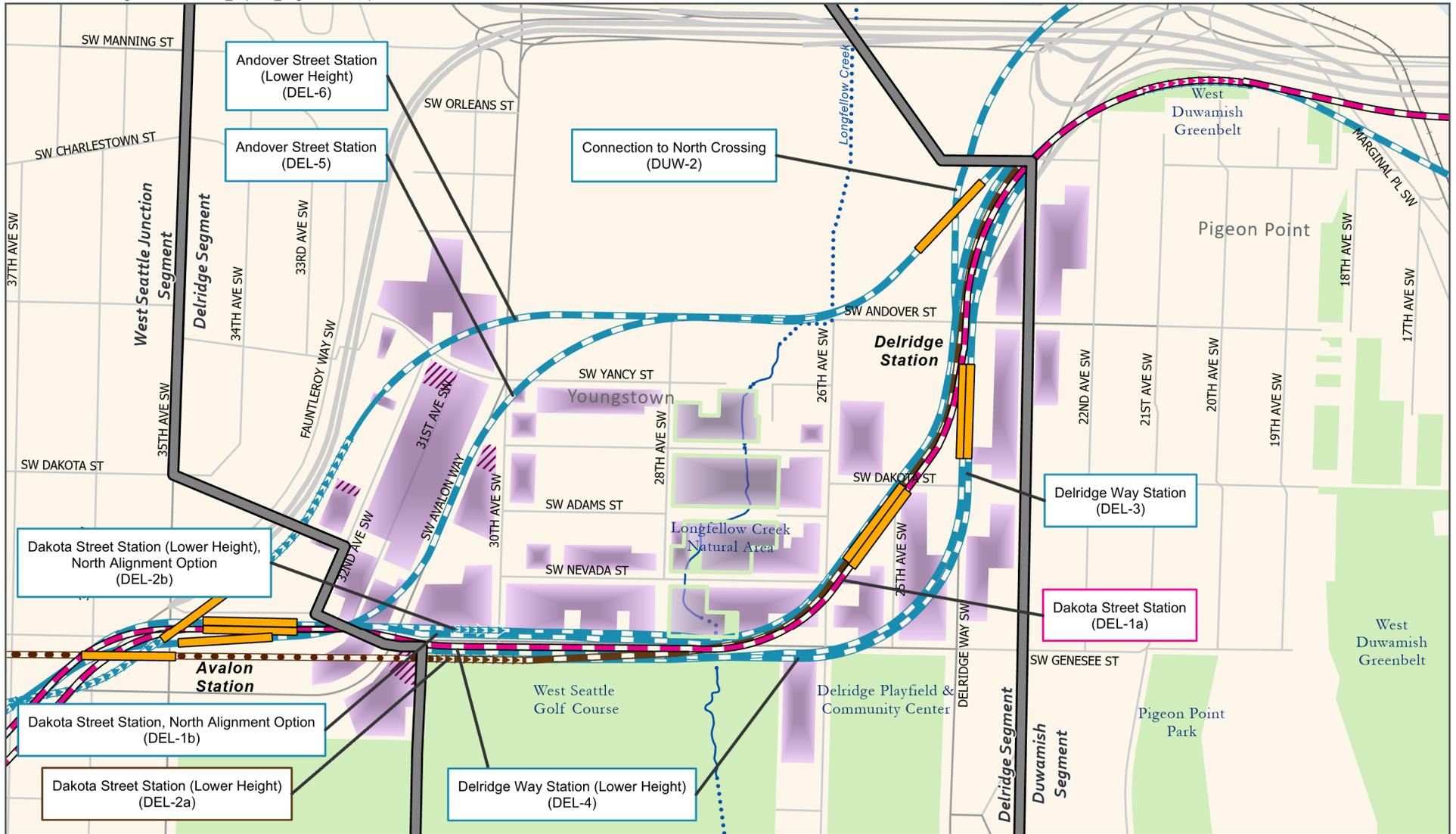
Source: City of Seattle, King County (2019, 2020, 2021).

- | | | |
|--|--------------------------|--|
| Alternatives | Segment Line | Area of Noise Impact |
| Preferred Alternative | Existing Link Light Rail | |
| Preferred Alternative with Third-party Funding | Railroad | |
| Other Alternatives | SODO Busway | |
| Alternative Profile | Proposed Overpass | Sound Transit Operations and Maintenance Facility (ST OMF) |
| Elevated | Tunnel | Piped Stream |
| At-Grade | Retained Cut | Park |
| Station | | |
| New | | |

FIGURE 4.2.7-3
Noise and Vibration Impacts
(before mitigation)
 West Seattle Link Extension -
 Duwamish Segment

*West Seattle and
 Ballard Link Extensions*



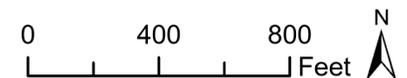


Source: City of Seattle, King County (2019, 2020, 2021).

- Alternatives**
- Preferred Alternative
 - Preferred Alternative with Third-party Funding
 - Other Alternatives
- Alternative Profile**
- Elevated
 - Tunnel
 - At-Grade
 - Retained Cut
- Station**
- New
- Legend:**
- Segment Line
 - Railroad
 - Stream
 - Piped Stream
 - Park
 - Area of Noise Impact
 - Area of Vibration or Groundborne Noise Impact

FIGURE 4.2.7-4
Noise and Vibration Impacts
(before mitigation)
 West Seattle Link Extension -
 Delridge Segment

*West Seattle and
 Ballard Link Extensions*



4.2.7.3.1 SODO Segment

Land uses in the SODO Segment are predominantly industrial and commercial. No FTA noise- or vibration-sensitive properties were identified in this segment.

4.2.7.3.2 Duwamish Segment

Noise

Preferred Alternative DUW-1a and Option DUW-1b would have the most noise impacts because of their proximity to residences on the north end of the Pigeon Point community (Table 4.2.7-4). Under DUW-1a, connections with Preferred Alternative DEL-1a, Alternative DEL-5, and Alternative DEL-6* would have the most noise impacts. Alternative DUW-2 would have the fewest noise impacts of all the Duwamish Segment Build Alternatives. The alignment for Alternative DUW-2 would be farther north than the other alternatives and is farther away from residences.

A moderate impact was identified at the Fire Station 14 with all Duwamish Segment Build Alternatives. Fire Station 36 would not have a noise impact under any of the alternatives because the alternatives are all elevated well above the fire station and there are high existing noise levels.

The Ballard Link Extension-only M.O.S. would result in a moderate noise impact at Fire Station 14, as described in Section 4.3.7.3.

Table 4.2.7-4. Light Rail Noise Impacts – Duwamish Segment

Alternative	Noise Impacts				Total Noise Impacts
	Category 1	Category 2 Moderate Impacts	Category 2 Severe Impacts	Category 3	
Preferred South Crossing (DUW-1a) ^a	0	6 to 10	0	0	6 to 10
South Crossing South Edge Crossing Alignment Option (DUW-1b) ^a	0	10 to 12	0	0	10 to 12
North Crossing (DUW-2) ^a	0	1	0	0	1

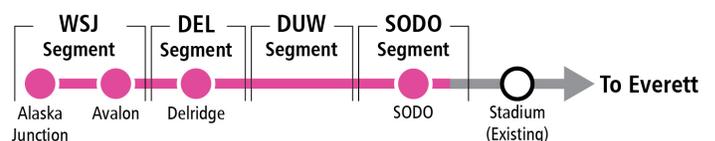
Notes:

The numbers presented are the number of units, counted by individual residences, including individual units of multi-family structures, and number of structures for other uses, like schools, places of worship, and parks. Category 2 parcels are evaluated with the 24-hour Ldn, and Category 1 and 3 are evaluated with the peak hour Leq.

Ranges reflect differences from connecting to different alternatives in adjacent segments. The total impacts are based on individual alternatives and connection options and not the high and low of each impact type shown in the table.

^a The Ballard Link Extension-only M.O.S. would result in a moderate noise impact at Fire Station 14 in the Duwamish Segment for the connection to the existing Operations and Maintenance Facility Central.

There are curves with potential for wheel squeal and crossovers in the Duwamish Segment for access to the Operations and Maintenance Facility Central, just north of Fire Station 14, that could increase light rail noise near this noise-sensitive land use for all alternatives. In addition to these curves, Preferred Alternative DUW-1a and Option DUW-1b each have a curve with potential for wheel squeal located near the Pigeon Point community. Alternative DUW-2 would have a similar curve in the same general area. Preferred Alternative DUW-1a has crossovers for the Operational and Maintenance Facility Central access. There are no crossovers in the



Pigeon Point area under Option DUW-1b. Alternative DUW-2 has a crossover near 1st Avenue South, east of the West Seattle Bridge, but it would not be near any noise-sensitive land uses.

Vibration

None of the Duwamish Segment alternatives would have vibration impacts. The guideway in this segment would primarily be elevated, which reduces vibration levels. Alternative DUW-2 is near Harbor Island Machine Works, a precision manufacturing company with vibration-sensitive equipment, but the projected vibration level with the project would not exceed the applicable vibration limit.

4.2.7.3.3 Delridge Segment

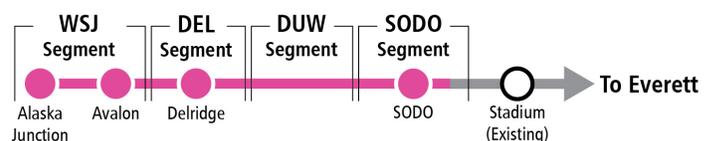
Noise

All alternatives except Alternatives DEL-5 and DEL-6* would have a moderate impact at the Category 1 land use, Secret Studio Records/Studio 1208, which specializes in music recording. The greatest number of Category 2 noise impacts would occur with Alternatives DEL-4* and DEL-5 because of their proximity to single- and multi-family residences (Table 4.2.7-5). The least amount of impacts would occur with Alternative DEL-6*. Impacts shown in Table 4.2.7-5 assume a connection to the Preferred Alternative DUW-1a in the Duwamish Segment. Impacts would be reduced when connecting to Alternative DUW-2. Alternative DEL-6* is the only alternative where noise impacts are predicted at the Longfellow Creek Natural Area.

Table 4.2.7-5. Light Rail Noise Impacts – Delridge Segment

Alternative	Noise Impacts				Total Noise Impacts
	Category 1	Category 2 Moderate Impacts	Category 2 Severe Impacts	Category 3	
Preferred Dakota Street Station (DEL-1a)	1	200 to 208	12 to 13	0	212 to 222
Dakota Street Station North Alignment Option (DEL-1b)	1	177	29	0	207
Preferred Dakota Street Station Lower Height (DEL-2a)*	1	187	44	0	232
Dakota Street Station Lower Height North Alignment Option (DEL-2b)*	1	150	27	0	178
Delridge Way Station (DEL-3)	1	205	2	0	208
Delridge Way Station Lower Height (DEL-4)*	1	210	26	0	237
Andover Street Station (DEL-5)	0	212	57	1	270
Andover Street Station Lower Height (DEL-6)*	0	100	1	1	102

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.



Note: The numbers presented are the number of units, counted by individual residences, including individual units of multi-family structures, and number of structures for other uses, like schools, places of worship, and parks. Category 2 parcels are evaluated with the 24-hour Ldn, and Category 1 and 3 are evaluated with the peak hour Leq.

Sound Transit evaluated traffic noise impacts for residences west of Southwest Avalon Way with Alternative DEL-6* because several residential structures between 32nd Avenue Southwest and the West Seattle Bridge would be removed, thereby exposing the other residences to traffic noise from Fauntleroy Way Southwest. Although there would be slight increases of 3 to 6 dB, no traffic noise impacts were identified due to the removal of the existing residential structures.

Preferred Alternative DEL-1a would have curves with potential for wheel squeal along Delridge Way Southwest north of Southwest Dakota Street, at Southwest Genesee Street and 26th Avenue Southwest, and at Southwest Genesee Street and Southwest Avalon Way. It would also have a crossover near the intersection of Delridge Way Southwest and Southwest Andover Street. Curves and crossovers for Option DEL-1b, Preferred Alternative DEL-2a*, and Option DEL-2b* would be the same as described under Preferred Alternative DEL-1a with the exception of the curve at Southwest Genesee Street and Southwest Avalon Way, where Preferred Alternative DEL-1a would be on the south side of the Southwest Genesee Street right-of-way while Option DEL-1b shifts to the north side of Southwest Genesee Street.

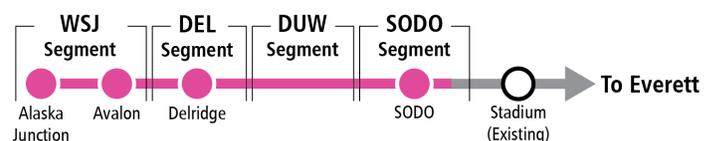
Alternative DEL-3 and Alternative DEL-4* would have curves with potential for wheel squeal at Delridge Way Southwest near Southwest Andover Way, at 25th Avenue Southwest and Southwest Genesee Street, and along Delridge Way Southwest between Southwest Dakota and Southwest Genesee Street. These alternatives would also have a crossover for each alternative at 23rd Avenue Southwest and Delridge Way Southwest. Alternative DEL-5 and Alternative DEL-6* would both have curves with potential for wheel squeal near Southwest Charlestown Street and Southwest Andover Street. Alternative DEL-5 would also have curves with potential for wheel squeal at Avalon Way Southwest and Southwest Yancy Street, and east of Avalon Way Southwest at Southwest Genesee Street. Alternative DEL-6* would have additional curves with potential for wheel squeal at the intersection of Southwest Yancy Street and 32nd Avenue and at the Delridge-West Seattle Junction border east of West Seattle Bridge and a crossover between Southwest Andover Street and Southwest Genesee Street, west of 32nd Avenue Southwest. Crossovers for both Alternative DEL-5 and Alternative DEL-6* are located along the west part of Pigeon Point in a retained cut.

Vibration

Preferred Alternative DEL-1a and Alternative DEL-3 would impact the most residences in the Delridge Segment (Table 4.2.7-6). The impacts would be at the same multi-family buildings near the intersection of Genesee Street and Southwest Avalon Way. Alternative DEL-5 would impact a multi-family building with many dwelling units, while Alternative DEL-6* would impact single-family residences.

Table 4.2.7-6. Groundborne Noise and Vibration Impacts – Delridge Segment

Alternative	Number of Predicted Vibration or Groundborne Noise Impacts ^a			Total Predicted Vibration or Groundborne Noise Impacts
	Category 1	Category 2 ^b	Category 3	
Preferred Dakota Street Station (DEL-1a)	0	12	0	12
Dakota Street Station North Alignment Option (DEL-1b)	0	0	0	0



Alternative	Number of Predicted Vibration or Groundborne Noise Impacts ^a			Total Predicted Vibration or Groundborne Noise Impacts
	Category 1	Category 2 ^b	Category 3	
Preferred Dakota Street Station Lower Height (DEL-2a)*	0	0	0	0
Dakota Street Station Lower Height North Alignment Option (DEL-2b)*	0	0	0	0
Delridge Way Station (DEL-3)	0	12	0	12
Delridge Way Station Lower Height (DEL-4)*	0	0	0	0
Andover Street Station (DEL-5)	0	9	0	9
Andover Street Station Lower Height (DEL-6)*	0	3	0	3

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

^a See Appendix N.3 for a more detailed information on groundborne noise and vibration impacts.

^b Number of predicted impacts for Category 2 land uses is the number of dwelling units, not the number of buildings.

4.2.7.3.4 West Seattle Junction Segment

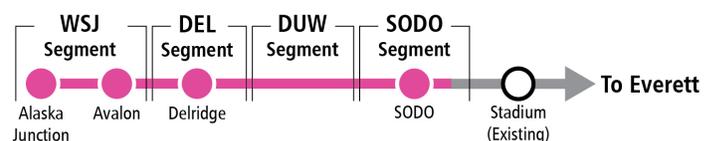
Noise

Preferred Alternatives WSJ-1 and WSJ-2 would have the most overall and most severe noise impacts in the West Seattle Junction Segment. Severe noise impacts for the Preferred Alternative WSJ-1 would be a result of the elevated guideway’s proximity to more multi-family buildings and guideway elevation (Table 4.2.7-7).

Table 4.2.7-7. Light Rail Noise Impacts – West Seattle Junction Segment

Alternative	Noise Impacts				Total Noise Impacts
	Category 1	Category 2 Moderate Impacts	Category 2 Severe Impacts	Category 3	
Preferred Elevated 41st/42nd Avenue Station (WSJ-1)	0	299	100	1	400
Preferred Elevated Fauntleroy Way Station (WSJ-2)	0	302 to 375	10 to 99	0	351 to 401
Preferred Tunnel 41st Avenue Station (WSJ-3a)*	0	0	0	0	0
Preferred Tunnel 42nd Avenue Station Option (WSJ-3b)*	0	0	0	0	0
Short Tunnel 41st Avenue Station (WSJ-4)*	0	128	0	0	128
Medium Tunnel 41st Avenue Station (WSJ-5)*	0	6	0	0	6

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.



Note: The numbers presented are the number of units, counted by individual residences, including individual units of multi-family structures, and number of structures for other uses, like schools, places of worship, and parks. Category 2 parcels were evaluated with the 24-hour Ldn, and Category 1 and 3 were evaluated with the peak hour Leq.

Impacts shown in Table 4.2.7-7 assume a connection to the Preferred Alternative DEL-1a in the Delridge Segment. Connections to other Delridge Segment alternatives could result in some moderate impacts changing to severe impacts but the overall number of impacts would be similar. Preferred Alternative WSJ-3a* and Preferred Option WSJ-3b* are not predicted to have any noise impacts. Preferred Alternative WSJ-1 would have three curves with potential for wheel squeal noise: at Fautleroy Way Southwest between Southwest Avalon Way and 35th Avenue Southwest, Southwest Alaska Street and 41st Avenue Southwest, and Southwest Edmunds Street and 42nd Avenue Southwest. There would also be a double crossover near 40th Avenue Southwest between Southwest Oregon Street and Southwest Alaska Street. Preferred Alternative WSJ-2 would have three curves with potential for wheel squeal, all along Fautleroy Way Southwest. Alternative WSJ-4* would have two curves with potential for wheel squeal: one at Fautleroy Way Southwest and Southwest Genesee Street and another at 38th Avenue Southwest and Southwest Oregon Street. Alternative WSJ-5* would have one curve at its boundary with the Delridge Segment and West Seattle Junction Segment.

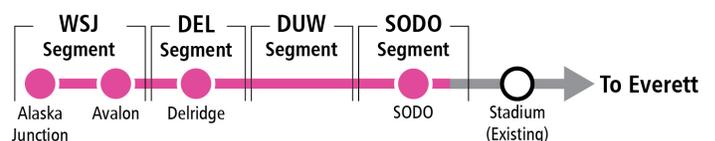
Vibration

In the West Seattle Junction Segment, the tunnel alternatives (Preferred Alternative WSJ-3a*, Preferred Option WSJ-3b*, Alternative WSJ-4*, and Alternative WSJ-5*) would have more vibration or groundborne noise impacts than Preferred Alternative WSJ-1 because elevated guideways reduce vibration levels by about 10 decibels (Table 4.2.7-8). Preferred Alternative WSJ-2 would have no impacts because of the vibration reduction provided by the elevated structure and no sensitive receivers are close to the structure. Preferred Option WSJ-3b* would have the most vibration or groundborne noise impacts in this segment, which would be concentrated in large multi-family buildings along 42nd Avenue Southwest near Southwest Alaska Street and east of Avalon Station along Southwest Avalon Way.

Table 4.2.7-8. Groundborne Noise and Vibration Impacts – West Seattle Junction Segment

Alternative	Number of Predicted Vibration or Groundborne Noise Impacts ^a			Total Predicted Vibration or Groundborne Noise Impacts
	Category 1	Category 2 ^b	Category 3	
Preferred Elevated 41st/42nd Avenue Station (WSJ-1)	0	7	0	7
Preferred Elevated Fautleroy Way Station (WSJ-2)	0	0	0	0
Preferred Tunnel 41st Avenue Station (WSJ-3a)*	0	24 to 199	0	24 to 199
Preferred Tunnel 42nd Avenue Station Option (WSJ-3b)*	0	269 to 430	0	269 to 430
Short Tunnel 41st Avenue Station (WSJ-4)*	0	153	0	153
Medium Tunnel 41st Avenue Station (WSJ-5)*	0	205	0	205

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to



require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

Note: Ranges reflect differences from connecting to different alternatives in adjacent segments. The total impacts are based on individual alternatives and connection options and not the high and low of each impact type shown in the table.

^a See Appendix N.3 for a more detailed information on groundborne noise and vibration impacts.

^b Number of predicted impacts for Category 2 land uses is the number of dwelling units, not the number of buildings.

4.2.7.4 Environmental Impacts of the Build Alternatives during Construction

4.2.7.4.1 Noise

Except for underground tunnel construction, Sound Transit estimates that most project construction noise levels, such as elevated guideway and station construction, would be between 84 and 89 dBA (hourly Leq) at a distance of 50 feet.

During construction of elevated structures such as guideways and stations, the loudest sources of noise would be cranes, excavators, concrete pumps, and pneumatic tools. Construction of elevated structures might result in sound levels of up to 87 dBA at a distance of 50 feet. Impact pile-driving during bridge construction in the Duwamish Segment would generate substantial noise levels that would likely exceed 101 dBA at 50 feet. Noise from pile-driving would be required to meet City of Seattle regulations or the project would seek a noise variance, which may allow construction noise to exceed the City’s construction sound level limits under specific circumstances. See Section 3.1.3 of Appendix N.3 for more information on construction noise criteria.

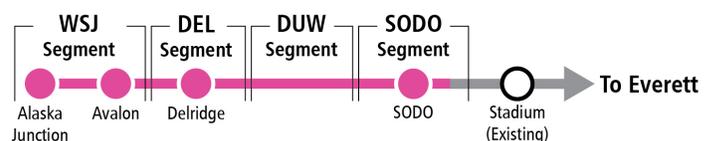
Above-grade activities at tunnel portals would mainly consist of material deliveries and hauling materials. Ventilation fans might run 24 hours a day at tunnel portals and access shafts to supply fresh air into the tunnel. Sound levels from tunnel construction at tunnel portals are anticipated to be approximately 86 dBA at a distance of 50 feet. Nighttime construction near tunnel portals would likely be necessary throughout tunnel construction.

Cut-and-cover tunnel and station construction would likely occur during the daytime and might result in sound levels of approximately 88 dBA at a distance of 50 feet during the loudest phases of construction, such as backfilling.

During retained cut construction, the loudest pieces of construction equipment would be cranes, backhoes, jackhammers, excavators, pneumatic tools, and concrete mixers. Retained cut construction may result in sound levels of up to 89 dBA at a distance of 50 feet.

At-grade construction is anticipated to occur primarily within the SODO Segment. Construction equipment that could be used for at-grade construction include excavators, backhoes, concrete mixers, concrete pumps, and haul trucks. Construction noise from at-grade construction could result in sound levels up to 87 dBA at a distance of 50 feet.

Construction noise is subject to City of Seattle code requirements, and noise levels for construction would be required to stay within those requirements unless the project obtained a variance from the City. Nighttime construction work required for tunneling and elevated guideway construction, would require a noise variance from the City. Sound Transit would ensure that the construction contractor minimize noise impacts from nighttime construction as described in Section 4.2.7.6, Mitigation Measures, and noise levels would meet requirements set forth in the variances. For detailed information on construction noise impacts, refer to Section 6 of Appendix N.3.



The SODO Segment and eastern portion of the Duwamish Segment are mostly industrial and commercial properties, which are less sensitive to construction noise; therefore, no noise impacts are expected in these segments. In the Duwamish Segment, bridge construction would mostly take place in industrial areas on the shore of the Duwamish Waterway (also known as Duwamish River) and Harbor Island, and possibly in the water, depending on the type of bridge constructed. Residents with lines of sight to construction near the Duwamish Waterway, such as in the Riverside community, would likely experience more construction noise impacts than other nearby residential properties. Because Alternative DUW-2 would be farther from residential areas than the other alternatives and would not require retained-cut construction, it is expected to result in fewer construction noise impacts at noise-sensitive properties.

In the Delridge Segment, there is potential for construction noise impacts to noise-sensitive receivers along all the Build Alternative alignments. Alternative DEL-5 and Alternative DEL-6* would have lower potential for construction noise impacts at noise-sensitive properties because a portion of these alternatives would be closer to industrial and commercial areas and farther away from some noise-sensitive properties than the other Delridge Segment alternatives.

In the West Seattle Junction Segment, construction of Preferred Alternatives WSJ-1 and WSJ-2 are anticipated to have lower potential for noise impacts at noise-sensitive properties than other alternatives which would require tunneling. Although tunneling would take place underground, night work at the tunnel portals could last several years. The overall construction duration of Preferred Alternatives WSJ-1 and WSJ-2 might also be less than construction of a below-grade station and tunnel.

4.2.7.4.2 Vibration

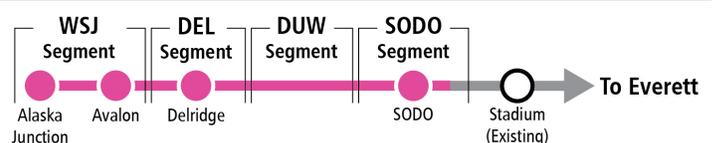
Vibration caused by construction activities could potentially damage nearby structures and annoy occupants. The construction activity most likely to generate high levels of vibration is pile-driving. Within the Duwamish Segment, pile-driving for the new light rail bridge over the Duwamish Waterway could result in potential cosmetic damage to structures within 100 feet of pile locations if an impact pile driver is used. The number and severity of vibration impacts would depend on the location of the piles and the method of installation.

When operating at distances greater than 20 feet, most other construction equipment has a low risk of causing vibration damage. No buildings were identified within 20 feet of construction activities. Vibration from the tunnel boring machine cutterhead and supply train would likely remain below the damage and annoyance thresholds for residential and institutional land uses, and there are no Category 1 or special buildings close to the tunnel alternatives.

Alternative DUW-2 in the Duwamish Segment would have an impact from pile-driving at Harbor Island Machine Works, a Category 1 land use. Detailed vibration predictions and mitigation measures would be included in a Vibration Control Plan for this property because of its vibration sensitivity. No other vibration impacts are expected to Category 1 land uses or special buildings during project construction.

4.2.7.5 Indirect Impacts of the Build Alternatives

Indirect noise and vibration impacts could be associated with transit-oriented development. Although noise associated with future development could increase noise in the project corridor, any increase would likely be minimal and any new developments would be required to meet the City of Seattle noise regulations.



4.2.7.6 Mitigation Measures

4.2.7.6.1 Noise

Light Rail Noise

Sound Transit is committed to minimizing project noise levels at their source for all of its light rail corridors. When noise would exceed FTA moderate or severe impact criteria, Sound Transit would provide noise mitigation measures consistent with its Link Noise Mitigation Policy (Motion No. M2004-08, Sound Transit 2004), the *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018), and the Sound Transit *Design Criteria Manual* (2021).

The Link Noise Mitigation Policy provides the hierarchy for implementation of mitigation measures. It prioritizes reduction at the noise source, followed by measures to disrupt the noise path, such as sound walls. Lastly it considers residential sound insulation. The policy also guides coordination with the affected property owners and reconsideration of noise impacts and mitigation during final design.

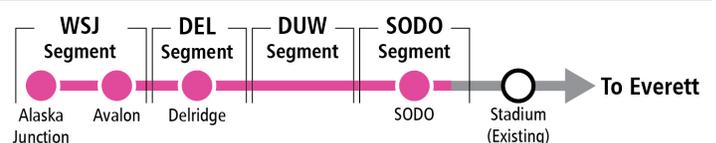
Sound walls are the primary noise mitigation option for West Seattle Link Extension operations because they are effective at reducing noise near the source. Sound walls for elevated profiles would be along the side of the top of the guideway; for other profiles, they would be next to the guideway on the ground or retaining structures. Sound walls are proposed for all areas with residential land uses in all segments. They are also proposed adjacent to Fire Station 14 in the Duwamish Segment.

Wheel squeal reduction measures, including non-oil-based lubrication and friction modifiers, would be included in the project design following the Sound Transit policy in the *Design Criteria Manual*.

For noise from crossovers, recommended mitigation would include special trackwork, such as moveable-point or spring-rail “frogs” (a mechanical installation enabling trains to be guided from one track to another, such as at a junction or where a spur or siding branches off), to eliminate the noise- and vibration-causing gap between tracks.

When source mitigation measures or sound barriers are infeasible or not entirely effective at reducing exterior noise levels below the FTA impact criteria, and where the affected building does not already achieve a sufficient exterior-to-interior reduction of noise levels, Sound Transit would provide residential sound insulation. Most newer buildings have effective exterior-to-interior noise reduction, and additional sound insulation might not be necessary.

The project would mitigate the majority of noise impacts with sound walls along the guideway and with special trackwork at track crossover locations. A summary of the recommended sound walls is provided in Table 4.2.7-9. Limited sound insulation might also be needed. With the potential mitigation, Sound Transit expects that project noise levels would be below FTA criteria. The modeling process is conservative, and proposed mitigation is based on the current project design. During final design, the detailed noise analysis would be updated based on more advanced design. All predicted noise levels and mitigation measures would be reviewed. Mitigation would be modified as needed to reduce noise levels to below the FTA impact criteria. If equivalent mitigation could be achieved by a less costly means or if the final design analysis shows no impact, then the mitigation measure may be modified or eliminated. After light rail operations begin, if the resulting noise were to exceed FTA criteria, Sound Transit would evaluate the need for additional mitigation. More details on light rail noise mitigation are available in Appendix N.3. Attachment N.3D shows detailed maps of noise impacts with



proposed mitigation, and Attachment N.3F shows tables of noise predictions and includes predicted levels with mitigation.

Table 4.2.7-9. Recommended Noise Mitigation – West Seattle Link Extension

Segment	Alternative	Mitigation Recommendation
Duwamish	Preferred South Crossing (DUW-1a)	Sound Walls: 4 to 6 feet
	South Crossing South Edge Crossing Alignment Option (DUW-1b)	Sound Walls: 4 feet
	North Crossing (DUW-2)	Sound Walls: 4 feet
Delridge	Preferred Dakota Street Station (DEL-1a)	Sound Walls: 4 to 6 feet
	Dakota Street Station North Alignment Option (DEL-1b)	Sound Walls: 4 to 6 feet
	Preferred Dakota Street Station Lower Height (DEL-2a)*	Sound Walls: 4 to 8 feet
	Dakota Street Station Lower Height North Alignment Option (DEL-2b)*	Sound Walls: 4 to 8 feet
	Delridge Way Station (DEL-3)	Sound Walls: 4 to 6 feet
	Delridge Way Station Lower Height (DEL-4)*	Sound Walls: 4 to 8 feet
	Andover Street Station (DEL-5)	Sound Walls: 4 to 8 feet
	Andover Street Station Lower Height (DEL-6)*	Sound Walls: 4 to 8 feet
West Seattle Junction	Preferred Elevated 41st/42nd Avenue Station (WSJ-1)	Sound Walls: 4 to 8 feet
	Elevated Fauntleroy Way Station (WSJ-2)	Sound Walls: 4 to 8 feet
	Short Tunnel 41st Avenue Station (WSJ-4)*	Sound Walls: 4 to 6 feet
	Medium Tunnel 41st Avenue Station (WSJ-5)*	Sound Walls: 4 to 6 feet

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

Note: Sound wall height is determined by assessing the degree of noise impact and the height needed to mitigate the impact.

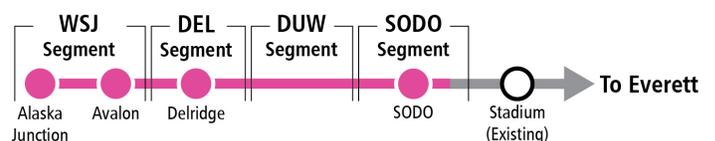
Construction Noise

Through compliance with applicable construction permits and the incorporated best management practices, such as using broadband backup alarms during nighttime hours, minimizing the use of public address systems, ensuring internal combustion equipment are fitted with mufflers, and locating equipment away from noise-sensitive properties to the extent feasible, no mitigation for noise impacts would be needed. Sound Transit would obtain a noise variance from the City of Seattle to complete work during nighttime hours. For the construction staging areas near tunnel portals, mitigation measures could include construction of temporary noise barriers adjacent to the staging area. Detailed information on construction noise mitigation can be found in Appendix N.3.

4.2.7.6.2 Vibration

Operations

Sound Transit would mitigate vibration and groundborne noise impacts that exceed FTA criteria. Vibration impacts are projected at several special trackwork locations as the wheels travel



through the gap between tracks at these locations. Sound Transit would use low-vibration designs for special trackwork, referred to as low-impact frogs, to mitigate these impacts.

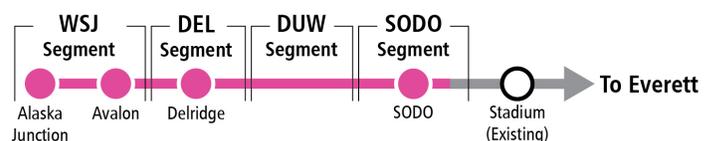
For vibration impacts not caused by special trackwork, high-resilience direct-fixation fasteners would be used to reduce vibration levels. Fasteners are used to attach the rail to the concrete track slab. At some locations, high-resilience direct-fixation fasteners might not be sufficient to reduce projected vibration levels to below the FTA criteria. At these locations, project design modifications during final design, such as refining the depth of the tunnel or placement of columns, could eliminate or reduce these impacts. Continuous-mat floating slabs are recommended where impacts are predicted at highly sensitive Category 1 land uses, where high-resilience fasteners would not provide sufficient mitigation. As project design advances, some impacts may be eliminated or the type of mitigation needed may change. Alternative vibration mitigation approaches that may be applied under specific circumstances include increasing the thickness of the concrete under the track, specifying straighter rails, and building the track on top of pile foundation systems where the track would traverse very soft sections of soil.

With the potential mitigation, project vibration and groundborne noise levels are expected to be below FTA criteria. In addition, the modeling process is conservative, and additional measurement information at affected buildings might show no or reduced impact. During final design, the detailed vibration analysis would be updated based on more advanced design and would evaluate the specific buildings, and alternative mitigation measures might be warranted. All predicted vibration levels and mitigation measures would be reviewed. Mitigation would be modified as needed to reduce vibration levels to below the FTA impact criteria. Recommended mitigation measures for each alternative with impacts are shown in Table 4.2.7-10. Additional information on light rail vibration mitigation can be found in Appendix N.3. Attachment N.3E shows detailed maps of vibration impacts with proposed mitigation, and Attachment N.3G shows tables of vibration predictions and includes predicted levels with mitigation.

Table 4.2.7-10. Recommended Groundborne Noise and Vibration Mitigation – West Seattle Link Extension

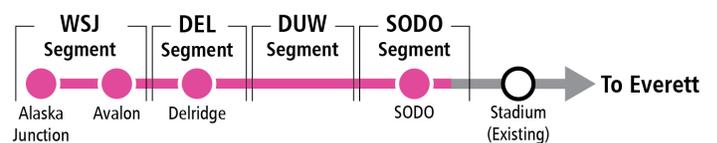
Segment	Alternative	Mitigation Recommendation
Delridge	Preferred Dakota Street Station (DEL-1a)	High-resilience direct-fixation fastener
	Delridge Way Station (DEL-3)	High-resilience direct-fixation fastener
	Andover Street Station (DEL-5)	High-resilience direct-fixation fastener
	Andover Street Station Lower Height (DEL-6)*	High-resilience direct-fixation fastener
West Seattle Junction	Preferred Elevated 41st/42nd Avenue Station (WSJ-1)	Low-impact frog (monoblock)
	Preferred Tunnel 41st Avenue Station (WSJ-3a)*	High-resilience direct-fixation fastener and low-impact frog (moveable-point)
	Preferred Tunnel 42nd Avenue Station Option (WSJ-3b)*	High-resilience direct-fixation fastener and low-impact frog (moveable-point)
	Short Tunnel 41st Avenue Station (WSJ-4)*	High-resilience direct-fixation fastener and low-impact frog (moveable point)
	Medium Tunnel 41st Avenue Station (WSJ-5)*	High-resilience direct-fixation fastener and low-impact frog (moveable point)

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement, some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.



Construction

The primary means of mitigating vibration from construction activities is to require the contractor to prepare and implement a detailed Construction Vibration Control Plan. Appendix N.3 provides more information on this plan. The Construction Vibration Control Plan would include Category 1 land uses and any other structures where predicted construction vibration would exceed the applicable thresholds. If pile-driving is planned within 100 feet of structures, alternative methods of pile installation or vibration monitoring would be considered. Options for mitigating vibration from the supply train during tunneling are reducing the operation speed of the supply train, smoothing the running surface, or using rubber-tire supply train vehicles. Pre-construction surveys would be conducted to document the existing conditions of buildings, and the contractor would be responsible for repairing damage resulting from the project. During final design, all impacts and potential mitigation measures would be reviewed for verification.



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4.2.8 Water Resources

4.2.8.1 Affected Environment

The study area for water resources consists of the Longfellow Creek basin, Duwamish Waterway (also known as Duwamish River), Elliott Bay, and the City of Seattle combined sewer basins along the project corridor. The project is in the city of Seattle, King County, Washington, within Water Resource Inventory Area 9, the Green-Duwamish Basin. The West Seattle Link Extension study area is just inland of Puget Sound's Elliott Bay and includes the Duwamish Waterway and Longfellow Creek. The potential area of effect encompasses locations where water resources would be altered by construction and operation of the project and where resources would likely receive direct runoff from the project during construction and in long-term operation. The study area is generally highly developed, aside from the West Duwamish Greenbelt, which is a vegetated slope stretching 4 miles south from the West Seattle Bridge along the western side of the Duwamish Waterway. The study area is served by combined, separated, and partially separated storm sewer systems. The waterbodies, drainage basins, and associated floodplains in the study area are shown on Figure 4.2.8-1.

4.2.8.1.1 Surface Water

Surface water, including stormwater runoff, in the West Seattle Link Extension study area drains into either a combined sewer system (city or county) or to designated receiving waters through direct discharge, stormwater drains in separated sewer systems, or stormwater drains in partially separated sewer systems. Within the study area, stormwater in partially separated systems drains to either Puget Sound directly or to the Duwamish Waterway, which then flows into Elliott Bay, which is part of Puget Sound. Surface water also flows to Longfellow Creek, a tributary to the Duwamish Waterway. Stormwater runoff that drains to a combined sewer system is treated at the West Point Wastewater Treatment Plant before being discharged into Puget Sound. Figure 4.2.8-1 shows the major creeks and waterways in the study area. The primary surface waters in the study area are the Duwamish Waterway and Longfellow Creek, both highly urbanized resources.

The Washington State Department of Ecology (Ecology) has assigned water uses to each of these waterbodies (see Table 1-1 in Appendix L4.8, Water Resources). These uses define applicable water quality standards for each waterbody. Elliott Bay, Longfellow Creek, and the Duwamish Waterway have designated uses of aquatic life, recreation, and non-domestic water supply. More information on fish habitat is provided in Section 4.2.9, Ecosystems.

Stormwater Drainage in the Study Area

Combined Sewer System

Wastewater and stormwater travel in the same pipe to treatment plants. In the study area, there are both county and city combined sewer systems.

Separated Sewer System

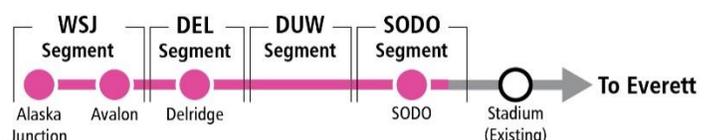
Wastewater and stormwater travel in separate pipes: the wastewater is conveyed to treatment plants and stormwater is conveyed to drainage outlets.

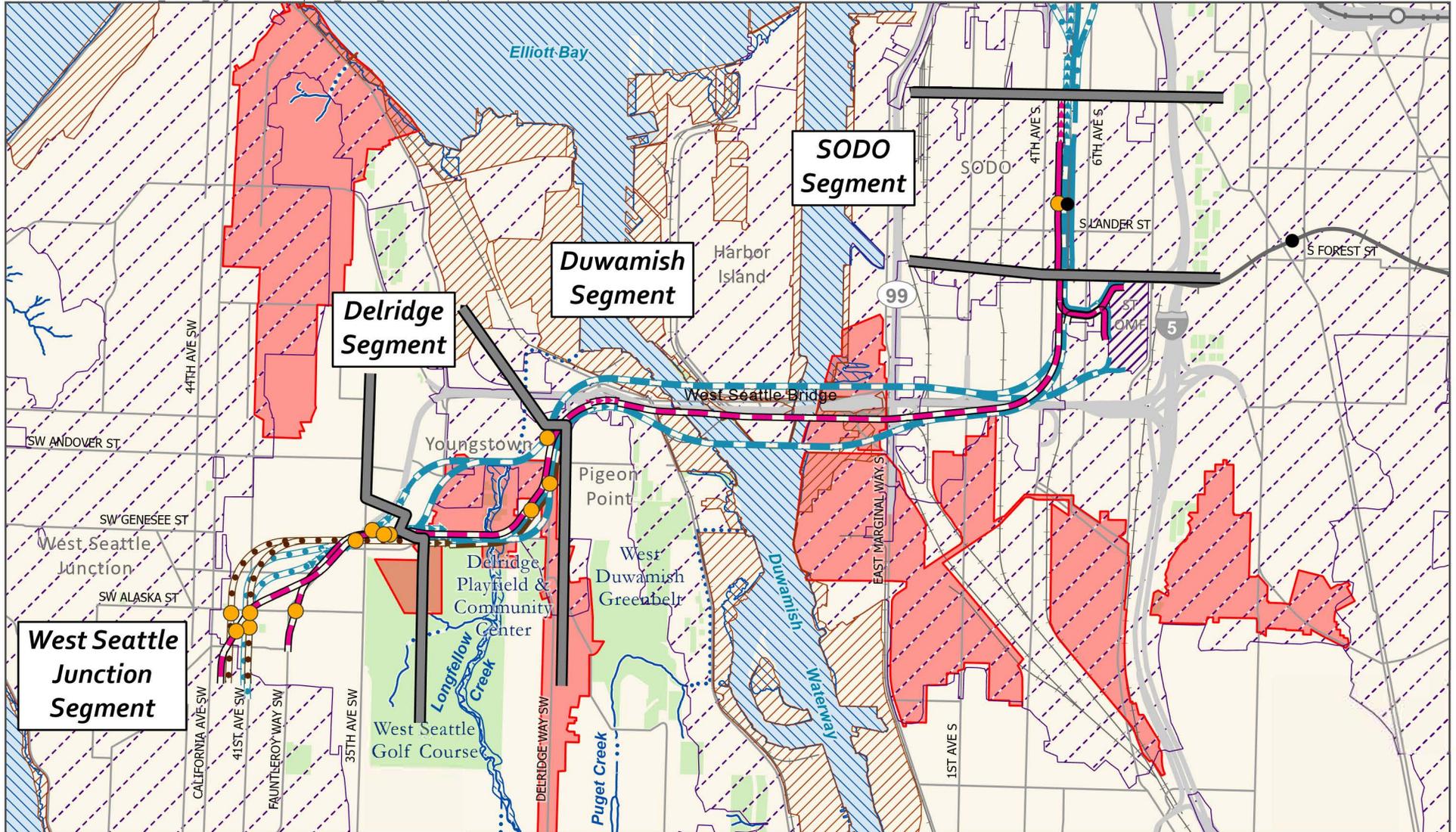
Partially Separated Sewer System

Similar to the separated sewer system except that some stormwater (e.g., from roof drains) joins the wastewater in pipes leading to treatment plants. In the study area, stormwater in these areas drains to designated receiving waters via city drainage systems.

Direct Discharge

Water flows over impervious surfaces, through ditch/culvert systems, or through small private drainage systems to a receiving waterbody.





Source: City of Seattle, King County (2019, 2020, 2021).

Alternatives

- Preferred Alternative
- Preferred Alternative with Third-party Funding
- Other Alternatives

Alternative Profile

- Elevated
- Tunnel
- At-Grade
- Retained Cut

Station

- New
- Existing

Segment Line

Sound Transit Operations and Maintenance Facility (ST OMF)

Existing Link Light Rail

East Link Light Rail (Under Construction)

Railroad

Stream

Piped Stream

Park

FEMA 100-year Floodplain

Direct Discharge Areas

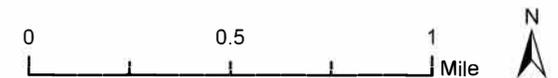
City of Seattle Combined Sewer Basins

Drainage Areas to Receiving Waterbodies

Notes: 1) Areas outside of the basins shown are served by King County Combined Sewer. 2) Within drainage areas to receiving waters, stormwater is collected and conveyed in city storm drain systems.

**FIGURE 4.2.8-1
Floodplains and Basins
West Seattle Link Extension**

*West Seattle and
Ballard Link Extensions*



Duwamish Waterway

The lowermost 4.6 miles of the Duwamish Waterway are in the city of Seattle. This area is an estuary where saltwater from Puget Sound and freshwater from the river mix. This area includes the East and West Duwamish Waterways, separated by Harbor Island and referred to collectively as the Duwamish Waterway. Because the Duwamish Waterway drains into Elliott Bay, its water levels are tidally influenced. It supports commercial and recreational navigation and salmon fishing, most especially in the estuarine area.

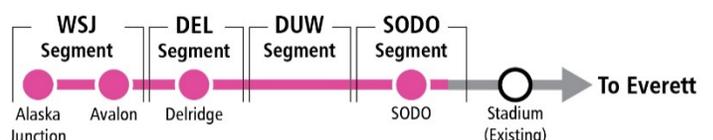
The Duwamish Waterway receives flows from numerous combined sewer overflow outfalls and separate storm drain outfalls within the study area. Runoff from the SODO and Duwamish segments flows to the West Point Treatment Plant, which discharges to Puget Sound after treatment, or discharges into the Duwamish Waterway during combined sewer overflow events. Runoff from the Delridge Segment also flows to the Duwamish Waterway through an existing storm drain outfall.

There are two Superfund sites in the water resources study area that are crossed by project alternatives. The United States Environmental Protection Agency listed Harbor Island and its associated sediments as a Superfund site in 1983, and the Lower Duwamish Waterway as a Superfund site in 2001 (United States Environmental Protection Agency 2019a, 2019b). The Lower Duwamish Superfund site is 5 miles long, stretching from the southern tip of Harbor Island to the end of the straightened waterway in Tukwila. See Section 4.2.12, Hazardous Materials, for more information on the status of these sites. The Lockheed West Seattle Superfund site is also located about a mile north from the West Seattle Link Extension project alternatives at the mouth of the Duwamish Waterway, and is noted here because it does contribute to water quality impairments in the study area. Ecology classifies the Lower Duwamish Waterway as a Category 5 waterbody, and it was included in the Ecology 303(d) list of impaired waterbodies in 2014 because of exceedances of more than 40 water quality criteria. Ecology maintains the 303(d) list in compliance with Section 303(d) of the Clean Water Act, to track impaired waterbodies and to prioritize cleanup needs. A Category 5 waterbody means that Ecology has data showing that the water quality standards have been violated for one or more pollutants, and that there is no pollution-control program in place (Ecology 2016). Of special concern are dissolved oxygen and fecal coliform, which frequently exceed the state standard. The Duwamish Waterway has also seen an increasing trend of water temperatures since the 1970s (King County 2016a).

Longfellow Creek

Longfellow Creek flows for more than 4 miles from its origin near Southwest Thistle Street into the West Duwamish Waterway (City of Seattle 2012). North of Southwest Yancy Street, the northern 3,260 feet of the creek flows through an underground 48-inch storm drain beneath shopping centers, houses, roads, Nucor Steel, and Port of Seattle properties until it discharges into the West Duwamish Waterway (City of Seattle 2019). Land use along the creek is almost entirely developed (King County 2016a). The creek is categorized as “Salmonid Spawning, Rearing and Migration Habitat” for aquatic life use (King County 2016b). Portions of the creek have been assigned “Supplemental Spawning and Incubation Protection” temperature criteria of 13 degrees Celsius, applicable from September 15 to May 15.

Water quality testing completed by King County since the 1970s in the northernmost point of the creek has identified this area as High Concern (King County 2016c). Ecology classifies Longfellow Creek as a Category 5 waterbody, and it was included on the Ecology 303(d) list in 2014 because of exceedances of criteria for water temperature, dissolved oxygen, and fecal coliform bacteria (Ecology 2016).



Elliott Bay

Elliott Bay is the part of Puget Sound adjacent to the Seattle downtown waterfront, and the Duwamish Waterway flows into it. Some runoff from the West Seattle Junction Segment of the project corridor drains untreated into Puget Sound through existing stormwater system infrastructure. This resource is categorized as “Salmonid rearing and migration only” for aquatic life use (Ecology 2016) and is included in 303(d) listings for exceedances in bacteria levels.

Combined Sewer Service Areas

The combined sewer system is a network of City pipelines collecting both storm and sanitary sewer flows that are conveyed to King County interceptor pipes. In these areas of Seattle, pipes lead to diversion structures and the West Point Treatment Plant, where the flows are treated and released to Puget Sound. During overflow events, untreated water in this system is discharged to Puget Sound or the Duwamish Waterway at combined sewer overflow outfalls. Surface water runoff from the study area in the West Seattle Junction Segment drains into the Seattle combined sewer system, which is treated at the West Point Treatment Plant, located adjacent to Discovery Park in the Magnolia neighborhood of Seattle.

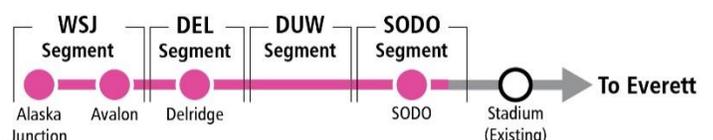
4.2.8.1.2 Shorelines

The Duwamish Waterway shorelines are designated as Urban Industrial in the City of Seattle’s Shoreline Master Program (City of Seattle 2019) and are heavily developed with Port of Seattle and related industrial waterfront uses. This program regulates designated shorelines of the state within the City and 200 feet from the ordinary high-water mark along the shoreline. The only other shorelines that are included in the project area are associated with the mouth of Longfellow Creek. Although Longfellow Creek itself is not a designated shoreline of the state, the mouth of the creek lies within the shoreline jurisdiction and 200-foot buffer of the West Duwamish Waterway. Information on shoreline habitat is provided in Section 4.2.9, Ecosystems.

4.2.8.1.3 Floodplains

The portion of Longfellow Creek in the study area lies within a floodplain, classified by the Federal Emergency Management Agency (FEMA) as a Special Flood Hazard Area Inundated by the 100-Year Flood as Zone A, meaning that no base flood elevations nor floodways have been determined (FEMA 2020). FEMA-designated 100-year floodplains are areas with a 1 percent or greater chance of flooding each year. Flooding is known to occur at numerous locations along Longfellow Creek because of restricted channel and culvert capacities and partial obstruction of the natural channel because of debris accumulations, although these are primarily farther south (upstream) from the study area (FEMA 2020). Seattle Public Utilities owns and maintains the Southwest Genesee Street Detention Dam, a flood control and stormwater detention dam on Longfellow Creek on the south side of Southwest Genesee Street. The north slope of the roadway is armored with concrete blocks and is designed to function as an emergency spillway when needed. In normal conditions, the dam does not retain any water and all flows are conveyed within Longfellow Creek (City of Seattle 2020). This dam is regulated and permitted by Ecology and is considered a high-hazard dam if the dam were to fail (Ecology 2020).

The Duwamish Waterway is classified by FEMA as a Special Flood Hazard Area Inundated by the 100-Year Flood as Zone AE, meaning that base flood elevations have been determined (FEMA 2020).



However, the area is heavily industrialized and nearly 100 percent of the Duwamish Waterway shoreline has been modified with structural protection (i.e., rip rap or sheet piles), so only a few small areas outside of the waterway itself are within the floodplain. The Duwamish Waterway is tidally influenced for approximately 11 miles upstream and is regulated for flood control on the upper Green River (near river mile 64.5) by the Howard A. Hanson dam, which is operated by the United States Army Corps of Engineers. See Figure 4.2.8-1 for the Duwamish Waterway floodplain limits.

4.2.8.1.4 Groundwater

There are no designated sole-source aquifer areas, critical aquifer recharge, or wellhead protection areas that occur within the study area. The hydrogeologic regime and groundwater flow in the Puget Sound area are highly variable. Groundwater recharge typically occurs in the upland areas of Seattle and predominantly flows downward to the discharge areas, and eventually to major surface waterbodies. On the steep slopes on Pigeon Point, groundwater seeps were observed, meaning that groundwater reached the surface. More information on potential for groundwater contamination is provided in Section 4.2.12, Hazardous Materials. Section 4.2.11, Geology and Soils, provides more information on groundwater and aquifers.

4.2.8.2 Environmental Impacts of the No Build Alternative

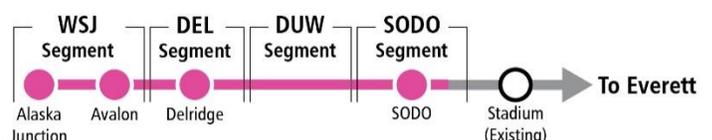
Under the No Build Alternative, light rail would not be extended to West Seattle and the potential impacts on water resources identified for the Build Alternatives would be avoided. The No Build Alternative would have no direct impacts on any waterbodies, stormwater flow in combined sewer service areas, shorelines, or floodplains and floodways. There would also be no construction impacts. However, the potential water quality benefits associated with the project would also not be realized, such as reduced pollution from motor vehicles and the addition of water quality treatment for pollution-generating impervious surfaces that are currently not treated.

4.2.8.3 Environmental Impacts of the Build Alternatives during Operation

4.2.8.3.1 Impacts Common to All Alternatives

As design advances, Sound Transit would continue to coordinate with the City of Seattle on issues related to water resources, including the following:

- Approved points of discharge and discharge basins
- Flow control and water quality requirements
- Opportunities for infiltration
- Extension of utility mainlines
- Temporary and permanent dewatering
- Potential for onsite stormwater management when outside of the public right-of-way



Water Quality

All alternatives would increase impervious surfaces. In this project, pollution-generating impervious surfaces are the pavement areas of road improvements needed to accommodate the project. The pollutants from vehicular traffic on these surfaces accumulate on the road surface and are transported to waterbodies by stormwater runoff that, if not treated, can degrade water quality in receiving waters. If not treated, the potential impacts of added pollution-generating impervious surfaces are greater in drainage basins that drain directly to surface water resources than in basins draining to combined sewers, which are treated before discharging to surface water resources. However, Sound Transit would provide required treatment for runoff from pollution-generating impervious surfaces before discharging to the surface water resource. In areas where project runoff would flow to a combined sewer, the runoff would be subject to flow control where required. This would prevent the additional runoff from the project from overloading and affecting the City and County pipe networks, and other combined sewer system infrastructure.

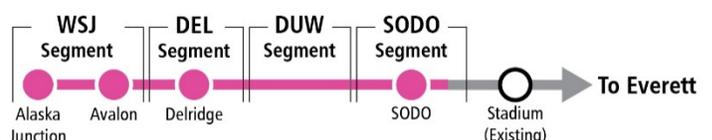
Impervious Surfaces

Impervious surfaces are hard surfaces that do not allow rainwater to seep through and enter groundwater beneath the surface. Impervious surfaces increase runoff volumes that can also increase pollutant runoff, flooding, and stream erosion. New impervious surfaces are areas that would replace existing pervious surfaces, where rainwater can seep through the surface and enter groundwater. Existing pervious surface areas are generally vegetated or bare ground.

Non-pollution-generating impervious surfaces in this project are guideways,¹ station buildings, and sidewalks. In general, runoff from non-pollution-generating impervious surfaces would not generate pollutants and would not be treated. Though these surfaces will not degrade water quality, additional impervious surface area could increase stormwater volumes and flow rates to affected waterbodies and decrease groundwater infiltration. Table 4.2.8-1 summarizes the estimated total impervious surface added with each alternative (these totals combine both pollution-generating and non-pollution-generating impervious surfaces). For further details, see Appendix L4.8, Water Resources, which quantifies the types of impervious surfaces added to areas not served by combined sewer systems.

Best management practices included as part of the project would minimize the effects of increased impervious surface. Where required by the City of Seattle, flow-control vaults would be added in areas of added impervious surfaces, such as roadway improvements, guideway, and at stations. Exceptions may include where runoff would flow to flow-exempt waterbodies or combined sewer systems if the City determines that the existing system has the capacity to handle the additional flow. The vaults would control the volume, rate, frequency, and flow duration of stormwater runoff. Stormwater vaults consist of concrete boxes sited below ground level, with access covers or grates at the surface. Water quality treatment would be provided when pollutant-generating impervious surface (roadway) runoff discharges into a storm drainage basin rather than a combined sewer system. In addition, at intersections that would experience higher traffic volumes and that are improved, additional oil control treatment would be provided. This provides supplemental removal of pollutants from areas with higher vehicle use. As noted,

¹ Sound Transit and Ecology 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 guideways. 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 Sound Transit will identify all known, available, and reasonable methods of prevention, control, and treatment to define light-rail specific best management practices.



if areas discharge to a combined sewer system, water quality treatment is not required as the runoff collected in these systems is directed to a wastewater treatment plant.

Table 4.2.8-1. Summary of Added Impervious Areas for West Seattle Link Extension Alternatives

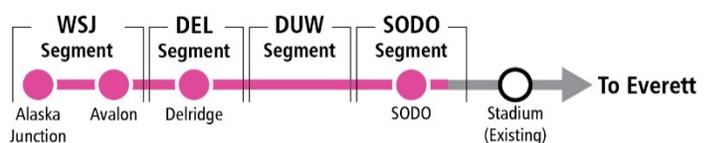
Segment	Alternative	Total New Impervious Surface (square feet)
SODO	Preferred At-Grade (SODO-1a)	3,100
	At-Grade South Station Option (SODO-1b)	7,100
	Mixed Profile (SODO-2)	3,700
Duwamish	Preferred South Crossing (DUW-1a)	65,700
	South Crossing South Edge Crossing Alignment Option (DUW-1b)	60,100
	North Crossing (DUW-2)	4,800
Delridge	Preferred Dakota Street Station (DEL-1a)	53,400
	Dakota Street Station North Alignment Option (DEL-1b)	44,600
	Preferred Dakota Street Station Lower Height (DEL-2a)*	51,300
	Dakota Street Station Lower Height North Alignment Option (DEL-2b)*	21,900
	Delridge Way Station (DEL-3)	48,300
	Delridge Way Station Lower Height (DEL-4)*	31,700
	Andover Street Station (DEL-5)	27,300
	Andover Street Station Lower Height (DEL-6)*	29,400
West Seattle Junction	Preferred Elevated 41st/42nd Avenue Station (WSJ-1)	35,900
	Preferred Elevated Fauntleroy Way Station (WSJ-2)	30,700
	Preferred Tunnel 41st Avenue Station (WSJ-3a)*	64,100
	Preferred Tunnel 42nd Avenue Station Option (WSJ-3b)*	30,700
	Short Tunnel 41st Avenue Station (WSJ-4)*	81,700
	Medium Tunnel 41st Avenue Station (WSJ-5)*	64,100

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

In addition, there are areas in all the project segments where older, existing impervious surfaces on the streets will be replaced with newer surfaces to improve their strength and durability.

Where required, runoff from replaced surfaces will also receive water quality treatment prior to discharging to surface waters. Some of these replaced surfaces are pollution-generating but currently do not receive treatment, because such treatment was not required when they were constructed. Adding treatment for these surfaces will result in additional reductions of pollutants, providing additional benefits to surface waters. These areas will be identified during subsequent design of the projects, based on pavement condition data to be collected.

A City requirement to direct stormwater from the project to storm drains that are within 300 feet of the project’s long-term footprint will be incorporated where opportunities exist. This will reduce flows to the combined sewer system, increasing available capacity. These opportunities



will be identified as the projects develop; one specific example is described under the Delridge Segment.

Groundwater

Increases in impervious area from the project could reduce the amount of groundwater recharge because there would be less pervious area available for precipitation to directly infiltrate into the ground. Low-impact design (also referred to as onsite stormwater management), which encourages natural processes of managing stormwater such as infiltration, evaporation, and dispersion, would be used where possible based on available property and soil infiltration, which could offset the effects of decreases in pervious area by increasing infiltration in some locations. As a result, the project is not expected to substantially impact groundwater levels.

Subsurface drainage systems would be required in certain locations where groundwater would be present behind foundations and retaining walls. The subsurface drainage systems would be designed to protect the project and manage the groundwater. In addition, project stormwater runoff from pollution-generating impervious surfaces would be treated as required before release, such that groundwater quality would not be adversely impacted. The following segment-specific sections mention locations where groundwater systems are currently expected to be needed; other locations may be identified during design after additional subsurface data are collected.

4.2.8.3.2 SODO Segment

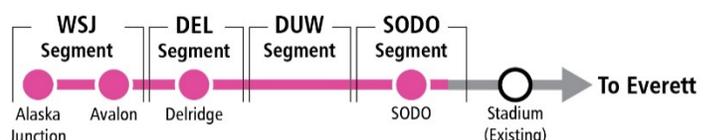
There would be no additional impacts to water resources in the SODO Segment beyond the applicable impacts common to all alternatives.

4.2.8.3.3 Duwamish Segment

Groundwater seeps along the West Duwamish Greenbelt would require a subsurface drainage system beneath the slope and elevated guideway of Preferred Alternative DUW-1a and Option DUW-1b to manage seepage and provide slope stability. The system would collect the groundwater flows upslope of the project and discharge flows downslope of the project. Due to this, negative impacts to groundwater or the Duwamish Waterway are not anticipated.

All of the Duwamish Segment alternatives would be on elevated guideway and would cross the Duwamish Waterway on a high-level fixed bridge. Sound Transit is evaluating the feasibility of several bridge types to cross the waterway. Depending on the bridge type selected, the water crossing could require guideway columns in the water. In-water guideway columns would be in the FEMA-classified floodplain and would have the potential to change the flow behavior of the waterbody around the columns.

As shown in Table 4.2.8-2, Alternative DUW-2 could have the greatest amount of water displacement from the guideway columns within the ordinary high-water mark of the Duwamish Waterway, depending on bridge type. Both Preferred Alternative DUW-1a and Alternative DUW-2 have the potential to avoid displacing water within the ordinary high-water mark, depending on bridge type. All work below the ordinary high-water mark would be within the mapped floodplain for the Duwamish Waterway. There is no mapped floodplain above the ordinary high-water mark; therefore, no structures would be placed in floodplain above the ordinary high-water mark. Potential changes to the mapped floodplain would be analyzed during final design if a bridge type is selected that results in impacts within the mapped floodplain, and Sound Transit would work to minimize impacts consistent with Executive Order 11988, Floodplain Management.



Preferred Alternative DUW-1a would require relocation of an 8-inch Port of Seattle stormwater outfall that discharges to the West Duwamish Waterway. The permanent impact area for this relocated outfall would be less than 0.1 acre and would be below the ordinary high-water mark. Alternative DUW-1b would require relocation of the same outfall as Preferred Alternative DUW-1a, as well as two 18-inch Port of Seattle stormwater outfalls, one that discharges to the West Duwamish Waterway and one that discharges to the East Duwamish Waterway. The permanent impact area for these relocated outfalls would be less than 0.1 acre total and would be below the ordinary high-water mark. Alternative DUW-2 would not require relocation of any outfalls. All outfall relocations are related to conflicts with bridge column foundation locations. Impacts to surface habitat in the Duwamish Waterway from the column footprint and outfall relocations are discussed in Section 4.2.9, Ecosystems.

Table 4.2.8-2. Summary of Bridge Column Volumes in the Duwamish Waterway

Alternative	Approximate Volume of Columns below Ordinary High-Water Mark (cubic yards)
Preferred South Crossing (DUW-1a)	0 to 6,600
South Crossing South Edge Crossing Alignment Option (DUW-1b)	6,560 to 9,840
North Crossing (DUW-2)	0 to 10,450

Notes:

Range reflects impacts from different possible bridge types.

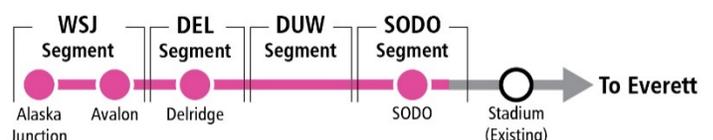
In-water column volumes include the volume of the columns (including pier caps) that are fully or partially in-water.

4.2.8.3.4 Delridge Segment

All Delridge Segment alternatives would drain to the storm drainage system (which drains into the Duwamish Waterway), or to a combined sewer system that would be conveyed to the West Point Wastewater Treatment Plant. During combined sewer overflow events, drainage would discharge to the Duwamish Waterway.

As shown on Figure 4.2.8-1, the Dakota Street and Delridge Way station alternatives all would cross Longfellow Creek at Southwest Genesee Street, but on different sides and distances from the street. The creek has a FEMA-designated 100-year floodplain on each side of Southwest Genesee Street, and all of these alternatives would have one or more elevated guideway columns in the floodplain. Sound Transit would establish the base flood elevation during preliminary design for the Preferred Alternative in the Final Environmental Impact Statement, and evaluate whether columns could be shifted to avoid or minimize impacts to the floodplain, consistent with Executive Order 11988, Floodplain Management. Alternatives DEL-5 and DEL-6* would not have columns in this floodplain. Appendix L4.8, Water Resources, provides more information on potential floodplain impacts. The elevated guideway for Alternative DEL-5 and Alternative DEL-6* would cross the creek where it is piped underground and there is no mapped floodplain. After being detained for flow control, runoff from these two alternatives would discharge downstream of the open creek channel and would not have an impact on the creek.

The Dakota Street and Delridge Way station alternatives could also have column foundations in close proximity to the Southwest Genesee Street Detention Dam or may require widening of the roadway to the north, affecting the emergency spillway. Although placement of column foundations within the dam fill is not expected based on the current level of design, Option DEL-1b and Option DEL-2b* would require widening of Southwest Genesee Street to the north. Sound Transit would coordinate with Seattle Public Utilities and Ecology to determine if any



modifications to the dam or emergency spillway would be needed to maintain the dam integrity or function. Modifications, if needed, could require a permit from Ecology’s Dam Safety Office.

4.2.8.3.5 West Seattle Junction Segment

There are no additional impacts to water resources in the West Seattle Junction Segment beyond the applicable impacts common to all alternatives.

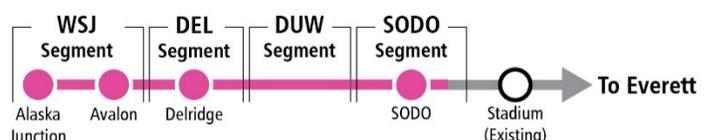
4.2.8.4 Environmental Impacts of the Build Alternatives during Construction

4.2.8.4.1 Impacts Common to All Alternatives

Construction-related impacts to water resources would be similar for all Build Alternatives because construction equipment and techniques would be similar. Alternatives with more at-grade or cut-and-cover portions would disturb more ground area and require more water pollution protective measures.

The following construction activities could affect water resources:

- **Earthwork, stockpiling, and material transport:** Soil exposed in sloped excavations or fills is especially susceptible to local erosion until vegetation is established. Wind can erode dry, exposed soil. Water or wind can carry loose soil into adjacent stormwater drains. Construction vehicle tires can carry soil onto roadways, where the soil could wash into ditches and storm drains during storms.
- **Concrete work and paving:** Runoff that encounters process water or slurry from concrete work or curing concrete can increase the pH in surface water to levels harmful to fish and wildlife.
- **Construction machinery:** Equipment leaks, or spills can affect water quality in nearby water resources. Construction-related pollutants can increase turbidity and affect other water quality parameters, such as oils and grease, pH levels, and/or the amount of available oxygen in the water.
- **Construction below the groundwater table:** In locations along the project corridor where construction of tunnels and underground stations would be at or below the groundwater table, groundwater dewatering would occur to keep construction excavations free of water to provide safe and workable spaces. This is a temporary impact to groundwater levels and flow. If the groundwater meets City and King County pollutant criteria, it would be discharged to an existing separated storm drain system, where available, or to the existing combined sewer system if there is capacity. Discussion of hazardous materials and procedures may be found in Section 4.2.12, Hazardous Materials. This has the potential to temporarily increase flow to existing infrastructure. Construction below the groundwater table also has the potential to impact the water quality of groundwater because of the construction machinery itself. In upland areas, where groundwater flows downward to surface waterbodies, and the Pigeon Point neighborhood, where seeps have been observed, this potential water quality impact would also apply to the nearby surface waterbodies.



Sound Transit would develop and implement a Construction Stormwater Pollution Prevention Plan, with the following plans (for further details, see Appendix L4.8, Water Resources):

- Temporary Erosion and Sediment Control Plan
- Spill Prevention, Control, and Countermeasures Plan
- Concrete Containment and Disposal Plan
- Dewatering Plan
- Fugitive Dust Plan

Sound Transit would use a variety of best management practices to avoid or minimize impacts during construction such as erosion, sedimentation, dust, and other water quality impacts. Best management practices could include stabilized construction site entrances, silt fencing, and the mulching or covering of stockpiles and other disturbed sites.

In upland areas, conventional best management practices such as construction limit fencing and mulching or other temporary covering of exposed soils as with plastic would reduce the erosion during construction. For example, in areas with steep slopes, workers would minimize disturbance and place erosion blankets over reseeded areas at the conclusion of construction. More information on best management practices can be found in Appendix L4.8, Water Resources.

Construction impacts specific to working in or near waterbodies are outlined in the subsections of the project containing waterbodies and/or where the project would affect groundwater.

4.2.8.4.2 SODO Segment

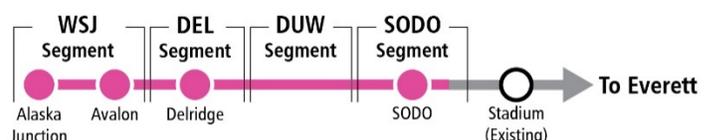
There are no additional impacts to the water resources in the SODO Segment beyond the applicable impacts common to all alternatives.

4.2.8.4.3 Duwamish Segment

Construction at waterbody crossings, such as the Duwamish Waterway, can pose a direct risk to water quality from pollutant spills, sediment runoff and transport, or wind deposition of stockpiled materials. Soil exposed in sloped excavations or fills during construction is especially susceptible to local erosion until vegetation is established. Water or wind can carry loose soil into adjacent waterbodies. Column construction activities within the Duwamish Waterway for the bridge structures, including coffer dams and work trestle foundations, would disturb sediments, potentially impacting water quality. Outfall relocations would also disturb sediments, but to a lesser degree than bridge columns because the area disturbed would be smaller and the construction duration would be less. Work barges used during construction to transport supplies or provide work cranes could also stir up sediments.

Sound Transit would use the best management practices described above and follow regulatory requirements to minimize these impacts.

All Duwamish Segment alternatives would cross the Duwamish Waterway and its shoreline on high-level bridges. As shown in Table 4.2.8-3, Option DUW-1b would have the largest in-water construction area on the Duwamish Waterway and Preferred Alternative DUW-1a would have the smallest. Sound Transit is considering several different types of high-level fixed bridges for crossing the waterway. Depending on the bridge type, the in-water footprint could potentially be reduced. All work below the ordinary high-water mark would be in the mapped floodplain for the Duwamish Waterway. There is no mapped floodplain above the ordinary high-water mark; therefore, no additional impacts would occur above the ordinary high-water mark.



Groundwater pump stations would be needed to control groundwater for alternatives near Pigeon Point. It is assumed that the groundwater in this area would be routed to detention facilities where necessary and discharged to storm drains where available.

Table 4.2.8-3. Summary of Construction Impacts to the Duwamish Waterway

Alternative	Approximate Area of Construction Impacts in Waterbody (acres)
Preferred South Crossing (DUW-1a)	0 to 0.3 ^a
South Crossing South Edge Alignment Option (DUW-1b)	0.2 to 1 ^a
North Crossing (DUW-2)	0 to 0.9

Note: Range reflects impacts from different possible bridge types.

^a Less than 0.1 acre of impact is associated with storm drain outfalls.

4.2.8.4.4 Delridge Segment

Though there are no columns in Longfellow Creek, construction activities could still impact the creek. The potential impacts associated with construction near waterbody crossings are as described for the Duwamish Segment and would be managed with the same best management practices. Longfellow Creek also requires protection from pollutants and streambed erosion during construction activities. Construction discharges to Longfellow Creek would be controlled to meet City and National Pollutant Discharge Elimination System permit requirements for water quality and flow rates.

4.2.8.4.5 West Seattle Junction Segment

Although tunnels would be tightly waterproofed, all tunnel alternatives in this segment would have a drainpipe to convey groundwater that may seep into the tunnel. The Sound Transit tunnel design criteria assume 0.2 gallon per minute of seepage per 250 feet of tunnel. These small flows would be pumped into the nearest storm or combined sewer system for disposal and are not expected to substantially affect the groundwater level around the tunnel alternatives.

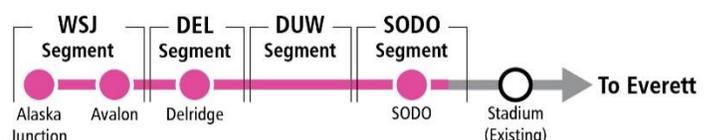
4.2.8.5 Indirect Impacts of the Build Alternatives

Population in Washington state is expected to increase, which would increase demand for development and vehicular traffic in many parts of the state. The project would convert some future vehicle traffic to light rail and reduce vehicle-related stormwater pollutants. This would be a benefit to water quality in the region.

The project could also indirectly attract residents and increase density near the new stations, reducing development pressure and associated increases in stormwater runoff in undeveloped areas in other portions of the watershed. The project would also support redevelopment around station areas, which could lead to associated infrastructure improvement. These redevelopment projects would be required to provide stormwater treatment which would improve water quality.

4.2.8.6 Mitigation Measures

The project would adhere to regulations and implement best management practices. Compensatory mitigation for impacts in the Duwamish Waterway would be required for all alternatives if a bridge type with in-water impacts is selected. Mitigation for unavoidable impacts in the Duwamish Waterway would be approved by the appropriate permitting agencies and jurisdictions before construction. See Section 4.2.9, Ecosystems, for additional information on compensatory mitigation.



4.2.9 Ecosystems

4.2.9.1 Affected Environment

The ecosystem study area includes all species and habitat within 200 feet of the project limits, as well as wetlands within 300 feet of the project limits. At water crossings, the study area extends 300 feet downstream and 100 feet upstream of the project limits, or to the extent that sound could travel underwater (e.g., to where sound reaches the nearest land mass). Documented observations of sensitive federal or state-listed species within 0.25 mile of the project limits and in Elliott Bay are also included. The project limits include permanent project improvements and areas needed for project construction.

Sound Transit evaluated ecosystem components by using:

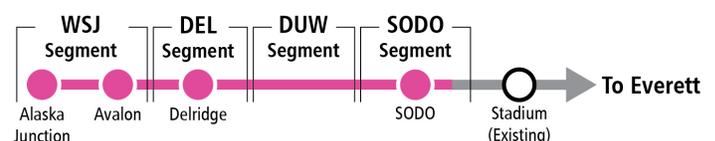
- Scientific literature
- Federal and state resource agency websites
- Consultation with Muckleshoot Indian Tribe, the Suquamish Tribe, the Confederated Tribes and Bands of the Yakama Nation, the Snoqualmie Indian Tribe, the Stillaguamish Tribe of Indians of Washington, the Tulalip Tribes of Washington, and federal, state, and local resource agencies
- Field investigations (especially at wetlands, streams, and waterbodies crossed by the project footprint)
- Aerial maps, GIS maps, and aerial images

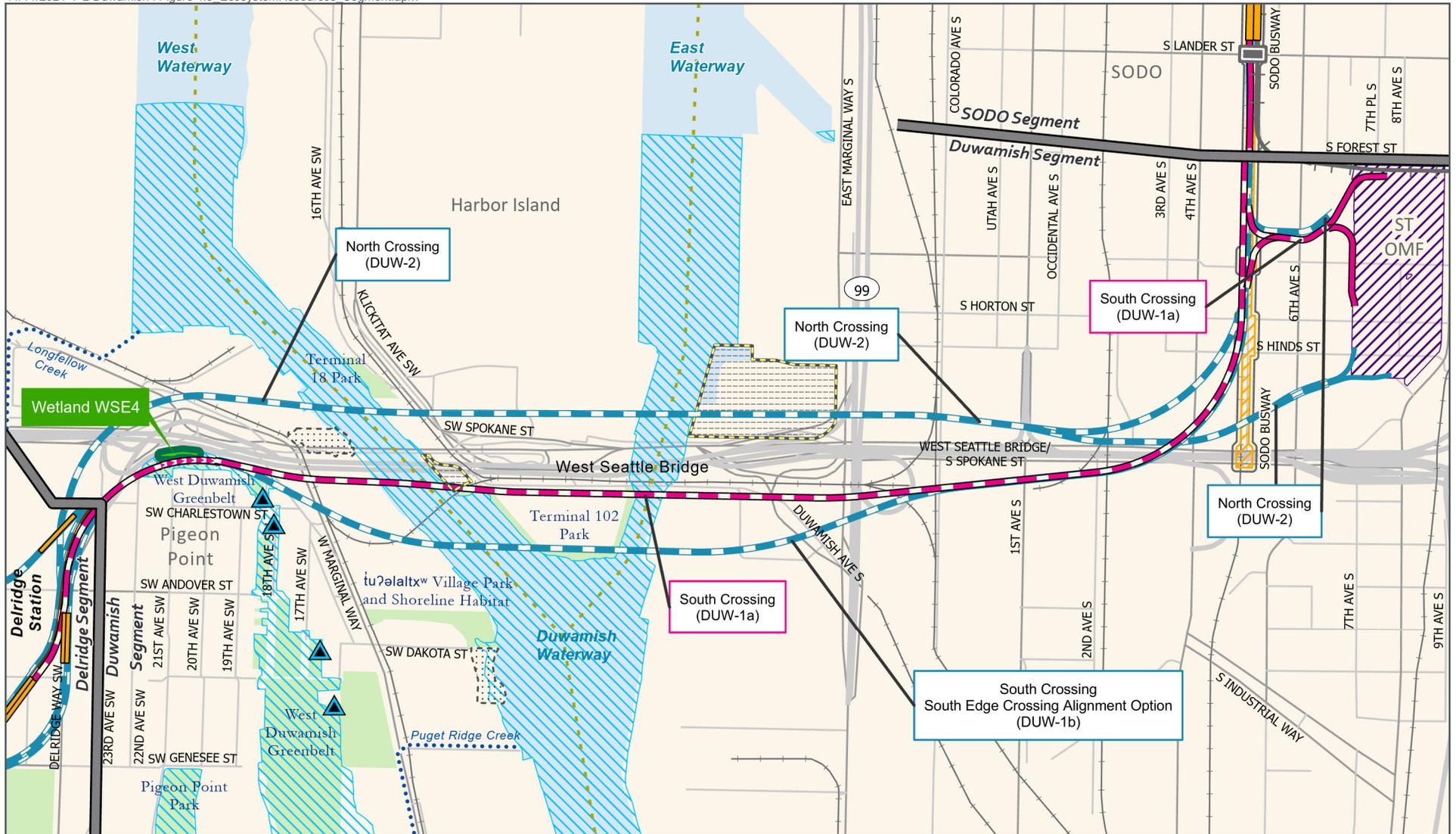
4.2.9.1.1 Aquatic Species and Habitat

The West Seattle Link Extension crosses two waterbodies: the Duwamish Waterway (also known as the Duwamish River) and Longfellow Creek (Figures 4.2.9-1 and 4.2.9-2). The Duwamish Waterway splits into two channels around Harbor Island (the West Waterway and East Waterway) before flowing into Elliott Bay, a large estuary system that provides habitat for a wide variety of fish species and marine mammals. Sensitive species in Elliott Bay are included in this analysis because in-water construction at the Duwamish Waterway crossing could create underwater noise audible in Elliott Bay.

The Duwamish Waterway, a Shoreline of the State, provides open water habitat, pockets of shoreline habitat in between industrial uses, and estuary habitat. The waterway is tidally influenced, and portions of the Duwamish Waterway contain intertidal mudflats. The waterway supports many species of native and introduced fish, including natural and hatchery runs of coho, Chinook, and chum salmon and steelhead and cutthroat trout. The waterway provides the single point of entry for these salmon species to access the Duwamish River/Green River system from Puget Sound and travel up to 60 miles inland.

Marine mammals such as killer whales, humpback whales, and harbor porpoise occasionally occur in Elliott Bay. Seals and sea lions also occur in the bay and may travel up the waterway from Elliott Bay into the study area. Osprey, bald eagle, great blue heron, and waterfowl use the waterway for foraging. A purple martin breeding site is present south of Harbor Island—purple martins and other migratory birds present in the study area are federally protected. The waterway's benthic habitat, which is the area along the bottom of a waterbody, is also key for nutrient cycling and for macroinvertebrates. Macroinvertebrates are prey for many of the above species.



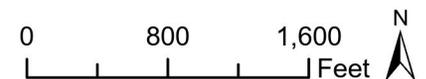


Source: City of Seattle, King County (2019, 2020, 2021), Washington Department of Fish and Wildlife (2019).



Notes: 1) The critical habitat shown is for Chinook salmon, steelhead and bull trout. 2) The WDFW Salmon Stock Inventory maps wild populations of salmon in the Duwamish Waterway and Longfellow Creek. 3) City and federal mapping of wetlands was reviewed and field verified where possible. Mapping may differ from other public wetland mapping sources.

FIGURE 4.2.9-1
Ecosystem Resources
 West Seattle Link Extension -
 Duwamish Segment
*West Seattle and
 Ballard Link Extensions*





Source: City of Seattle, King County (2019, 2020, 2021), Washington Department of Fish and Wildlife (2019).

Alternatives

- Preferred Alternative
- Preferred Alternative with Third-party Funding
- Other Alternatives

Alternative Profile

- Elevated
- Tunnel
- At-Grade
- Retained Cut

Station

- New

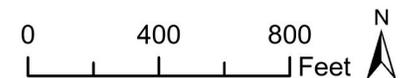
Legend:

- Segment Line
- Railroad
- Park
- ▲ Great Blue Heron Nest
- Stream
- ⋯ Piped Stream
- WDFW Priority Habitat
- Wetland
- Wetland Buffer

Notes: 1) The steelhead trout critical habitat follows the streams. 2) The WDFW Salmon Stock Inventory maps wild populations of salmon in Longfellow Creek. 3) City and federal mapping of wetlands was reviewed and field verified where possible. Mapping may differ from other public wetland mapping sources.

FIGURE 4.2.9-2
Ecosystem Resources
 West Seattle Link Extension -
 Delridge Segment

*West Seattle and
 Ballard Link Extensions*



The Duwamish Waterway flows through a heavily developed industrial area. Very little natural estuarine habitat or intertidal shoreline habitat remains within the study area. Conditions include bulkheads and steep shorelines comprised of rock, gravel, or a combination of rock with silty areas. Some of the shoreline is covered by over-water structures, and little vegetation is present. Below-water substrates include sand/mud, gravel, or rock, with limited aquatic vegetation. Some habitat for shorebirds is present among rocks or where silty sediment is exposed during low tides, such as along the shorelines of Harbor Island south of and underneath the West Seattle Bridge. Upland habitat within 200 feet of the Duwamish Waterway is fully developed.

Limited restoration work has occurred along the waterway within the study area: about 1 acre of industrial property has been restored to tidal marsh, mudflat, and riparian buffer along the west side of the West Duwamish Waterway. The Port of Seattle has identified a potential 9-acre habitat restoration project at Terminal 25 on the East Duwamish Waterway. Washington State Department of Ecology (Ecology) lists numerous water quality concerns in the waterway, including fecal coliform, Ammonia-N, and temperature (Ecology 2016). The river also provides a discharge point for many storm drains and combined sewer overflows, which route contaminants from the urban environment into the waterway. Three active Superfund sites along the river are undergoing remediation; two are within the study area (see Section 4.2.12, Hazardous Materials, for the status of these Superfund sites).

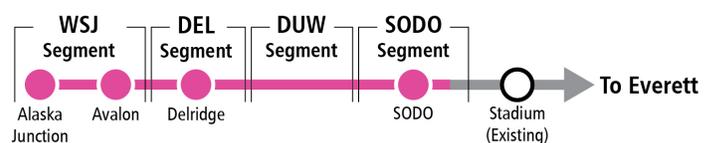
Longfellow Creek is a perennial stream that drains into the Duwamish Waterway. In the study area, the creek is an open channel running through the West Seattle Golf Course, within a culvert under Southwest Genesee Street, then an open channel again through the Longfellow Creek Natural Area. This section of the creek contains large, deep pools that can support fish (City of Seattle 2007). Downstream of the Longfellow Creek Natural Area, just south of Southwest Andover Street, the creek flows about 0.5 mile through a series of culverts to an outlet near Terminal 5 (City of Seattle 2012). The City of Seattle regulates the creek and its surrounding vegetation as a fish and wildlife habitat conservation area; the City regulates any development in or over the creek.

Adult Chinook, chum, steelhead, and coho salmon have been observed in Longfellow Creek up to the West Seattle Golf Course. Fish-passage barriers block anadromous salmon from reaching the segments of the creek upstream of the West Seattle Golf Course. Rainbow trout have also been documented in Longfellow Creek, and numerous releases of coho fry have occurred in the creek (King County 2016a; Puget Soundkeeper 2016; Kerwin and Nelson 2000).

Water quality in the creek is of high concern, as rated by Ecology’s water quality index. Longfellow Creek has periodic exceedances of dissolved oxygen, temperature, and fecal coliform bacteria beyond levels suitable for aquatic life (King County 2016b; Ecology 2016). Stormwater runoff from urban areas can also bring elevated concentrations of nutrients, bacteria, metals, pesticides, or other organic pollutants into the creek (City of Seattle 2007). Recent surveys of coho salmon in urban streams in Puget Sound, including Longfellow Creek, have documented abnormally high levels of pre-spawn mortality. Contaminants from urban stormwater runoff are being investigated as the likely cause, and stormwater treatment may be critical to the health of the coho run in Longfellow Creek (King County 2016a). Starting in the 1990s, ongoing physical and biological restoration efforts in the creek and in upland areas draining to the creek aim to improve the creek’s water quality and habitat quality.

4.2.9.1.2 Vegetation, Terrestrial Wildlife, and Wildlife Habitat

The West Seattle Link Extension runs through densely developed city and suburban properties that have been greatly altered from historical conditions. In the study area, land cover is



primarily urban, with about 80 percent developed with high-density buildings, industrial areas, and high- to moderate-density residential areas (National Land Cover Database 2016). These types of developed areas, with 50 to 100 percent impervious surfaces, have low potential for supporting native wildlife.

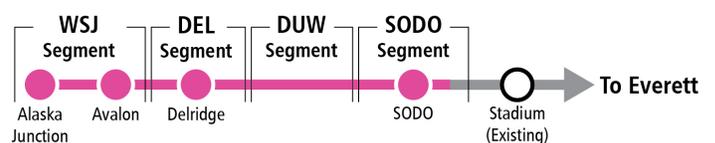
There are about 38 acres of forested habitat with moderate habitat value in the study area, making up only 5 percent of the overall study area. Wildlife habitat is limited to community parks (see Section 4.2.17, Parks and Recreational Resources), the West Seattle Golf Course, and two larger forested corridors: the West Duwamish Greenbelt and the Longfellow Creek Natural Area.

The West Duwamish Greenbelt is within the Duwamish Segment. The greenbelt stretches 4 miles south from the West Seattle Bridge along the western side of the Duwamish Waterway. The Washington Department of Fish and Wildlife designates the greenbelt as a Biodiversity Area and Corridor (a priority habitat). It is primarily deciduous forest with bigleaf maples and red alders, and provides habitat elements such as mixed forest snags, downed woody debris, and areas with multi-layered canopy. The Delridge Segment includes the greenbelt around Longfellow Creek (also a Washington Department of Fish and Wildlife-designated Biodiversity Area and Corridor), as well as developed open space in the West Seattle Golf Course and the Delridge Playfield and Community Center park. The golf course contains mowed fairways bordered with rows of trees and a few patches of forest. Delridge Playfield has lines of trees and the groundcover is primarily mowed lawn. Riparian habitat along Longfellow Creek is fragmented, but stream and riparian restoration projects, including native plantings and placement of large woody debris in the creek, have increased habitat quality within the study area.

These greenbelts, as well as the forested patches within the golf course, provide shelter for wildlife tolerant of proximity to urban areas, including deer, coyote, raccoon, squirrel, opossum, bats, and many species of birds. Voles and other small mammals might also occur in the greenbelts and in portions of the small parks and the golf course that have shrubs or herbaceous groundcover. Great blue herons have established nesting colonies (rookeries) within the West Duwamish Greenbelt in the study area, including at Pigeon Point just south of the West Seattle Bridge. A wetland along about 800 feet of Longfellow Creek (within the golf course) stores sediment deposited during high flows and provides riparian habitat for wildlife including waterfowl, herons, songbirds, small and large mammals, and amphibians.

Several raptor species are known to use these greenbelts for nesting, roosting, and foraging. The City of Seattle has historically mapped bald eagle nesting in the West Duwamish Greenbelt. Peregrine falcons are known to nest along the West Seattle Bridge on a nest platform placed on a bridge guideway column (Urban Raptor Conservancy 2019). Osprey may forage in the Duwamish Waterway, and may use trees or utility poles near the waterway for nesting. An artificial platform for nesting osprey is present near Sound Transit’s existing operations and maintenance facility on the eastern edge of the Duwamish Segment. The greenbelt trees and golf course trees also provide roosting and nesting habitat for raptors such as red-tailed hawk, merlin, and barred owl, and roosting opportunities for bald eagles.

Outside of small parks and the forested corridors described above, vegetation in the study area predominantly consists of street trees (ornamental and native), native and non-native shrubs along roadsides, and landscaping in residential yards. Street trees throughout Seattle can be nominated as a “heritage tree” based on their size, form, rarity, or historic contribution. No heritage trees are mapped within the project limits. However, project limits include other trees regulated by the City of Seattle’s tree protection code. This code covers heritage trees, any trees over 6 inches in diameter at breast height, and “exceptional trees”. Exceptional trees are defined as rare or exceptional due to their size, species, condition, cultural/historic importance,



age, or contribution to a grove, or that meet specific diameter thresholds (City of Seattle 2008). These trees and trees less than 6 inches in diameter that are within critical areas would require additional protection or mitigation under the City’s critical areas regulations.

Invasive plant species are present throughout the highly modified environment of the study area. These plants include Himalayan blackberry and non-native grasses. English ivy is prevalent as groundcover in the West Duwamish Greenbelt and in roadside areas under the West Seattle Bridge, where it is outcompeting native shrubs and young trees. English ivy is also present on some tree trunks and branches in the greenbelt; heavy infestations of ivy on tree branches can cause tree branches to break during storms.

4.2.9.1.3 Wetlands

Four wetlands were identified in the Duwamish and Delridge segments. All the wetlands are in areas altered by human development. Two wetlands (less than 0.1 acre in size) are rated as Category IV, and they have low habitat scores based on limited habitat complexity and their location adjacent to paved roads and other human disturbance. These wetlands receive water from groundwater and precipitation, as well as from stormwater runoff. The other two wetlands (between 0.4 and 0.5 acre in size) are higher-quality (Category II) as they flank the fish-bearing Longfellow Creek, to the north and south of Southwest Genesee Street. These wetlands provide multiple water quality, flood control, and habitat functions. Beaver activity is evident, shrub and tree layers provide shelter for wetland-associated mammals and birds, and areas with seasonal inundation could provide amphibian habitat. Additional details on individual wetlands are described in the Ecosystem Resources Technical Report, Appendix N.4.

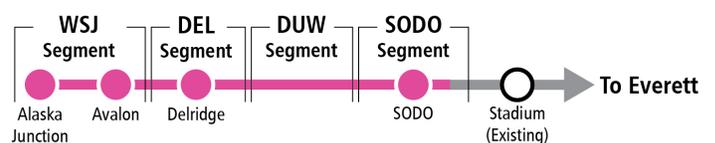
4.2.9.1.4 Threatened and Endangered Fish and Wildlife Species, Species of Concern, Essential Fish Habitat, and Washington Department of Fish and Wildlife Priority Species and Habitat

Table 4.2.9-1 summarizes federally listed species and species of concern that are known to occur or potentially occur in the West Seattle Link Extension corridor. The United States Fish and Wildlife Service and National Oceanic and Atmospheric Administration Fisheries have adopted final recovery plans for Chinook salmon, steelhead, and bull trout that guide recovery efforts throughout Puget Sound, including within the study area. The Chinook salmon plan includes recommendations to improve water quality in the lower 5 miles of the Duwamish River, and to restore intertidal habitat within the river where fresh water and salt water mix. The steelhead plan also recommends improvements to habitat complexity in the lower reaches of rivers.

The Magnuson-Stevens Fishery Conservation and Management Act protects essential fish habitat for federally managed species. In addition to the essential fish habitat listed in Table 4.2.9-1, the Duwamish Waterway is also mapped as essential fish habitat for all life stages of groundfish, finfish, coastal pelagic species, and salmonids. Longfellow Creek is in a watershed mapped as essential fish habitat for pink salmon.

The Washington Department of Fish and Wildlife data show the following priority species of salmonids using the Duwamish Waterway: sockeye, odd-year pink, and fall chum salmon, and resident cutthroat trout. Coho and chum salmon have also been documented in Longfellow Creek (King County 2016a). Elliott Bay contains priority species including harbor porpoise, harbor seal, and California and Steller sea lions, and contains priority estuary habitat.

Washington Department of Fish and Wildlife has identified the Longfellow Creek Natural Area and West Duwamish Greenbelt as priority biodiversity areas and wildlife corridors. Terrestrial



priority species that could occur in the greenbelts include Townsend’s big-eared bat, pileated woodpecker, band-tailed pigeon, and Vaux’s swift. The great blue heron is also a Washington Department of Fish and Wildlife priority species, and the City of Seattle has designated it as a species of local importance (Seattle Municipal Code 25.09.200(C)5).

Table 4.2.9-1. Listed Species and Species of Concern Potentially Occurring in the West Seattle Link Extension Study Area

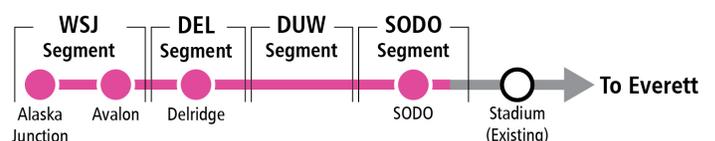
Common Name	Status	Occurrence in Study Area
Bull trout	Federal Threatened; State Candidate	Documented in Duwamish Waterway; critical habitat in Elliott Bay and Duwamish Waterway.
Chinook salmon	Federal Threatened; State Candidate	Documented in Elliott Bay, Duwamish Waterway, and Longfellow Creek; critical habitat in Elliott Bay, Duwamish Waterway; essential fish habitat in Duwamish Waterway and Longfellow Creek.
Steelhead trout	Federal Threatened	Documented in Elliott Bay, Duwamish Waterway, and Longfellow Creek; critical habitat in the Duwamish Waterway and Longfellow Creek.
Bocaccio	Federal Endangered; State Candidate	Likely in Elliott Bay, potential in Duwamish Waterway; critical habitat in Elliott Bay.
Yelloweye rockfish	Federal Threatened; State Candidate	Likely in Elliott Bay, potential in Duwamish Waterway; critical habitat in Elliott Bay.
Southern resident killer whale ^a	Federal Endangered	Documented in Elliott Bay; critical habitat in Elliott Bay.
Humpback whale ^a	Federal Endangered, State Endangered	Documented in Puget Sound, potential in Elliott Bay.
Green sturgeon ^a	Federal Threatened	Unlikely; could occur in Elliott Bay but no spawning occurs in Puget Sound rivers.
Pacific eulachon ^a	Federal Threatened	Unlikely; closest documented spawning is in southern British Columbia.
Marbled murrelet	Federal Threatened; State Threatened	Marbled murrelets occur in Elliott Bay and may also access the Duwamish Waterway for foraging.
Steller sea lion ^a	Federal Species of Concern	Documented in Elliott Bay; potential in Duwamish Waterway.
Pacific cod ^a	Federal Species of Concern; State Candidate	Documented in Elliott Bay and Duwamish Waterway.
River lamprey	Federal Species of Concern	Documented in Elliott Bay; potential in Duwamish Waterway.
Coho salmon	Federal Species of Concern	Documented in Duwamish Waterway and Longfellow Creek; essential fish habitat in Duwamish Waterway and Longfellow Creek.

Sources: United States Fish and Wildlife Service 2019, National Oceanographic and Atmospheric Administration 2019, Washington Department of Fish and Wildlife 2018.

^a Listed marine species found in Elliott Bay but not the Duwamish Waterway are included here because in-water construction noise could reach the bay.

4.2.9.2 Environmental Impacts of the No Build Alternative

The No Build Alternative would not have any direct impacts on ecosystem resources.



4.2.9.3 Environmental Impacts of the Build Alternatives during Operation

Sound Transit analyzed the potential long-term impacts of operation of the West Seattle Link Extension Build Alternatives on ecosystem resources in the study area. These impacts would include permanent loss of habitat that is replaced with light rail facilities. Permanent changes in habitat adjacent or nearby the light rail facilities are also considered.

4.2.9.3.1 Impacts Common to All Alternatives

The West Seattle Link Extension would have long-term impacts on ecosystem resources in the study area except in the SODO Segment, where no ecosystem resources are present. In some areas, the guideway would be within or near existing forested habitat. Vegetation and wildlife habitat within and 15 feet beyond the footprint of the guideway would be permanently converted from forested or scrub/shrub vegetation to light rail. During operation, Sound Transit would continue to remove “hazard trees” (trees that might cause a hazard to light rail operations) throughout project operations as needed. Removing street trees with trunks larger than 6 inches in diameter during maintenance activities would require coordination with the City of Seattle.

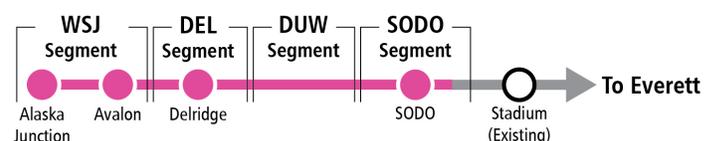
Based on the urban environment of the study area, the operation of any alternatives has a low potential to affect the viability of local wildlife populations. Directly impacted land cover is highly modified and dominated in many areas by impervious surface or invasive species. Most vegetation has low value for wildlife. The alternatives would primarily be along existing road and rail corridors (existing barriers to wildlife movement) so would not affect areas that currently serve as connective corridors to wildlife.

Although the potential for adverse effects would be low, operations could impact vegetation and wildlife over the long term. For example, maintenance activities that involve the removal of vegetation during the breeding season could require removal of nests, eggs, or birds protected under the Migratory Bird Treaty Act. At-grade guideways would reduce the amount of habitat for small mammal species. Vegetated areas would be changed to impervious surfaces, which increases runoff volumes. However, as described in Section 4.2.8, Water Resources, stormwater from project-related impervious surfaces would receive flow control as required by the City of Seattle and, where appropriate, water quality treatment.

Some of the guideway and other features would be elevated. This reduces the amount of light and rainfall reaching vegetation. Based on the existing high levels of noise and vehicle traffic throughout the study area, as well as human activity associated with residential, commercial, and industrial development in the study area, wildlife that use habitats adjacent to the light rail alternatives are likely accustomed to noise and human activity. Therefore, the potential is low for disturbance from increased human access, noise, and light. Some species may move farther into greenbelt habitat to avoid the immediate area of the light rail, but these minor localized movements would not affect these species' viability.

4.2.9.3.2 SODO Segment

The SODO Segment travels through a primarily industrial district. Ecosystem resources are not present in this segment; therefore, there would be no impacts to ecosystems. Long-term effects would be limited to updates to stormwater systems (see Section 4.2.8).



4.2.9.3.3 Duwamish Segment

Table 4.2.9-2 lists long-term ecosystem impacts. All the Duwamish Segment alternatives would be on elevated guideway through industrial areas and would cross the Duwamish Waterway. Sound Transit is evaluating multiple high-level fixed bridge types to cross the waterway. Depending on the bridge type, the water crossing could require bridge guideway columns in the water. Option DUW-1b would have in-water bridge guideway columns for all bridge types, while some bridge types for Preferred Alternative DUW-1a and Alternative DUW-2 could avoid guideway columns in water. In-water guideway columns may also include a pier-protection system when sited adjacent to the navigation channel.

Preferred Alternative DUW-1a would require relocation of an 8-inch Port of Seattle stormwater outfall that discharges to the West Duwamish Waterway. Option DUW-1b would require relocation of the same outfall as Preferred Alternative DUW-1a, as well as two 18-inch Port of Seattle stormwater outfalls, one that discharges to the West Duwamish Waterway and one that discharges to the East Duwamish Waterway. Alternative DUW-2 would not require relocation of any outfalls. All proposed outfall relocations are related to conflicts with bridge column foundation locations.

Table 4.2.9-2. Long-term Impacts to Ecosystems – Duwamish Segment

Alternative	Wetlands (acres) ^{a, b}	Wetland Buffers (acres) ^a	Shoreline (linear feet)	Biodiversity Area (acres) ^c	Over-water Structures (acres) ^d	In-water (Benthic Surface) Impacts (acres) ^e
Preferred South Crossing (DUW-1a)	0 to 0.1	0.1 to 0.6	600	1.5 to 2.2	0.6 to 0.8	0 to <0.1 ^f
South Crossing South Edge Crossing Alignment Option (DUW-1b)	0	0.2	500	1.9	0.7 to 0.9	<0.1 to 0.4 ^f
North Crossing (DUW-2)	0	0	500	0	0.7 to 0.9	0 to 0.5

^a To estimate wetland impacts, the impact analyses for all alternatives assumed areas under elevated guideways as permanently impacted.

^b Ranges shown for wetlands and biodiversity area reflects differences from connecting to different alternatives in adjacent segments.

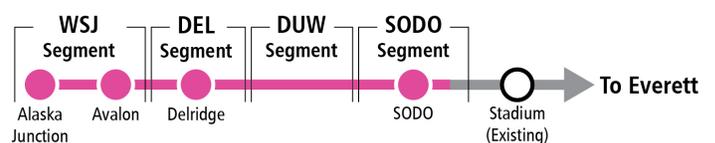
^c Biodiversity areas are forested corridors mapped by the City of Seattle and identified by Washington Department of Fish and Wildlife as priority habitats.

^d This area represents the total area of elevated bridge features over the Duwamish Waterway; this does not include bridge guideway columns and pile caps in the water; these are shown in the permanent in-water (benthic surface) impacts column.

^e The range of impacts shown represent impacts from different bridge types; pile cap locations would vary by bridge type, and some bridge types could avoid in-water work. In-water benthic surface impacts include columns and pile caps that are either fully or partially in-water.

^f Less than 0.1 acre of impact is associated with storm drain outfalls.

In-water columns and pier-protection systems would permanently change shoreline, benthic habitat, and in-water habitat within waters that are essential fish habitat and critical habitat for listed salmon species. The columns would not directly conflict with current projects to restore intertidal habitat under Chinook or steelhead salmon recovery plans. However, the columns would increase the steepness of some shoreline patches where they are not currently armored.



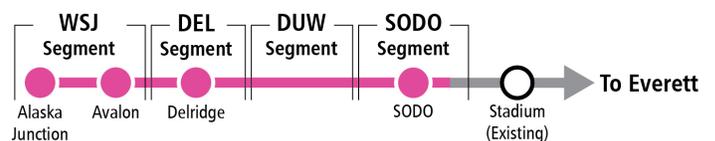
Recovery plans for listed salmon identify shallow areas of shoreline as important to migrating salmonids. Guideway columns and pier-protection systems along the shoreline could change the movement patterns of migrating salmon, and navigation lights on the bridge structure could alter the nighttime swimming behavior of juvenile salmonids, which may avoid these areas to avoid potential predation, or seek these areas to feed on prey. The bridge guideway columns could cover up to about 18,370 square feet (about 0.5 acre) of bottom habitat that is currently accessible to fish and benthic invertebrates. The covered area of benthic habitat could reduce the amount of productivity in these benthic locations. Over-water shading from the guideway is not likely to change fish behavior or impact benthic productivity or temperature in the waterway, as the bottom of the bridge would have a clearance of approximately 90 to 135 feet above the water. Some bridge types would require pile cap structures close to the waterline that would prevent daylight from reaching the waters and benthic surface below them. This could reduce productivity and also increase areas for predator fish to shelter that may prey upon young migrating salmonids.

Preferred Alternative DUW-1a and Option DUW-1b would cross the north end of the West Duwamish Greenbelt on a mix of elevated and retained-cut guideway. Trees and understory vegetation (primarily non-native Himalayan blackberry and English ivy) would be removed. Low-growing vegetation may be used to stabilize this slope, but large trees would not be allowed near the guideway for safety reasons. Some of the trees that would be removed in the West Duwamish Greenbelt are within the core zone of the management area for a great blue heron colony, and the guideway would also pass close to a known peregrine falcon nesting site on the West Seattle Bridge. Preferred Alternative DUW-1a would pass closer to the falcon nest and Option DUW-1b would pass closer to the heron colony. Although the falcons are already habituated to an urban environment and traffic on nearby roads and bridges, under either Preferred Alternative DUW-1a or Option DUW-1b the light rail trains moving close to the nest could affect their return to this artificial nest location. Both alternatives would affect the buffer of a Category IV wetland.

Preferred Alternative DUW-1a would impact the habitat enhancements that may occur at the City of Seattle’s Bluefield Holdings/Wildlands Site 2 shoreline restoration project, and could require modifications to the site. Alternative DUW-2 would cross the Duwamish Waterway on the north side of the West Seattle Bridge, avoiding impacts to the greenbelt, the Category IV wetland, and the heron colony. Alternative DUW-2 may require relocation of the artificial nesting platform for osprey on the eastern edge of the Duwamish Segment; the platform would be relocated in the vicinity to ensure continued use. This alternative could also impact about 600 square feet of the Port of Seattle’s proposed habitat restoration project at Terminal 25. Sound Transit would coordinate with the Port to identify to identify potential modifications to the restoration site design. The guideway would be at least 90 feet above the site such that no impacts on vegetation from shading are expected.

4.2.9.3.4 Delridge Segment

Table 4.2.9-3 compares the ecosystem impacts of the alternatives in the Delridge Segment. Preferred Alternative DEL-1a would parallel the north end of the West Seattle Golf Course. It would cross over a culverted portion of Longfellow Creek on an elevated guideway and avoid direct impacts to the creek; guideway columns would be placed on existing impervious surface or vegetated street rights-of-way outside of stream boundaries. Guideway columns would also be placed outside of the boundary of the wetlands along Longfellow Creek; however, the alternative would impact the wetland buffer that consists of mowed grass along the roadside or on paved roadway where wetland buffer function is currently not provided. Other alternatives that follow Southwest Genesee Street (Option DEL-1b, Preferred Alternative DEL-2a*, Option



DEL-2b*, Alternative DEL-3, and Alternative DEL-4*) would have similar long-term impacts to the stream and wetlands.

All of the alternatives following Southwest Genesee Street would require some vegetation removal along the southern side of the street at the north boundary of the West Seattle Golf Course. The vegetation here consists of mowed grass areas and small to moderate-height trees, including small ornamental trees, Douglas fir, and western hemlock trees. Options DEL-1b and DEL-2b* would also impact roadside vegetation on the northern side of Southwest Genesee Street. Option DEL-1b is farther north at the Longfellow Creek biodiversity area and therefore would have the greatest impact to this resource (Table 4.2.9-3). Preferred Alternative DEL-1a and Alternative DEL-3 would remain elevated over Southwest Genesee Street but would require column foundations where trees are currently growing along the golf course edge. Preferred Alternative DEL-2a* and Alternative DEL-4* descend to retained-cut guideway in the northwestern corner of the golf course. This would remove some trees and grassy areas, but these alternatives would avoid impacts to the biodiversity area along Longfellow Creek. Wildlife could continue their current movement under the elevated guideway.

Table 4.2.9-3. Long-term Impacts to Ecosystems – Delridge Segment

Alternative	Wetlands (acres) ^a	Wetland Buffers (acres) ^a	Biodiversity Corridor (acres) ^b
Preferred Dakota Street Station (DEL-1a)	0	0.5	0
Dakota Street Station North Alignment Option (DEL-1b)	0	0.8	0.1
Preferred Dakota Street Station Lower Height (DEL-2a)*	0	0.4	0
Dakota Street Station Lower Height North Alignment Option (DEL-2b)*	0	0.6	<0.1
Delridge Way Station (DEL-3)	0	0.6	0
Delridge Way Station Lower Height (DEL-4)*	0	0.5	0
Andover Street Station (DEL-5) ^c	0	0	<0.1
Andover Street Station Lower Height (DEL-6)* ^c	0	0	0

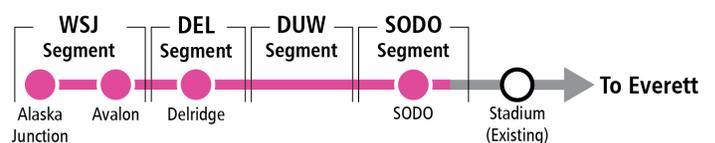
* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

^a To estimate wetland or critical areas impacts, the impact analyses for all alternatives assumed areas under elevated guideways as permanently impacted.

^b Biodiversity areas are forested corridors mapped by the City of Seattle and identified by Washington Department of Fish and Wildlife as priority habitats.

^c Critical areas 300 feet upstream of this alternative still need to be confirmed with field reconnaissance.

Alternatives DEL-5 and DEL-6* would avoid impacts to wetlands and wetland buffers along Genesee Street and would have no impact on Longfellow Creek, because the creek is culverted under Southwest Andover Street. Guideway columns for these alternatives could require removing a few Douglas fir, spruce, or red alder trees in the greenbelt along Longfellow Creek. The elevated crossings over Longfellow Creek for all alternatives would not preclude future projects to daylight portions of the creek currently flowing through culverts. Wildlife could continue their current movement under the elevated guideway. No stormwater from the project would be discharged into Longfellow Creek.



4.2.9.3.5 West Seattle Junction Segment

None of the Build Alternatives would have direct long-term impacts to wetlands, aquatic habitat, critical habitat for any species, or biodiversity areas in the West Seattle Junction Segment. Long-term effects related to vegetation and wildlife would be limited to permanent removal and replacement of some street trees with all alternatives.

4.2.9.4 Environmental Impacts of the Build Alternatives during Construction

4.2.9.4.1 Impacts Common to All Alternatives

Construction would last 3 to 4 years for elevated portions of the alternatives and 4 to 5 years for tunnel portions of the alternatives, although active construction would be intermittent during these timeframes. For the tunnel alternatives, ground disturbance would happen at tunnel portals. For surface alternatives, ground-disturbing activities would include clearing of existing vegetation, soil fill, excavation and grading, drainage system relocation, ground improvement activities, and dewatering. Ground-disturbing activities could introduce sediment and contaminants (e.g., runoff from stockpiled soils, spilled fuels from construction equipment) to aquatic habitat or stormwater features. Temporarily disturbed sites that are currently vegetated would be replanted immediately following construction in each project segment to restore or improve upon pre-construction conditions (e.g., replacing non-native weeds with native plants), and low-growing vegetation would likely become reestablished within a year or two. Some areas of currently forested greenbelt would be restored with herbaceous or shrub species close to the guideway.

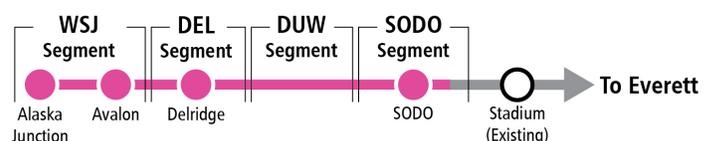
All alternatives would require removal of or disturbance to street trees. Several alternatives would also require removal of native trees and other existing vegetation within habitat biodiversity areas. During construction, removing street trees with trunks larger than 6 inches in diameter or any trees in critical areas would require coordination with the City of Seattle. Some of these trees could be removed entirely; others would be replaced with the same or similar trees.

4.2.9.4.2 SODO Segment

Construction in the SODO Segment would have no impacts to ecosystems other than street trees.

4.2.9.4.3 Duwamish Segment

Estimated construction impacts are summarized in Table 4.2.9-4. Depending on bridge type, all Duwamish Segment Build Alternatives could require constructing bridge foundations in or partially in the Duwamish Waterway. If in-water bridge foundations are needed, most bridge designs would require a temporary cofferdam system to be built around each bridge guideway column location as described in Chapter 2, including how a temporary cofferdam system would be installed. One bridge type for Preferred Alternative DUW-1a could require piles for one guideway column to be vibrated or drilled into place without a cofferdam. Temporary work trestles on in-water support pilings and construction barges would also be used during construction. Cofferdam placement and removal, pile-driving, trestle-support construction (and eventual removal), and movement of construction barges would disturb benthic habitat and sediments and create temporary turbidity in the vicinity, in areas of critical fish habitat. Outfall relocations would also disturb sediments, but to a lesser degree than bridge columns because



the area disturbed would be smaller and the construction duration would be less. Suspended sediments from this construction in the Duwamish Waterway might contain contaminants because this excavation would be occurring in the Harbor Island Superfund Site and potentially in the Lower Duwamish Waterway Superfund Site. Construction methods and activities in the area of the Superfund sites would be coordinated with the United States Environmental Protection Agency and Ecology, to avoid conflicts with existing and future cleanup actions at the Superfund site. Additionally, for project elements within the Harbor Island Superfund site or the Lower Duwamish Waterway Superfund site, Sound Transit would coordinate with the United States Environmental Protection Agency and Ecology on any potential protective measures or restrictions that might be required for the project.

Table 4.2.9-4. Construction Impacts to Ecosystems – Duwamish Segment

Alternative	Wetlands (acres) ^a	Wetland Buffers (acres) ^{a, b}	Shoreline (linear feet)	Biodiversity Area (acres) ^{b, c}	Approximate Area of Impacts in Waterbody (acres) ^{d, e}
Preferred South Crossing (DUW-1a)	0 to <0.1	0 to 0.2	400	0.2 to 0.4	0 to 0.5 ^f
South Crossing South Edge Crossing Alignment Option (DUW-1b)	<0.1	0.2	1,000	0.6	0.6 to 1.0 ^f
North Crossing (DUW-2)	0	0	700	0	0 to 0.9

Note: Construction impacts represent areas temporarily impacted by the project, outside of the long-term project footprint.

^a To estimate wetland impacts, the impact analyses for all alternatives assumed a complete loss of wetland or buffer within the construction footprint.

^b Ranges shown for wetlands and biodiversity areas reflect differences from connecting to different alternatives in adjacent segments.

^c Biodiversity areas are forested corridors mapped by the City of Seattle and identified by Washington Department of Fish and Wildlife as priority habitats.

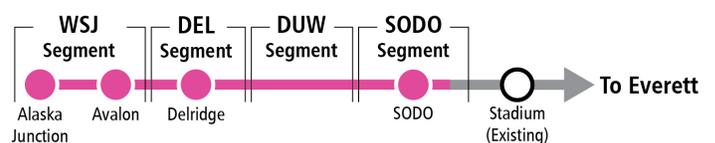
^d These construction in-water impacts represent the total area of the cofferdam footprints, piles, and work trestle column support footprints that would be placed on the benthic surface, minus the area of guideway columns and pile caps that will remain permanently within that same footprint. All this in-water work would occur in salmonid critical habitat and essential fish habitat.

^e Ranges shown for in-water impacts represent different bridge types; the number and position of cofferdams, piles, and work trestles could vary by bridge type, and two bridge types for Preferred Alternative DUW-1a and Alternative DUW-2 could avoid in-water work.

^f Less than 0.1 acre of impact is associated with storm drain outfall relocations.

The barges and work trestles would also temporarily shade benthic habitat; this shade could affect fish movements through the waterway. During construction, temporary lighting close to the water will be used on the temporary cofferdams, work trestles, and associated barges. Changes in underwater light regimes at night can alter fish movements and can affect predator/prey interactions in a way that could be harmful to fish.

Cofferdam installation and pile-driving could create noise loud enough to potentially injure fish or marine mammal species or change their movements through the area. Underwater sound could travel unimpeded down the East Duwamish Waterway and would therefore be audible to sensitive species within Elliott Bay. While the cofferdam is in place, the dewatered areas would exclude habitat from use by aquatic species, including listed fish species and benthic invertebrates. Dewatering of the cofferdam would cause mortality of benthic organisms present in the cofferdam area. Placement of and construction on barges and trestles would also create



construction noise. Best management practices would be used during all over-water construction to contain any spills of fuel, oil, or other contaminants from construction equipment.

If Alternative DUW-2 requires relocation of the osprey nesting platform near the Operations and Maintenance Facility Central, this would be performed outside the nesting season using standard permits and protocols for osprey nest relocation.

Construction of Preferred Alternative DUW-1a or Option DUW-1b would impact the West Duwamish Greenbelt and a small Category IV wetland (Table 4.2.9-4). Construction noise could disturb wildlife in the greenbelt and would occur within the great blue heron management area. A portion of the steep slope at Pigeon Point (at the north end of the greenbelt) would need to be stabilized using slope drains, soil nails, and other reinforcement that would require ground disturbance and noise. Vegetation would be cleared within the construction footprint near known great blue heron nest trees. In addition, hazard trees would be removed in and adjacent to the construction zone. The amount of greenbelt impact would vary depending on the design option or the specific connection to the Delridge Segment, but all would require some tree removal within the great blue heron management area. Alternative DUW-2 would avoid construction impacts to the greenbelt, the great blue heron colony’s year-round buffer, and the small wetland. The construction footprint of Alternative DUW-2 does overlap the edge of the heron’s seasonal buffer. Pile-driving strike noise from Preferred Alternative DUW-1a or Option DUW-1b could temporarily exceed existing ambient noise levels at the colony (which include traffic and industrial noise, and frequent train horns). Strike noise from Alternative DUW-2 could also be audible at the colony but is not expected to exceed ambient noise levels. If the Port of Seattle’s proposed habitat restoration site at Terminal 25 is constructed prior to the West Seattle Link Extension, Alternative DUW-2 would temporarily impact about 0.4 acre of the site.

4.2.9.4.4 Delridge Segment

Table 4.2.9-5 summarizes construction impacts to ecosystems in the Delridge Segment. The alternatives following Southwest Genesee Street (Preferred Alternative DEL-1a, Option DEL-1b, Preferred Alternative DEL-2a*, Option DEL-2b*, Alternative DEL-3, and Alternative DEL-4*) would have similar impacts to wetland buffers and the Longfellow Creek Natural Area during construction. Option DEL-2b* would have a small impact to the western corner of the wetland north of Southwest Genesee Street. Alternatives DEL-5 and DEL-6* would avoid wetland and wetland buffer impacts. Wetland buffer areas disturbed during construction would be revegetated using native vegetation, and would replace current non-native vegetation; this could lead to long-term improvements in riparian habitat along the creek and wetlands.

4.2.9.4.5 West Seattle Junction Segment

Preferred Alternative WSJ-3a* and Preferred Option WSJ-3b* would include construction staging at the edge of a wetland buffer on existing paved surfaces that do not provide buffer functions or would occur in unpaved areas separated from the wetland by a paved road. These tunnel alternatives could also require removal and replacement of some street trees and other ground vegetation in cut and cover locations, but these areas would be revegetated and restored after construction. No other temporary impacts to ecosystems would occur in the West Seattle Junction Segment because this segment has no natural vegetation or critical areas; vegetation is limited to residential landscaping and street trees.

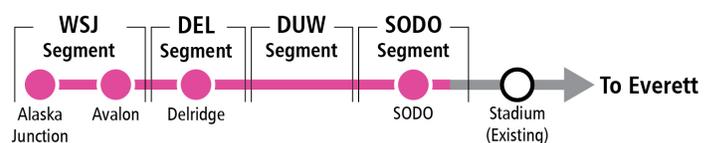


Table 4.2.9-5. Construction Impacts to Ecosystems – Delridge Segment

Alternative	Wetlands (acres)	Wetland Buffers (acres)	Biodiversity Corridor acres) ^a
Preferred Dakota Street Station (DEL-1a)	0	0.4	0.1
Dakota Street Station North Alignment Option (DEL-1b)	0	0.4	<0.1
Preferred Dakota Street Station Lower Height (DEL-2a)*	0	0.4	<0.1
Dakota Street Station Lower Height North Alignment Option (DEL-2b)*	<0.1	0.4	<0.1
Delridge Way Station (DEL-3)	0	0.4	<0.1
Delridge Way Station Lower Height (DEL-4)*	0	0.4	0
Andover Street Station (DEL-5) ^b	0	0	<0.1
Andover Street Station Lower Height (DEL-6)* ^b	0	0	0

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

Notes:

Construction impacts represent areas temporarily impacted by the project, outside of the long-term project footprint.

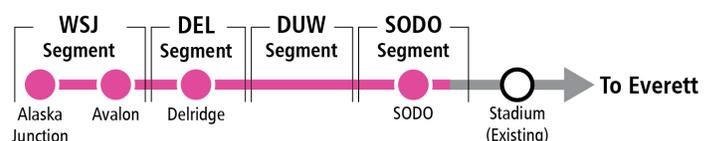
^a Biodiversity areas are forested corridors mapped by the City of Seattle and identified by Washington Department of Fish and Wildlife as priority habitats.

^b Critical areas 300 feet upstream of this alternative still need to be confirmed with field reconnaissance.

4.2.9.5 Indirect Impacts of the Build Alternatives

Indirect impacts to ecosystem resources would be limited as the project would be in areas that are already densely developed. The West Seattle Link Extension would not interfere with future habitat improvement projects such as culvert replacements along Longfellow Creek or habitat restoration efforts along the creek. Along the Duwamish Waterway, if guideway columns are placed along the Harbor Island shoreline, they would prevent future restoration at those specific locations (see the impacted length of shoreline in Table 4.2.9-2). However, the area directly adjacent to the guideway columns would retain opportunities for habitat enhancement.

Where the guideway would cross the Duwamish Waterway, bridge guideway columns could cover benthic habitat in the waterway that currently provides substrate for invertebrates and aquatic vegetation. Some productivity would be lost, which could in turn affect the availability of prey species for salmonids and marine mammals using the waterway. A change in distribution of the prey species could change the movement patterns of salmonids or marine mammals. Under some bridge designs, guideway columns would be placed partially onshore. These columns could remove small patches of intertidal silt, rock, or gravel shoreline from an area with already-degraded baseline conditions, and would prevent these patches from being considered for future restoration efforts under the Chinook and steelhead salmon recovery plans. Elevated guideways would add impervious surfaces that have the potential to change hydrology at Longfellow Creek and the associated wetlands, and at the wetland at the north end of the West Duwamish Greenbelt. The guideways have the potential to intercept and reroute water flow. However, the Longfellow Creek wetlands receive most of their water from the creek itself and are not expected to experience any hydrology or water quality changes from the new guideway.



Improved stormwater detention could minimize these effects to the West Duwamish Greenbelt wetland (see Section 4.2.8).

Construction could contribute to the spread of invasive plant species by transporting them to or from the construction site when moving soil, or by creating bare soil areas that weeds might colonize quickly; however, weeds are already common in the study area. Sound Transit would minimize this risk by restoring temporarily disturbed areas with native plant species, which may improve existing conditions in greenbelts and buffers.

Indirect impacts would include increased human activity and train traffic near wildlife habitat and adjacent to biodiversity areas. The introduction of light rail transit to the area could also create a slight reduction in vehicle traffic compared to current levels. This effect, in turn, would slightly decrease (in the short term) or slow the increase (in the long term) of the expected automotive emissions and pollutant-laden stormwater runoff associated with increased traffic under the No Build Alternative.

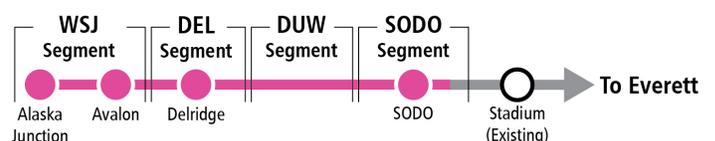
4.2.9.6 Mitigation Measures

Sound Transit’s policy on ecosystem mitigation is to avoid impacts on environmentally sensitive resources where practicable and to compensate for unavoidable impacts to ensure no net loss of ecosystem function and acreage as a result of agency projects. Mitigation for ecosystem impacts is based on a hierarchy of avoiding, minimizing, and compensating for unavoidable adverse impacts. Sound Transit would comply with all applicable laws.

4.2.9.6.1 Avoidance and Minimization Measures

The design of the West Seattle Link Extension already incorporates avoidance and minimization techniques, although further avoidance and minimization measures would continue to be pursued as the project enters final design and permitting stages. Attachment N4.F of Appendix N4, Ecosystems Technical Report, provides a compilation of best management practices that could be used to avoid or minimize project construction and operational impacts on sensitive ecosystem resources, including state and federal protected species and their habitats, wetlands, and aquatic resources. Avoidance and minimization measures would include the following design features:

- Avoiding direct impacts to Longfellow Creek by routing the guideway over culverted areas of the creek.
- Siting guideway columns to avoid direct placement on wetlands or shorelines, where possible.
- Pursuing bridge design options that minimize permanent impacts to the waterway.
- Minimizing the placement of construction staging areas in buffers and forested areas.
- Designing stormwater treatment facilities and flow control measures to minimize impacts on stream water quality and flow, or flow to larger waterways (see Section 4.2.8).
- Replanting cleared areas and implementing best management practices to minimize the risk of introducing or spreading invasive species.
- Reducing use of herbicides and fertilizers when restoring disturbed areas by using mulching, ground cover, and other planting strategies that discourage growth of undesirable species.



- Restricting clearing activities to outside the active bird nesting period, to the extent possible, to comply with the Migratory Bird Treaty Act administered by the United States Fish and Wildlife Service. If avoidance scheduling is infeasible, Sound Transit would work with staff at the United States Fish and Wildlife Service to conduct pre-construction surveys to determine the presence or absence of nesting migratory birds and assist Sound Transit in complying with the Migratory Bird Treaty Act.

With the exception of new guideway columns in the Duwamish Waterway, Sound Transit would avoid impacting existing stream channels and culverts. In-water work in the Duwamish Waterway would be scheduled to occur during the in-water work windows approved by the United States Army Corps of Engineers, Washington Department of Fish and Wildlife, United States Fish and Wildlife Service, and National Marine Fisheries Service, to minimize the effects on salmonids and other fish species. Measures would be taken to manage noise and turbidity of any in-water work to minimize impacts to fish and marine mammals. In-water work in the Duwamish Waterway would also be required to comply with the Marine Mammal Protection Act; this would likely entail monitoring during construction activities to avoid harassment or injury to marine mammal species.

Work within the great blue heron management zone would require development of and adherence to a habitat management plan to comply with City of Seattle, Washington Department of Fish and Wildlife, and United States Fish and Wildlife requirements. Since this species is protected by the state, the City of Seattle requires a management plan that normally includes a year-round, 197-foot-radius buffer around nesting colonies, with an additional 300-foot buffer during the nesting season (February 1 through August 31). This management plan may include a variety of measures such as retaining trees to screen the colony, work sequencing in the buffers, preventing specific loud activities during the nesting season, monitoring during nesting season, or other measures as developed in coordination with Washington Department of Fish and Wildlife, the City of Seattle, and United States Fish and Wildlife Service.

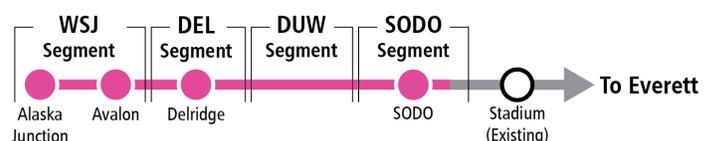
4.2.9.6.2 Compensatory Mitigation

To the extent that impacts cannot be avoided or minimized, Sound Transit would provide compensatory mitigation to achieve no net loss of ecosystem function and acreage. Sound Transit plans to mitigate long-term impacts on fisheries and benthic habitat, wetlands, stream buffers, and forested areas using one or more of the following methods, if available:

- In-lieu fee program through the King County Mitigation Reserves Program
- Approved mitigation bank through the Port of Seattle
- Advance offsite compensatory mitigation
- Project-specific mitigation developed concurrently by Sound Transit and approved by appropriate regulatory agencies

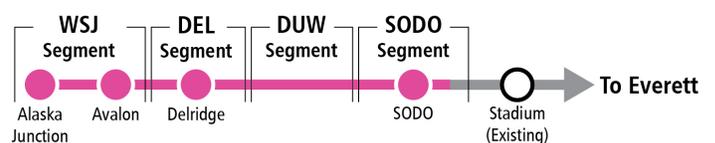
Sound Transit would implement compensatory mitigation in accordance with applicable federal, state, and local requirements and guidelines. This mitigation would address both permanent and temporary impacts, as required. To the extent practical, mitigation sites would be identified close to project impacts and compensate in-kind for lost values. Sound Transit would determine final mitigation actions in coordination with Tribes and federal, state, and local resource agencies during final design and permitting, as appropriate.

Sound Transit would provide mitigation for unavoidable impacts on other ecosystem components (e.g., benthic habitat, streams, stream buffers, vegetation, and wildlife habitat)



protected under federal, state, and local regulations. With the exception of the Duwamish Waterway, the project design would avoid impacts on existing streams. Mitigation for impacts on shorelines, wetlands, great blue heron priority areas, and benthic habitat in the Duwamish Waterway would need to be approved by the appropriate permitting agencies and jurisdictions prior to construction. Mitigation actions could include removing over-water structures or planting shoreline vegetation (per recommendations in salmon recovery plans), or installing upland plantings to improve areas vegetated with non-native plants.

Improving stream habitat and riparian function by replanting affected areas with native vegetation would mitigate some unavoidable impacts on stream riparian areas. Replanting near shorelines could improve conditions for juvenile salmonids in the Duwamish Waterway. Wetland enhancement work in the Longfellow Creek wetlands could improve over-water shade to the creek itself, thus improving fish habitat. Fish passage improvements, such as culvert replacements, on Longfellow Creek could also be considered. Sound Transit would mitigate for impacts on forested vegetation using applicable policies and regulations, and would coordinate with the City of Seattle on tree replacement requirements.



4.2.10 Energy Impacts

4.2.10.1 Affected Environment

The energy use study area for the project covers the Puget Sound Regional Council four-county region of King, Pierce, Kitsap, and Snohomish counties. Consistent with the Council’s regional travel demand model, the analysis includes vehicular travel on all facilities, including freeways, ramps, collector-distributors, arterials, and collector streets. This scale of analysis is the most comprehensive and accounts for mode shifts between private vehicles and public transit; that is, this scale primarily illustrates the effects of travel demand. According to the Energy Information Administration, Washington state consumed over 2,097 trillion British thermal units of energy in 2017 (Energy Information Administration 2019), enough energy to meet the needs of approximately 23 million households (United States Department of Energy 2019). Approximately 32 percent of total energy use was consumed for transportation purposes.

Table 4.2.10-1 presents daily vehicle miles traveled and energy consumption by mode for the region. According to the Puget Sound Regional Council traffic model and the Sound Transit ridership model, the existing daily total for the region is approximately 88.8 million vehicle miles traveled. The daily energy use by the different transportation modes is approximately 620 billion British thermal units.

Table 4.2.10-1. Existing Energy Consumption by Mode in King, Pierce, Kitsap, and Snohomish Counties

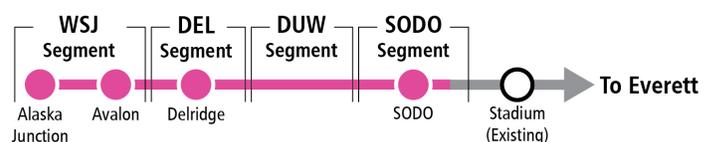
Vehicle Type	Energy Consumption Rate in British Thermal Units per Mile	Existing Conditions Daily Vehicle Miles Traveled	Existing Conditions in Billion British Thermal Units
Cars and Light Trucks	5,277	79,532,000	419,705
Heavy Trucks	21,335	9,012,000	192,271
Transit Buses	37,404	205,100	7,672
Streetcar	29,333	700	21
Light Rail	25,129	11,700	294
Commuter Rail	108,252	6,500	704
Total	Not Applicable	88,768,000	620,666

Sources: Oak Ridge National Laboratory 2019, Sound Transit 2019a, Roos 2019, Puget Sound Regional Council 2019.

Seattle City Light is a municipally owned utility that provides electricity to Seattle and other nearby King County communities. Its electricity is generated using a number of different resources, including utility-owned hydro facilities and purchased power. In 2017, hydroelectric power accounted for 91 percent of the utility’s power portfolio (City of Seattle 2018). The remaining power sources include nuclear, natural gas, wind, and other sources. Seattle City Light has been providing its service area with carbon neutral power since 2005 using utility-owned and purchased clean power sources.

4.2.10.2 Environmental Impacts of the No Build Alternative

Under the No Build Alternative, there would be no long-term or construction-related energy consumption.



4.2.10.3 Environmental Impacts of the Build Alternatives during Operation

The energy analysis evaluates operational energy use by the project and the demand on regional energy supply. The West Seattle and Ballard Link extensions were analyzed together for long-term effects because energy effects would be the same for both of these Link lines during operation.

Energy-related impacts during operation of the WSBLE Project are not anticipated. Sound Transit estimated long-term (operational) impacts from the vehicle-miles-traveled estimates by mode presented in the Puget Sound Regional Council traffic forecast model. The regional total light rail vehicle-miles-traveled estimates were modeled based on the projected operations plan for the combined Link light rail system. The regional vehicle-miles-traveled total was separated into passenger miles and heavy truck miles to account for differences in energy consumption levels. All energy consumed was converted to British thermal units to provide a common measure among all energy sources. The British-thermal-unit consumption rate per mile for each mode was obtained from the Transportation Energy Data Book, Edition 37 (Oak Ridge National Laboratory 2019), from Sound Transit, and from the American Public Transit Authority. The consumption rates in British thermal units for each mode are listed in Table 4.2.10-1.

The long-term direct energy impacts of the WSBLE Project are based on projected year 2042 regional traffic volumes and daily vehicle miles traveled, consistent with Puget Sound Regional Council data (2019) and the transit modeling performed by Sound Transit (2019a). The vehicle miles traveled, energy consumption rate, and total energy consumption for the No Build and the Build Alternatives are presented in Table 4.2.10-2.

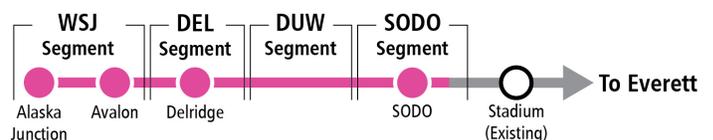
Table 4.2.10-2. Energy Consumption by Mode for the No Build and Build Alternatives

Vehicle Type	Consumption Rate in British Thermal Units per mile	2042 No Build Daily Vehicle Miles Traveled	2042 No Build Million British Thermal Units	2042 Build Daily Vehicle Miles Traveled	2042 Build Million British Thermal Units	Percent Change in Million British Thermal Units from No Build
Cars and Light Trucks	5,277	85,364,000	450,481	85,247,000	449,864	-0.1%
Heavy Trucks	21,335	11,269,000	240,424	11,269,000	240,424	0.0%
Transit Buses	37,404	257,700	9,639	259,900 ^a	9,721	0.9%
Streetcar	29,333	3,500	103	3,500	103	0.0%
Light Rail	25,129	135,700	3,410	151,700	3,812	11.8%
Commuter Rail	108,252	17,500	1,894	17,500	1,894	0.0%
Total	Not Applicable	97,047,400	705,952	96,948,600	705,819	0.0%^b

Sources: Oak Ridge National Laboratory 2019, Sound Transit 2019a, Roos 2019, Puget Sound Regional Council 2019.

^a Because of the shift from cars and trucks to light rail and transit buses, the Build Alternatives would result in an increase in transit bus miles compared to the No Build Alternative.

^b The total percentage change represents the change from the 2042 No Build Alternative to the 2042 Build Alternative total and includes all vehicle types.



The Build Alternatives are expected to reduce miles travelled by cars and light trucks by nearly 117,000 miles per day but would increase light rail miles by approximately 16,000 miles per day when compared to the No Build Alternative. This would result in a slight reduction of car and light truck vehicle miles as demand shifts to the light rail system and transit buses. Overall, energy use during project operation is expected to result in slightly less energy use than with the No Build Alternative.

Operation of the WSBLE Project would place a demand on the local electricity utility, Seattle City Light. The light rail energy consumption for the WSBLE Project is expected to be approximately 402 million British thermal units more energy per day than the No Build Alternative, which is 17.6 megawatt hours per day of electricity. On an annual basis, this translates to approximately 6,400 megawatt hours of electricity per year. This represents less than 0.5 percent of Seattle City Light’s total 2018 power generation. The WSBLE Project operation is not expected to have a notable impact on the electric utility because the utility could purchase additional electricity on the open market if necessary.

For the minimum operable segment (M.O.S.) to the West Seattle Link Extension’s Delridge Station and to the Ballard Link Extension’s Smith Cove Station, there would be less shift in demand to light rail; therefore, the decrease in energy use would be less than shown in Table 4.2.10-2.

4.2.10.4 Environmental Impacts of the Build Alternatives during Construction

Energy-related impacts during construction of the West Seattle Link Extension would be short term in nature and are not anticipated to be adverse. During project construction, energy would be consumed when construction materials are produced and transported to the project construction site. Operating and maintaining construction equipment would also consume energy. Because energy use is highly correlated to total project costs, the analysis compared the total energy consumption projections for both the overall low- and high-cost project scenarios. The energy analysis used the Federal Highway Administration Infrastructure Carbon Estimator tool to estimate the energy use associated with the project construction (Federal Highway Administration 2014). The tool provides a high-level estimate of energy consumption and allows users to estimate energy emissions using limited data inputs, such as miles of new track and the number of new stations. The FTA Greenhouse Gas Emissions Estimator was not used, as it does not provide outputs for energy use. Table 4.2.10-3 presents the project inputs used to estimate construction-related energy consumption for the West Seattle Link Extension. The low-cost estimate includes Preferred Alternative SODO-1a, Preferred Alternative DUW-1a, Alternative DEL-5, and Preferred Alternative WSJ-2. The high-cost includes Alternative SODO-2, Preferred Alternative DUW-1a, Option DEL-2b*, and Preferred Option WSJ-3b*.

Table 4.2.10-3. West Seattle Link Extension Energy Model Inputs

Scenario	Number of At-Grade Stations	Number of Elevated Stations	Number of Tunnel Stations	Miles of At-Grade Guideway	Miles of Elevated Guideway	Miles of Guideway in Tunnel
Build Alternatives: Low Cost	1	3	0	1.4	7.0	0.3
Build Alternatives: High Cost	0	2	2	0.6	6.6	2.4

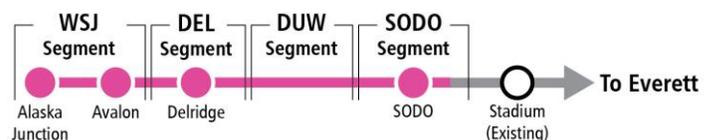


Table 4.2.10-4 shows the estimated energy that would be consumed during construction for the low- and high-cost alternatives. Upstream energy is related to the extraction, production, and transportation of construction materials. Direct energy refers to energy consumed by onsite construction equipment. The high-cost alternative is estimated to consume approximately three times as much energy as the low-cost alternative. Tunneling and tunnel station construction would use more energy than at-grade and elevated construction. The West Seattle and Ballard Link Extensions M.O.S. to Delridge Station would result in less energy consumption than what is shown in Table 4.2.10-4 because it would have a shorter alignment.

Table 4.2.10-4. Estimated Energy Consumed During Construction – West Seattle Link Extension

Scenario	Upstream Energy Materials (million British thermal units)	Direct Energy Construction Equipment (million British thermal units)	Total Energy Consumption
Build Alternatives: Low Cost	2,589,967	999,352	3,589,319
Build Alternatives: High Cost	5,313,117	7,481,412	12,794,529

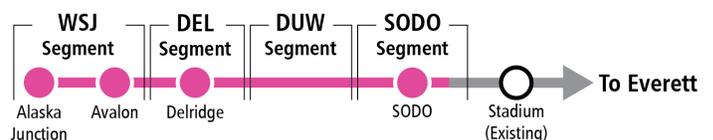
Assuming a 5-year construction period, the average annual energy consumed by construction of the West Seattle Link Extension would represent approximately 0.1 percent or less of the energy consumed in Washington state. Sound Transit’s commitment to sustainability practices includes minimizing greenhouse gas emissions, which could be achieved by conserving energy during construction. Such measures could include, but would not be limited to, conserving fuel use through reductions in construction vehicle idling, setting minimum United States Environmental Protection Agency-tier requirements for construction vehicles, and providing for pre-demolition extraction of salvageable/reusable/recyclable materials. Sound Transit would work with the contractor regarding the implementation of mitigation measures.

4.2.10.5 Indirect Impacts of the Build Alternatives

There would be no long-term indirect energy impacts associated with the WSBLE Project 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 the WSBLE Project are included in the energy consumed during construction units identified in Table 4.2.10-4.

4.2.10.6 Mitigation Measures

With the implementation of Sound Transit’s Sustainability Plan (Sound Transit 2019b), impacts on energy use from the project would be minimized and, therefore, no mitigation is proposed. Additionally, Sound Transit’s *Design Criteria Manual*, Chapter 30 (Sustainability), outlines specific measures around energy efficient design at the station level to minimize impacts on energy use and adopts requirements in line with the United States Green Building Council Leadership in Energy & Environmental Design transit rating system. Lastly, each construction phase of the project would pursue Envision certification, which includes elements of construction and operational reductions in energy consumption.



4.2.11 Geology and Soils

4.2.11.1 Affected Environment

Sound Transit assessed geologic units and soil characteristics along each alternative within the study area to establish the affected environment for geology and soils. The study area for geology and soils covers the area within 100 feet of the project limits. The project limits include permanent project improvements and areas needed for project construction. Regional geology was also considered to understand the mechanisms that created the local geology in the study area. Sound Transit assessed geologic units and soil characteristics using maps—including topographic maps, surficial soils maps, geologic maps, and geologic hazard maps—published by the City of Seattle, the United States Department of Agriculture, and United States Geological Survey. Sound Transit also assessed available site-specific geotechnical information for each alternative based on geotechnical explorations conducted for the project and as part of other projects in the study area.

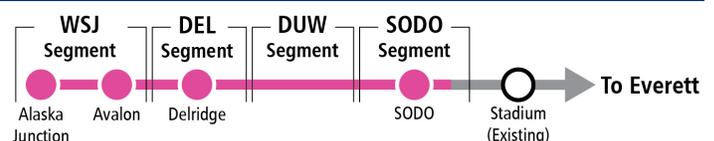
4.2.11.1.1 Topography and Regional Geology, and Seismicity

The WSBLE Project is in the central portion of the Puget Sound Basin, an elongated, north-south trending depression situated in western Washington between the Olympic Mountain Range to the west and the Cascade Mountain Range to the east. The regional topography consists of a series of north-south trending ridges separated by deep troughs, which are now occupied by streams, lakes, and waterways, including Puget Sound, Elliott Bay, Lake Union, and Lake Washington. Land elevations range from about 15 to approximately 380 feet (North American Vertical Datum of 1988) across the West Seattle Link Extension (see Figure L4.11-1 in Appendix L4.11, Geology and Soils). This regional topography was shaped mainly by glaciations that moved back and forth across the region over 10,000 years ago. The glaciers were sometimes several thousand feet thick. Soils that were over-ridden by glaciers are generally very hard or compact as a result of the weight of the glaciers. More recently, erosional processes and landform changes resulting from human development of the area have modified the regional topography.

Geology in the region generally includes recently developed surficial soils (created within the last 10,000 years) over a thick sequence of glacially consolidated soils and then bedrock (see Figures L4.11-2 to L4.11-5 in Appendix L4.11 for geologic units). Bedrock along the Build Alternative alignments is generally more than 500 feet below the ground surface. The region is seismically active—the project vicinity has been subject to earthquakes in the historical and recent past and will undoubtedly experience earthquakes again in the future. Earthquakes in the Puget Sound region result from any one of three sources: the Cascadia subduction zone off the coast of Washington, the deep intraslab subduction zone approximately 20 to 40 miles below the Puget Sound area, or shallow crustal faults. The closest active crustal source is the Seattle Fault Zone, which intersects the Duwamish Segment; this zone is shown on Figure L4.11-7 in Appendix L4.11.

4.2.11.1.2 Site Geology and Groundwater Conditions

Based on the geologic mapping and existing geotechnical reports, the study area is typically underlain by glacially consolidated soils and more recent soils, including unconsolidated recessional outwash, wetland deposits, tidelands, and areas of filled and reclaimed tidelands. Due to the complex glacial stratigraphy in the Seattle area, and its influence on the nature and flow of groundwater, multiple perched groundwater-bearing layers might be encountered.



Groundwater is typically found from 5 feet to 120 feet below the ground surface, with the shallowest groundwater in the Duwamish valley. In wetlands, groundwater can range from a few feet below the ground surface to the surface itself.

4.2.11.1.3 Geologic Hazards

Geologic hazard areas include steep slopes and landslide-prone areas, liquefaction-prone areas, peat settlement-prone areas, and seismic and volcanic hazard areas. The City of Seattle defines geologic hazard areas in its Environmentally Critical Areas ordinance (Seattle Municipal Code 25.09). Geologic hazard areas in the study area are shown on Figures L4.11-6 through L4.11-9 in Appendix L4.11 and described below.

Steep Slopes and Landslide-Prone Areas

Landslides can occur as relatively shallow surface debris flows or as relatively deep-seated slope failures. The landslide deposits in the study area generally consist of a disturbed, heterogeneous mixture of one or more soil types and may contain wood and other organics. The consistency of the landslide deposits is loose or soft, with random dense or hard pockets. The areas along the alternatives where landslides have occurred, are likely to occur, or that have steep slopes in excess of 40 percent are reflected in the City of Seattle’s Environmentally Critical Area mapping and are shown on Figures L4.11-6 through L4.11-9 and L4.11-10 through L4.11-12 in Appendix L4.11. These areas are prone to slope failure and considered hazardous; the slopes can become unstable during wet weather and seismic events.

Steep slopes hazard areas are slopes greater than 40 percent, with a vertical rise of more than 10 feet. Landslide-prone areas are based on slope, soil types, and evidence of past slide activity.

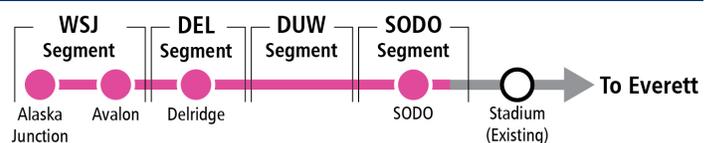
East of the Delridge neighborhood, there are slopes greater than 40 percent in the Pigeon Point area, as well as known and potential landslide hazards on the west, north, and east slopes; these locations are shown on Figures L4.11-7 and L4.11-10 in Appendix L4.11. There are no slopes greater than 40 percent in the study area between Pigeon Point and SODO.

Liquefaction-Prone Areas

Many of the shoreline and nearshore areas along Elliott Bay and Puget Sound are composed of historical fill over former Elliott Bay tide flats. These areas are susceptible to liquefaction during a large earthquake. During and following the magnitude 6.8 Nisqually earthquake on February 28, 2001, the region experienced localized building settlements, cracked concrete slabs and walls, and soil liquefaction. Earthquakes in the Puget Sound region with magnitudes of 6 and greater could affect these liquefaction-prone areas.

Liquefaction-prone areas have loose, saturated soils that lose the strength needed to support structures during earthquakes.

Liquefaction-prone areas are present in the Delridge valley, the Duwamish valley, and where there is historical fill in the SODO area. The liquefiable soils in the Delridge valley are primarily in the Longfellow Creek area and consist of loose native soil and fill that overlie the glacial soils. In the Duwamish valley, the upper 25 feet to 35 feet consists of loose to medium-dense sand. Interbedded medium-dense to very-dense sand and soft to stiff silt and clay underlie this upper loose to medium-dense sand, down to the stiff glacial soils.



Peat Settlement-Prone Areas

Peat is an accumulation of decaying organic plant material that typically forms in wetland environments and is highly compressible and prone to settlement when loaded by new structures and fill or when the groundwater table is lowered.

Peat settlement-prone areas contain substantial deposits of peat-rich soils that are susceptible to settling.

City of Seattle Environmentally Critical Area data identify a peat settlement-prone area near the Alaska Junction, between 44th Avenue Southwest and 42nd Avenue Southwest, extending from just north of Southwest Alaska Street to Southwest Edmunds Street (see Figure L4.11-3.4 in Appendix L4.11). Peat soils were not observed in geotechnical borings drilled for the project in this area.

Seismic Hazard Areas

The Puget Lowland is in the geologic basin of the Cascadia subduction zone. The tectonics and seismicity of the region are the result of the northeastward subduction of the Juan de Fuca Plate beneath the North American Plate offshore beneath the Pacific Ocean. The nearest potentially active fault to the study area is the east-west trending Seattle Fault Zone, which extends from Bremerton on the west through the Alki peninsula and West Seattle, then passes just north of and parallel to the West Seattle Bridge, and continues eastward. The project corridor crosses the mapped Seattle Fault Zone in the Duwamish and West Seattle Junction segments (see Figures L4.11-3.2 and L4.11-3.4). No evidence of fault movement was observed in the available soil boring exploration logs.

Seismic hazard areas include liquefaction-prone areas and areas subject to ground shaking and tsunamis.

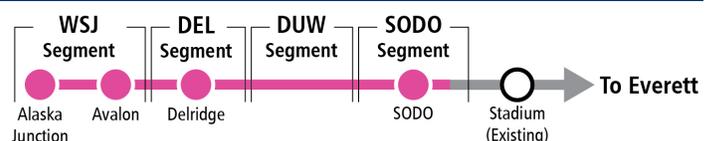
Tsunamis are large water waves created from seafloor movement during seismic events. The Duwamish and SODO segments could experience tsunamis during a large regional seismic event.

Volcanic Hazard Areas

While ashfall from any of the five Cascade volcanoes in Washington could pose statewide risks, Mount Rainier poses the most substantial threat to Seattle in the form of lahars and post-lahar sedimentation. Lahars from Mount Rainier have buried the Kent valley, but there is no evidence that a lahar has reached Seattle in the past 10,000 years. It is possible for a lahar to reach Seattle along the Duwamish Waterway (also known as the Duwamish River), but it would be extremely unlikely (Sound Transit 2020).

Volcanic hazard areas are subject to inundation by lahars (mudflows and debris flows that originate from the slopes of a volcano) or flooding resulting from volcanic activity on Mount Rainier.

Post-lahar sedimentation occurs after a lahar, when rivers are choked with debris and mud, which blocks the normal drainage channels and causes increased flooding and progressive burial by remobilized sediment. Sediment deposition is exacerbated by rainstorms that transport loose materials from the lahar down the drainage channel. Recent studies have revealed extensive layers of sandy sediment from Mount Rainier that extend along the Green River and Duwamish River valleys to the mouth of the Duwamish Waterway at Harbor Island (Driedger and Scott 2008).



4.2.11.2 Environmental Impacts of the No Build Alternative

Under the No Build Alternative, the existing geology and soils environment in the West Seattle Link Extension study area would remain unchanged. The existing risk from seismic hazards would still exist. New development would continue to take place in existing steep slope, erosion, and seismic hazard areas as allowed by City code.

4.2.11.3 Environmental Impacts of the Build Alternatives during Operation

4.2.11.3.1 Impacts Common to All Alternatives

Slope Stability, Retaining Structures, and Landslides

Earth slopes and retaining wall structures could be a hazard if not permanently stabilized. Earth slopes include existing slopes, slopes that could be steepened as part of the project, and slopes for embankment fills needed to support the light rail alignment. Slope instability could result in damage to structures in the path of moving soil or in a loss of the soil's supporting capacity for structures on or near the slope. The risk of inadequate slope stability would be greater if a large seismic event occurred. See Figures L4.11-6 through L4.11-9 and L4.11-10 through L4.11-412 in Appendix L4.11 for locations of known landslide hazard areas and steep slopes. The extent of steep slopes in the study area is limited, and the slope ground conditions are generally stable in most areas along the Build Alternatives alignments. Land clearing in steep slope areas could increase soil erosion, but Sound Transit would implement erosion-control management practices to reduce hazards and keep the overall risk low. Sound Transit would use measures such as slope stabilization or retaining walls to stabilize the areas of potential risk. Some structures could require permanent soil anchors or tiebacks that extend underground onto adjacent properties.

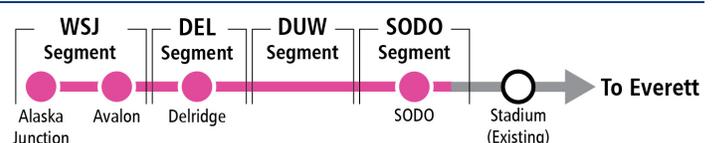
Seismic Hazard

The primary seismic hazard is ground shaking caused by a seismic event. Potential impacts are listed below:

- Seismic ground shaking during light rail operation would be transmitted to the guideway structures supporting the light rail system.
- If the project is built on sloping ground, the shaking could result in permanent movement of the ground and supported facilities.
- Seismic ground shaking could also lead to liquefaction of loose, saturated soils; settlement from densification of loose soils; increased risk of unstable earth slopes and retaining walls; and increased earth pressures on retaining walls.

Although these impacts would pose a risk to light rail facilities and users, Sound Transit would minimize the risk by designing the elevated, at-grade, and below-grade light rail support systems and retaining structures to withstand the effects of seismic ground shaking. Ground improvements in liquefaction-prone soils could include the following:

- Installing stone columns, which are vertical columns of stone injected into the ground to stabilize the soil
- Jet grouting, where grout is injected into the soil from the ground surface



- Deep soil mixing, which mixes a slurry material into existing soil from the surface to bind it together and stabilize it

Groundwater

Groundwater depths throughout the project corridor range from approximately 5 feet to 120 feet below the ground surface. Retaining structures (such as walls) and subsurface structures (such as tunnels) can affect or be affected by local groundwater movement and seepage. Retaining structures could block or redirect groundwater. Retaining structures and subsurface structures could change shallow or perched groundwater flow directions. During design, Sound Transit would consider groundwater conditions and provide appropriate means of drainage or waterproofing for controlling groundwater.

Settlement and New Earth Fills

Retained fills would be used in some areas where the project facilities would be above the existing grade to transition between profiles. The fill would cause increased loads on the existing soil, which would result in soft soil settling. Loads at foundations for stations and guideway structures could also have this effect. Without implementation of appropriate design measures, this settlement could damage light rail structures and nearby structures, roadways, and utilities. The overall risk of settlement for all Build Alternatives is low in the West Seattle Junction Segment, which is underlain by glacially consolidated soils and is not expected to experience settlement because these soils have already been loaded with much higher pressures from glaciers. There would be greater potential for settlement in the SODO, Duwamish, and Delridge segments, where poorer quality soils are present. The project design would incorporate measures to improve the soils where the potential for settlement is identified, or use lightweight fills to limit settlement, or would allow tolerances for anticipated settlement.

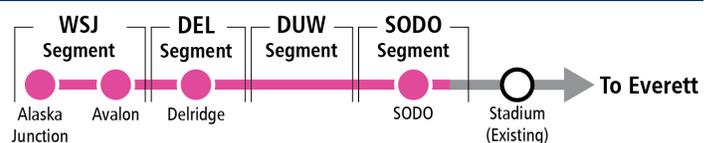
4.2.11.3.2 SODO Segment

All of the West Seattle Link Extension SODO Segment alternatives would be in liquefaction-prone soils. The Preferred Alternative SODO-1a and Option SODO-1b would be almost entirely at-grade and are not expected to require ground improvements for light rail or the Lander Street overpass. Alternative SODO-2 would require ground improvements around guideway columns for stability or enlarged foundations in the liquefaction-prone soils.

4.2.11.3.3 Duwamish Segment

Similar to the SODO Segment, all Duwamish Segment alternatives, including connections to the Operations and Maintenance Facility, would pass through liquefaction prone soils and therefore ground improvements or enlarged foundations would be needed in these areas. Option DUW-1b would have the longest length of guideway in liquefaction-prone soils. Ground improvements could include stone columns around guideway column foundations or other methods as indicated during final design.

The Preferred Alternative DUW-1a would be on the north side of Pigeon Point, which is a landslide-prone area of steep 40 percent or greater slopes with a history of slides. In combination with shallow groundwater, if encountered, steep slopes along Pigeon Point could be susceptible to slope instability. Permanent slope stabilization would include retaining walls, soil nails, and erosion mats. Depending on which alternative in the Delridge Segment that Preferred Alternative DUW-1a would connect to, the methods used for slope stabilization may be different because the guideway could be elevated or retained fill in this area. Option DUW-1b



would have the same considerations but a greater length of guideway in steep slope areas. Alternative DUW-2 would avoid these steep slopes on Pigeon Point.

4.2.11.3.4 Delridge Segment

Preferred Alternative DEL-1a and Option DEL-1b, Preferred Alternative DEL-2a* and Option DEL-2b*, Alternative DEL-5, and Alternative DEL-6* would be constructed along or west of Delridge Way and therefore avoid the steep slopes on the east side of Delridge Way. Alternatives DEL-3 and DEL-4* would have station access elements on the east side of Delridge Way and require permanent slope stabilization measures on a steep slope with known slides. These measures would be similar to those used in the Duwamish Segment and would prevent future slides from emanating from the disturbed areas.

All Delridge Segment alternatives would also travel through liquefaction-prone areas associated with Longfellow Creek. Preferred Alternative DEL-1a, Option DEL-1b, Preferred Alternative DEL-2a*, Option DEL-2b*, and Alternatives DEL-3 and DEL-4* would span most of this area but could have guideway columns in liquefaction-prone soils that would require ground improvements or enlarged foundations. Alternatives DEL-5 and DEL-6* would have a longer length of guideway in liquefaction-prone soils in the Delridge Segment and likely have more columns requiring ground improvements.

4.2.11.3.5 West Seattle Junction Segment

All West Seattle Junction Segment alternatives would avoid geologic hazard areas. Bored and/or sequential excavation mined tunnels would generally pass through or be within layers of water-bearing soils. Construction of shafts from the surface for station access and ancillary facilities, such as vents, would excavate through layers of water-bearing soils. Sound Transit would provide waterproofing gaskets in bored tunnel lining, and sequential excavation mined tunnels and shafts would be lined with waterproofing membrane to minimize groundwater seepage into the facilities and to avoid permanent drawdown of groundwater levels. Disposal of any groundwater seepage is discussed in Section 4.2.8, Water Resources. No special geologic considerations are expected in this area beyond those discussed above under Impacts Common to All Alternatives.

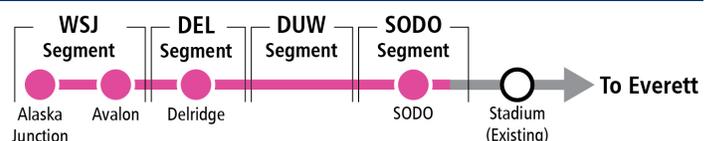
4.2.11.4 Environmental Impacts of the Build Alternatives during Construction

Construction activities have the potential to cause short-term geology- and soils-related impacts on the environment.

4.2.11.4.1 Slope Instability Hazard

Sound Transit would conduct detailed slope stability evaluations during design and, where appropriate, develop and use slope stabilization methods during construction. Earthworks would be designed, and specifications prepared, to avoid creating unstable conditions that could cause landslides. Methods that could help minimize slope stability hazards include, but are not limited to, the following:

- Use retaining structures with catchment for landslide debris
- Use on-site slope reinforcement, such as soil nailing



4.2.11.4.2 Erosion Hazards

Clearing vegetation, placing fill, and removing, grading, or stockpiling spoils during construction allow rainfall and runoff to erode soil particles. The risk of erosion and how severe the erosion would be is a function of the area of exposed soil, rainfall intensity and duration, soil characteristics, and the volume and configuration of soils stockpiled. Best management practices that could help minimize erosion hazards include, but are not limited to, the following:

- Maintaining as much vegetation as possible and designing surface water runoff systems
- Installing silt fences downslope of all exposed soil and using straw, mulch, or plastic covering over exposed earth
- Using temporary erosion control blankets and mulching to minimize erosion prior to vegetation establishment

4.2.11.4.3 Groundwater

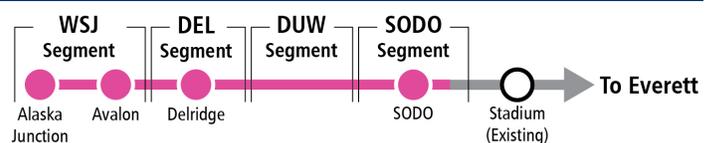
Light-rail facilities would create new loads and potentially affect groundwater conditions along the alternatives. Retaining structures can affect or be affected by local groundwater movement and seepage. During design of the retaining structures, Sound Transit would consider groundwater conditions and provide appropriate means of drainage or waterproofing for controlling groundwater both during construction and in the permanent condition. Dewatering could also cause settlement, as described in the following subsection.

4.2.11.4.4 Settlement

Retaining walls would be used to retain fills to meet track grade requirements. If the retaining walls were not designed correctly, settlement could occur behind the wall. Sound Transit would use standard construction techniques of retaining walls and compaction methods to avoid or minimize settlement impacts from new earth loads.

The West Seattle Junction Segment tunnel alternatives (Preferred Alternative WSJ-3a*, Preferred Option WSJ-3b*, and Alternatives WSJ-4* and WSJ-5*) have potential for settlement of the ground above or adjacent to tunneling work. Removal of excess soil for tunnels could create voids or loose zones in the soil that could progressively migrate upward. This could result in settlement and damage to adjacent facilities such as roadways, utilities, and buildings from loss of foundation bearing support. Loss of ground is most often encountered in poorly graded sands and gravels below groundwater. Settlement above tunnels could also occur from volume loss, which is when the amount of excavated soil is in excess of the calculated geometry of the tunnel. If a greater volume of material is excavated than is displaced by the tunnel, then this material was lost from around the tunnel, which could cause settlement. Volume loss would be minimized by using appropriate tunnel boring machine operation and ground improvement methods such as grouting. Supplemental ground support could be used to support nearby buildings as needed.

Where groundwater is present, sequential excavation mining and excavation from the surface for these tunnel alternatives could require localized dewatering, which has the potential to result in subsidence or settlement in soft or loose soils. Where soil is settlement-prone, Sound Transit could implement measures to avoid and minimize it. Temporary ground freezing might also be needed where cross passages between tunnels would be constructed.



4.2.11.4.5 Seismic Hazards

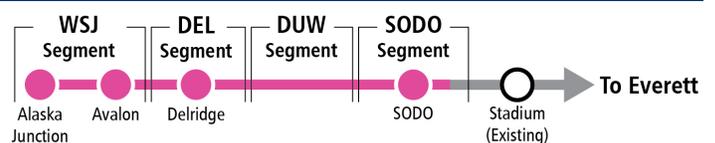
An earthquake could occur during project construction and cause embankment slope failures, liquefaction, or ground settlement. The risk of seismic hazards to construction is considered low because there is a low probability that an earthquake would occur during the actual construction period. If a large earthquake were to occur, the major risk would be to the ongoing construction activities. Work schedules would likely be delayed as efforts are made to repair damaged components of the work. Utilities or nearby structures could also experience some disruption from the damage to exposed cuts or fills. If needed, ground improvements could be used to stabilize liquefaction-prone soils.

4.2.11.5 Indirect Impacts of the Build Alternatives

Indirect impacts from the West Seattle Link Extension could result from permanent soil anchors or tiebacks that would be used in retaining wall structures. These wall support systems could restrict the type of excavation feasible for the future developments within the anchor zones.

4.2.11.6 Mitigation Measures

With appropriate use of engineering design standards and best management practices as described above, no adverse geological or soils impacts are expected. Therefore, no mitigation is needed.



4.2.12 Hazardous Materials

4.2.12.1 Affected Environment

The West Seattle Link Extension study area for hazardous materials extends 1/8 mile from either side of the project limits and the area used for construction. The project limits include permanent project improvements and areas needed for project construction.

Sound Transit acquired information about sites with known contamination or potential contamination within the study area, as well as relevant historical conditions within the study area from several sources that are listed in Appendix L4.12, Hazardous Materials. Based on the information collected and reviewed, Sound Transit categorized sites into three risk categories (high, medium, and low) to prioritize sites and determine the need for avoidance, remediation, or mitigation when considering project impacts. The risk levels are defined as follows:

- **High** – Sites that involve substantial contamination of large areas, including soil and groundwater, and multiple contaminants. High-risk sites might represent a higher risk of further releases of hazardous materials to people or the environment or would be likely to involve high levels of regulatory approvals, extensive or lengthy remediation activities that may create other impacts to the environment, or could pose major delays to the development of the project.
- **Medium** – Sites where the nature of potential contamination is known based on existing investigation data, the potential contaminants are not extremely toxic or difficult to treat, and probable remediation approaches are straightforward.
- **Low** – Sites where the nature of potential contamination is known based on existing investigation data and the sites are not expected to have notable impacts on the project due to their location, or sites where hazardous materials were used but had no or only very small reported releases.

Sites that were considered minimal risk were not reviewed or further counted. Minimal-risk sites include sites that had regulatory interactions not related to the potential release of hazardous materials to soil or groundwater (i.e., permitted air emissions) or sites with a small one-time spill that was reported as cleaned up.

In addition to the high-, medium-, or low-risk designation, sites were further split into two categories: (1) sites with documented release and (2) sites with potential release. Table L4.12-1 in Appendix L4.12 provides a complete list of hazardous materials sites identified in the study area.

Tables 4.2.12-1 through 4.2.12-4 list the number of sites in the West Seattle Link Extension study area by risk category for each alternative. The high-risk sites are discussed in more detail in Sections 4.2.12.3, Environmental Impacts of the Build Alternatives during Operation, and 4.2.12.4, Environmental Impacts of the Build Alternatives during Construction, and in Appendix L4.12.

Table 4.2.12-1. Number of Hazardous Materials Sites by Alternative – SODO Segment, West Seattle Link Extension

SODO Segment Alternative	High-Risk Sites	Medium-Risk Sites	Low-Risk Sites
Preferred At-Grade (SODO-1a)	1	11	28
At-Grade South Station Option (SODO-1b)	1	11	26
Mixed Profile (SODO-2)	1	11	26

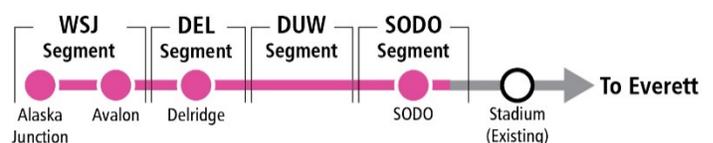


Table 4.2.12-2. Number of Hazardous Materials Sites by Alternative – Duwamish Segment

Duwamish Segment Alternative	High-Risk Sites	Medium-Risk Sites	Low-Risk Sites
Preferred South Crossing (DUW-1a)	7	37	78 to 80
South Crossing South Edge Crossing Alignment Option (DUW-1b)	7	38	81
North Crossing (DUW-2)	7	37	90

Note: Ranges reflect differences from connecting to different alternatives in adjacent segments.

Table 4.2.12-3. Number of Hazardous Materials Sites by Alternative – Delridge Segment

Delridge Segment Alternative	High-Risk Sites	Medium-Risk Sites	Low-Risk Sites
Preferred Dakota Street Station (DEL-1a)	1	1	9
Dakota Street Station North Alignment Option (DEL-1b)	1	1	9
Preferred Dakota Street Station Lower Height (DEL-2a)*	1	1	9
Dakota Street Station Lower Height North Alignment Option (DEL-2b)*	1	2	9
Delridge Way Station (DEL-3)	1	1	9
Delridge Way Station Lower Height (DEL-4)*	1	1	9
Andover Street Station (DEL-5)	1	2	12
Andover Street Station Lower Height (DEL-6)*	1	2	12

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

Table 4.2.12-4. Number of Hazardous Materials Sites by Alternative – West Seattle Junction Segment

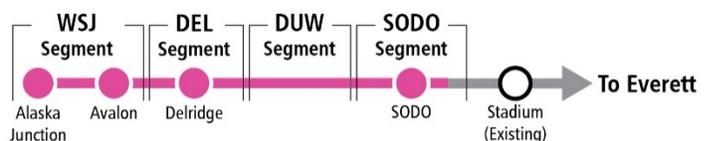
West Seattle Junction Segment Alternative	High-Risk Sites	Medium-Risk Sites	Low-Risk Sites
Preferred Elevated 41st/42nd Avenue Station (WSJ-1)	2	17	79
Preferred Elevated Fauntleroy Way Station (WSJ-2)	2	12	53
Preferred Tunnel 41st Avenue Station (WSJ-3a)*	2	15 to 16	74
Preferred Tunnel 42nd Avenue Station Option (WSJ-3b)*	2	16	75
Short Tunnel 41st Avenue Station (WSJ-4)*	2	16	78
Medium Tunnel 41st Avenue Station (WSJ-5)*	2	13	74

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

Note: Ranges reflect differences from connecting to different alternatives in adjacent segments.

4.2.12.1.1 Historical and Current Uses

Prior to the 1900s, the area encompassing the present-day SODO and Duwamish segments consisted of tide flats that were filled in the early 1900s with unknown fill material, including an informal landfill site along 6th Avenue South (Sixth Avenue South Landfill). Both of these segment areas were historically used for industrial and manufacturing activities and are



currently zoned for industrial use. Historical and current uses within both segment areas include railyards, shipping and cargo facilities, sawmills, metal foundries, and metal works.

The study area for all West Seattle Link Extension Build Alternatives is within the Tacoma smelter plume. The Asarco Company operated a copper smelter in Tacoma from 1890 to 1985, and air pollution from the smelter has resulted in arsenic, lead, and other heavy metals in surface soil throughout the Puget Sound area. Based on regional data, the Delridge, Duwamish, and SODO segments have estimated arsenic concentrations below 20 parts per million, which is the level considered as protective of both human health and the environment under the Washington State Model Toxics Control Act. The West Seattle Junction Segment has estimated arsenic concentrations between 20 and 40 parts per million, which is above the level considered as protective of human health and the environment but is below the Washington State Department of Ecology’s (Ecology) action level of 100 parts per million (Ecology 2019). Within the study area there are no actions planned for the arsenic contamination from Asarco.

4.2.12.1.2 Superfund Sites

There are two Superfund sites with ongoing cleanups that overlap with the project limits in the Duwamish Segment: Harbor Island and the Lower Duwamish Waterway. Pollutants at the Harbor Island Superfund Site include polychlorinated biphenyls, arsenic, carcinogenic polycyclic aromatic hydrocarbon, tributyltin, and mercury in soil or groundwater, as well as sediment impacts within the East Duwamish Waterway. Cleanup is complete at five of the six operable units, and contaminants within these five complete operable units are below the cleanup values set by the United States Environmental Protection Agency. Cleanup at the sixth operable unit began in 2018. The Lower Duwamish Waterway Superfund Site, which is south of the Duwamish Segment, has sediments impacted by polychlorinated biphenyls, arsenic, carcinogenic polycyclic aromatic hydrocarbon, as well as dioxins and furans.

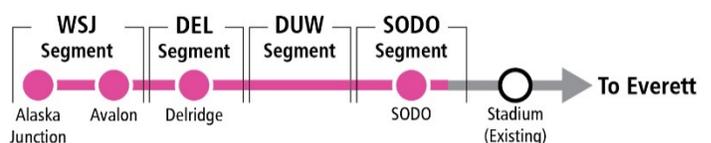
Additional details on the status of the Superfund sites is provided in Appendix L4.12 and Section 4.2.12.4.3, Duwamish Segment.

4.2.12.1.3 Abandoned Landfills

The Sixth Avenue South Landfill was an informal disposal area between South Forest Street and South Charlestown Street along 6th Avenue South (Seattle-King County Department of Public Health 1984). This site is present under and in the vicinity of the Operations and Maintenance Facility Central; however, it is not a high-risk site and therefore is not discussed further in this section. The West Seattle Landfill is outside of the Duwamish Segment study area but within 1,000 feet of the Duwamish Segment study area. This landfill is considered an environmentally critical area due to the potential presence of methane because areas within 1,000 feet of methane-producing landfills might be susceptible to accumulation of hazardous levels of methane gas in enclosed spaces. Development on abandoned landfills is subject to Seattle-King County Health Department requirements specified in Seattle Municipal Code.

4.2.12.1.4 Transportation-Related Uses

Transportation-related land uses in the West Seattle Link Extension study area that could contain contamination include the Port of Seattle terminals on Harbor Island, Union Pacific Railroad’s Argo Yard between East Marginal Way South and Interstate 5, and BNSF Railway’s International Gateway Intermodal Facility west of SODO.



4.2.12.2 Environmental Impacts of the No Build Alternative

The No Build Alternative would not introduce the potential for release of contaminants during construction but would also not provide removal or cleanup of potentially hazardous materials, including contaminated groundwater or soil, within the study area. Contaminated properties would remain in their current state, and the potential for uncontrolled migration of existing contaminants could continue.

4.2.12.3 Environmental Impacts of the Build Alternatives during Operation

4.2.12.3.1 Impacts Common to All Alternatives

This section discusses the potential long-term, operational impacts that the Build Alternatives could have on known contaminated sites and the potential impacts that the contaminated sites could have on project development. Potential impacts would likely be restricted to the areas immediately adjacent to the alternatives. The likelihood of impacts from the normal long-term operation and maintenance activities are low. Because the light rail trains operate on electricity, major spills are unlikely. However, minor hazardous materials releases could result during maintenance activities because hazardous materials, including lubricants, solvents, hydraulic fluids, or other chemicals, could be used at the maintenance facilities or during track maintenance. Light rail vehicles would be serviced at the existing Operations and Maintenance Facility Central in the Duwamish Segment. Sound Transit would manage generated hazardous waste according to applicable regulatory requirements.

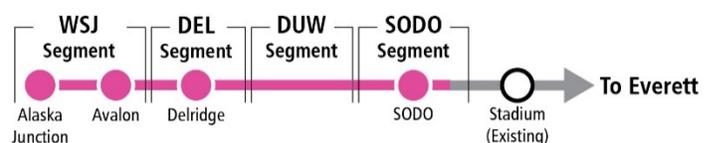
The SODO Segment has one high-risk site in the study area at 2411 6th Avenue South. High-risk sites in the Duwamish, Delridge, and West Seattle Junction segments are mapped on Figures 4.2.12-1 through 4.2.12-3. Contaminated sites affected by the project would be addressed before and during project construction, as discussed in Section 4.2.12.4, Environmental Impacts of the Build Alternatives during Construction. However, long-term operational impacts could occur if Sound Transit acquires properties that are a source of contamination, possibly requiring ongoing cleanup responsibility. Long-term monitoring or other protective measures or restrictions could be required. There are no properties proposed for acquisition where this is a concern in the SODO or Delridge segments; therefore, these segments are not discussed further in this section.

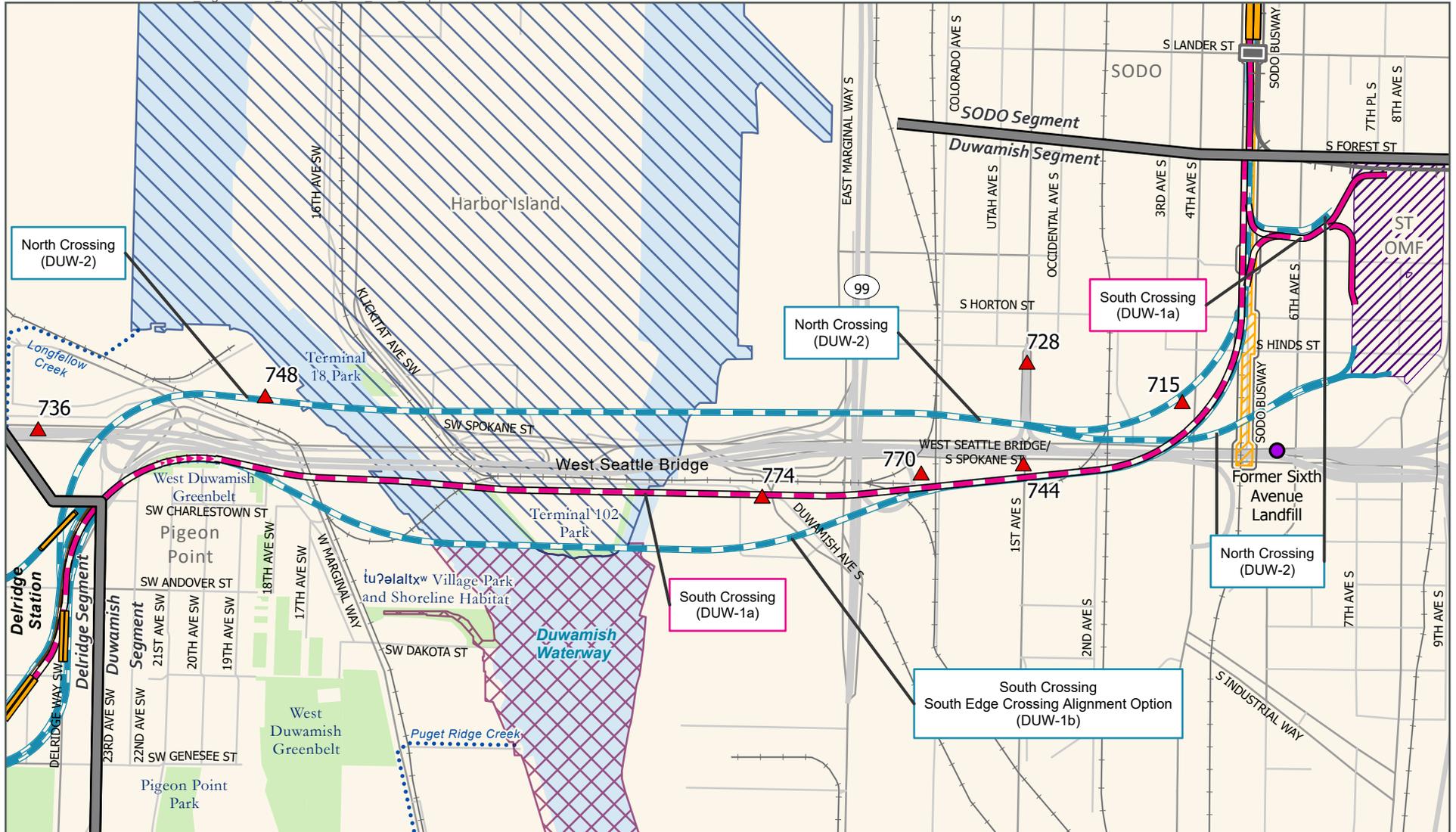
4.2.12.3.2 Duwamish Segment

High-risk hazardous material sites in the Duwamish Segment are shown on Figure 4.2.12-1. The two Superfund sites described above in Section 4.2.12.1.2, Superfund Sites, could require protective measures and restrictions. All Duwamish Segment alternatives would be within the Harbor Island Superfund Site, and all alternatives are close to the Lower Duwamish Waterway Superfund Site. Sound Transit would coordinate with the United States Environmental Protection Agency and Ecology on any potential protective measures or restrictions that might be required for the project.

4.2.12.3.3 West Seattle Junction Segment

High-risk hazardous material sites in the West Seattle Junction Segment are shown on Figure 4.2.12-3. Long-term, ongoing groundwater monitoring is currently occurring at the high-risk site Conoco Phillips 30124 (Map Identification Number [I.D.] 943), an active gasoline service station with ongoing remediation system operation, due to the presence of petroleum and potential presence of tetrachloroethylene and trichloroethylene in soil or groundwater, as discussed in Appendix L4.12. This site would be directly affected by Preferred Alternative WSJ-2 and could require remediation or long-term monitoring.



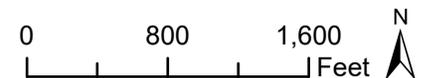


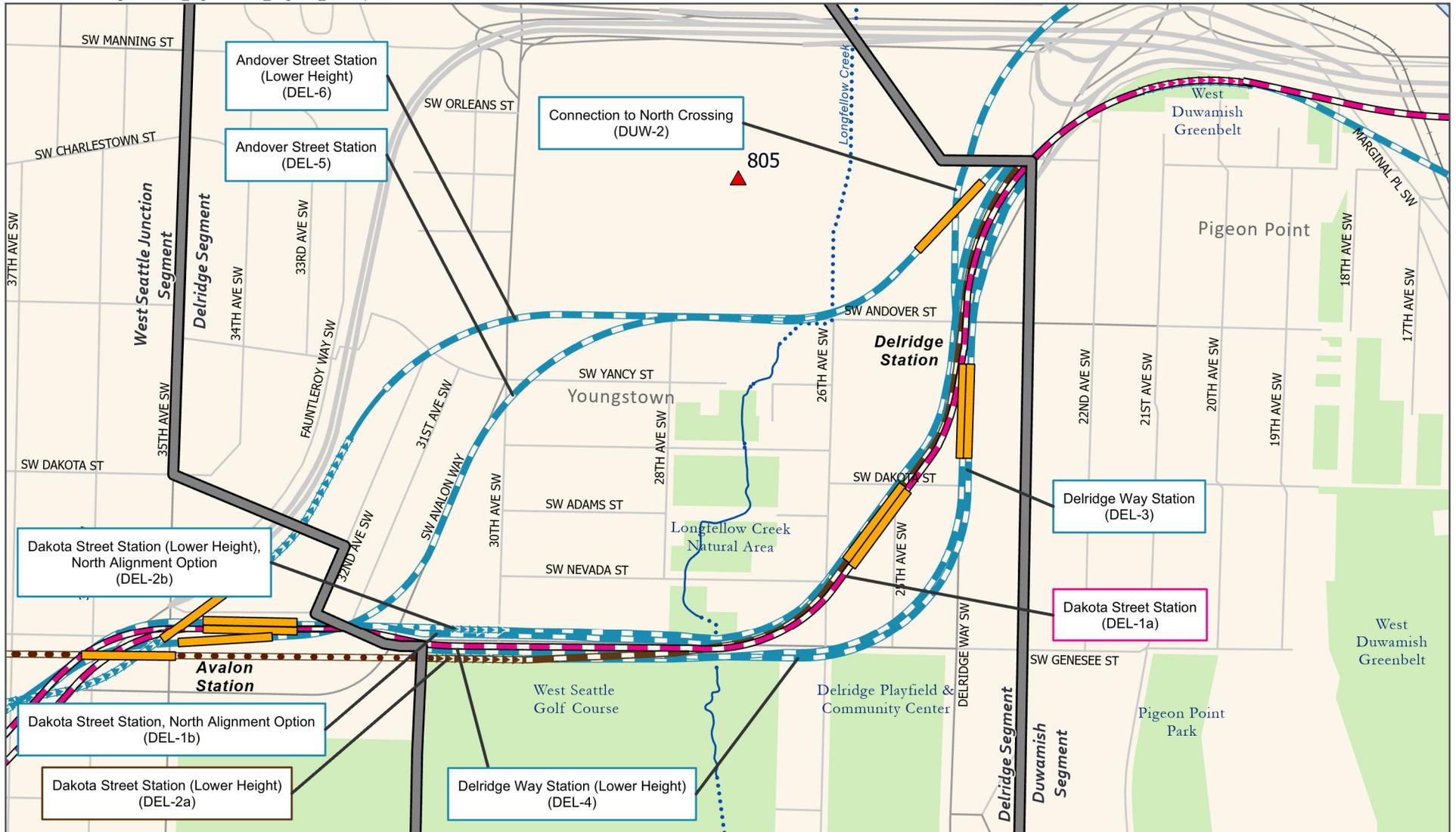
Source: City of Seattle, King County (2019, 2020, 2021), U.S. Environmental Protection Agency (2015), Environmental Data Resources Inc. (2018), Ecology (2019).

- | | | |
|--|--|--|
| Alternatives | Segment Line | High-Risk Hazardous Material Site |
| Preferred Alternative | Existing Link Light Rail | Abandoned Landfill |
| Preferred Alternative with Third-party Funding | Railroad | Harbor Island Superfund Site |
| Other Alternatives | SODO Busway | Lower Duwamish Waterway Superfund Site |
| Alternative Profile | Proposed Overpass | Piped Stream |
| Elevated | Sound Transit Operations and Maintenance Facility (ST OMF) | Park |
| At-Grade | Piped Stream | |
| Retained Cut | | |
| Station | | |
| New | | |

Note: Boundary between Superfund sites is approximate.

FIGURE 4.2.12-1
High-Risk Hazardous Material Sites
 West Seattle Link Extension -
 Duwamish Segment
West Seattle and Ballard Link Extensions



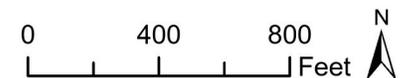


Source: City of Seattle, King County (2019, 2020, 2021), U.S. Environmental Protection Agency (2015), Environmental Data Resources Inc. (2018), Ecology (2019).

- Alternatives**
- Preferred Alternative
 - Preferred Alternative with Third-party Funding
 - Other Alternatives
- Alternative Profile**
- Elevated
 - Tunnel
 - At-Grade
 - Retained Cut
- Station**
- New
- Legend:**
- Segment Line
 - Railroad
 - Stream
 - Piped Stream
 - Park
 - ▲ High-Risk Hazardous Material Site

FIGURE 4.2.12-2
High-Risk Hazardous Material Sites
 West Seattle Link Extension -
 Delridge Segment

*West Seattle and
 Ballard Link Extensions*



4.2.12.4 Environmental Impacts of the Build Alternatives during Construction

The following discussion identifies high-risk sites within each segment study area. Potential impacts would likely be restricted to the areas immediately adjacent to the alternatives. Additional detail on high-risk sites is provided in Appendix L4.12.

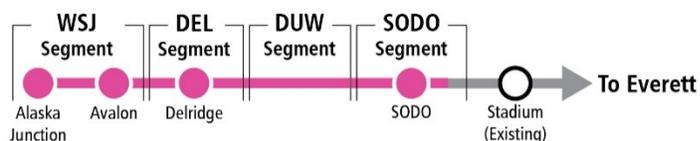
4.2.12.4.1 Impacts Common to All Alternatives

Potential construction impacts could result from existing soil or groundwater contamination encountered during construction activities.

Contamination may be found on or adjacent to known contaminated sites or within rights-of-way and utility corridors. Construction methods for each alternative would influence the potential impacts during construction, with bored or mined tunnel construction less likely to encounter contaminated soil or groundwater than excavation and construction activities from or at the ground surface. Construction impacts could include the following:

- Grading or excavation activities could uncover contamination, thus allowing direct exposure to workers or public.
- Grading or excavation activities could generate contaminated soil that would need treatment and proper disposal.
- Contamination could spread as the result of construction activities, such as dewatering, which might mobilize contamination.
- Dewatering during construction could generate contaminated groundwater that would need treatment and proper disposal.
- Construction activities could discover contamination that was otherwise unknown.
- Construction activities could encounter underground or above-ground storage tanks containing hazardous materials that would require special disposal.
- Construction activities could encounter pole-mounted electrical transformers, which might contain polychlorinated biphenyl-contaminated transformer oil and require special disposal.
- Demolishing, removing, and disposing of existing structures could release hazardous materials, such as asbestos or lead. Asbestos is commonly used in building construction and is most dangerous when crushed, broken, or otherwise disturbed. Lead is often found in lead pipes or in lead-based paint.
- Construction activities could encounter materials that require special disposal, such as creosote- or arsenic-treated wood, railroad ties, telephone poles, and marine or building piles.
- Construction activities could result in a spill or accidental releases of hazardous materials, such as lubricants or fuels from heavy equipment.

Construction activities could also encounter contaminated materials that require special handling or disposal along former and historical railway corridors. Historical railroads often used chemicals, such as metals, pesticides, or petroleum products, during normal railroad operations along the lines. In particular, arsenic is common in soil along railroad corridors from arsenic weed-control sprays, arsenic slag in bed fill, or arsenic-treated railroad ties. Petroleum impacts are also likely along the tracks from the lubricating oils or fuels used by trains.



During construction activities, contaminated soil could also be encountered in areas with artificial fill material. The SODO and Duwamish segments are in areas where substantial volumes of artificial fill were imported to raise the ground surface level. The source material for artificial fill is usually unknown and might contain debris or elevated levels of metals, polycyclic aromatic hydrocarbons, or petroleum products that could require special handling and disposal.

Sound Transit would minimize construction impacts by avoiding contaminated sites or portions of sites when possible. However, the study area might have other constraints, such as physical, environmental, or topographic impacts, that would make avoidance infeasible. Sound Transit would perform environmental due diligence for properties along the corridor before acquisition or construction to avoid or minimize impacts from contaminated sites. Environmental due diligence would include the completion of a Phase I Environmental Site Assessment for properties that would be acquired or that represent a substantial risk to the project during construction activities. A subsequent Phase II Environmental Site Assessment might be necessary for sites where contamination has been identified or is suspected.

As part of the project, Sound Transit would adhere to local, state, and federal regulations and implement applicable best management practices, which include construction stormwater pollution prevention plans, spill control and prevention plans, contaminated media management plans, and health and safety plans. These plans establish protocols for handling hazardous materials to ensure compliance with state and federal standards while minimizing impacts to the project.

The following discussion identifies high-risk sites within each segment study area. Potential impacts would likely be restricted to the areas immediately adjacent to the alternatives.

4.2.12.4.2 SODO Segment

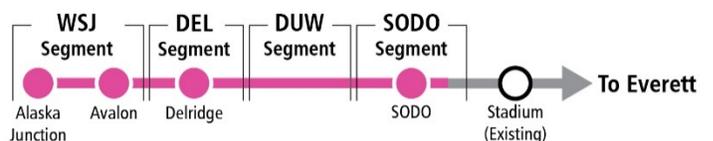
Table 4.2.12-5 identifies the high-risk site within the SODO Segment study area by alternative. In some cases, the West Seattle Link Extension and the Ballard Link Extension would use the same area in SODO for construction or operation. Impacts associated with high-risk sites in these areas are accounted for in the West Seattle Link Extension only because it is planned to be constructed first.

The SODO Segment is currently zoned for industrial and manufacturing use and has a long history of industrial activities. The area is also underlain by artificial fill. Contaminated soil and groundwater could be encountered within the SODO Segment as a result of contaminated fill material or past industrial use.

Table 4.2.12-5. Potential High-Risk Sites Affected by Alternative in the SODO Segment, West Seattle Link Extension

Site Name (Map I.D.)	Potential Impact	Preferred At-Grade Alternative (SODO-1a)	At-Grade South Station Option (SODO-1b)	Mixed Profile Alternative (SODO-2)
Industrial Plating (#648)	Encounter soil and groundwater impacted by trichloroethylene.	Affected	Affected	Affected
Total Sites Affected	Not Applicable	1	1	1

Note: All high-risk sites have documented releases.



4.2.12.4.3 Duwamish Segment

Table 4.2.12-6 identifies the high-risk sites within the Duwamish Segment study area by alternative. These sites are shown on Figure 4.2.12-1. All Duwamish Segment alternatives would pass within the boundaries of the Harbor Island Superfund Site and have the potential to affect areas of the Lower Duwamish Waterway Superfund Site. All Duwamish Segment alternatives would disturb areas within the Soil and Groundwater Operable Unit (OU1), where previous remediation activities included excavation of hot spot soils and treatment/disposal of these soils offsite, capping of remaining contaminated soil that exceeds cleanup goals, institutional controls, and implementation of long-term groundwater monitoring. Contaminated soils in the interior of Harbor Island that exceeded cleanup criteria were capped. Cleanup of this unit is considered to be complete (United States Environmental Protection Agency 2020).

Depending on bridge type, all alternatives could have a guideway column in the East Duwamish Waterway, where cleanup of contaminated sediments is still underway. The United States Environmental Protection Agency has determined that no additional cleanup is necessary in the West Waterway Sediments Operable Unit (OU8) because the sediment poses no current unacceptable risks to human health or the environment (United States Environmental Protection Agency 2005, 2020).

Construction methods and activities in the area of the Superfund sites would be coordinated with the United States Environmental Protection Agency and Ecology, as appropriate, to avoid conflicts with existing and future cleanup actions at the Superfund sites. Additionally, for project elements within the Harbor Island Superfund Site or the Lower Duwamish Waterway Superfund Site, Sound Transit would coordinate with the United States Environmental Protection Agency and Ecology on any potential protective measures or restrictions that might be required for the project.

In addition to the high-risk sites, the unknown fill material as well as former and current industrial activities within the Duwamish Segment might have resulted in releases of hazardous substances. Due to this there is a high likelihood of encountering metals or polycyclic aromatic hydrocarbons in shallow soil or groundwater during construction.

4.2.12.4.4 Delridge Segment

Table 4.2.12-7 identifies the high-risk site within the Delridge Segment study area by alternative. The site is shown on Figure 4.2.12-2.

4.2.12.4.5 West Seattle Junction Segment

Table 4.2.12-8 identifies the high-risk sites within the West Seattle Junction Segment study area by alternative. These sites are shown on Figure 4.2.12-3.

4.2.12.5 Indirect Impacts of the Build Alternatives

The construction of the West Seattle Link Extension would support redevelopment of properties around station areas where local zoning allows. 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.

4.2.12.6 Mitigation Measures

With inclusion of the best practices described under Section 4.2.12.4.1, Impacts Common to All Alternatives, and adherence to regulatory requirements as part of the project, there are no anticipated impacts and no mitigation is needed.

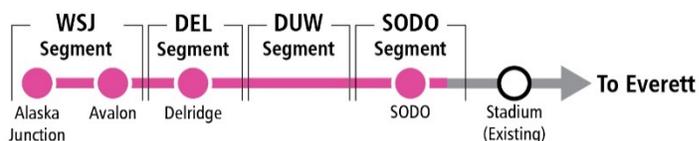


Table 4.2.12-6. Potential High-Risk Sites Affected by Alternative – Duwamish Segment

Site Name (Map I.D.)	Potential Impact	Preferred South Crossing Alternative (DUW-1a)	South Crossing South Edge Crossing Alignment Option (DUW-1b)	North Crossing Alternative (DUW-2)
Harbor Island Superfund Site	Encounter soil, groundwater, and sediment contaminated with metals, polycyclic aromatic hydrocarbons, dioxin and furans, and polychlorinated biphenyls.	Affected	Affected	Affected
Lower Duwamish Waterway Superfund Site	Encounter sediments contaminated with polychlorinated biphenyls, metals, carcinogenic polycyclic aromatic hydrocarbons, or dioxin/furans	Affected	Affected	Affected
SW Harbor Project (#736)	Encounter soil, groundwater, and surface water contaminated by metals, polychlorinated biphenyls, polycyclic aromatic hydrocarbons, and petroleum products.	Not Affected	Not Affected	Affected
Island Tug and Barge (#748)	Encounter groundwater contaminated by dioxin/furans.	Not Affected	Not Affected	Affected
Port of Seattle Terminal 106W (#774)	Encounter soil and groundwater contaminated by lead.	Affected	Affected	Not Affected
Nelson Iron Works (#770)	Encounter soil and groundwater contaminated by petroleum, carcinogenic polycyclic aromatic hydrocarbons, and metals.	Affected	Affected	Not Affected
Business Pro Computers (#715)	Encounter soil and groundwater impacted with petroleum.	Not Affected	Not Affected	Affected
Buffalo Industries (#744)	Encounter soil contaminated with tetrachloroethylene and groundwater contaminated with petroleum and polycyclic aromatic hydrocarbons.	Affected	Affected	Not Affected
Enterprise NW (#728)	Encounter soil or groundwater contaminated with petroleum, polycyclic aromatic hydrocarbons, and polychlorinated biphenyls.	Not Affected	Not Affected	Affected
Total Sites Affected	Not Applicable	5	5	6

Note: All high-risk sites have documented releases. The potential for each alternative to affect high-risk sites is based on direct construction impacts. If a high-risk site falls within the construction area, it could be affected, which could result in associated impacts.

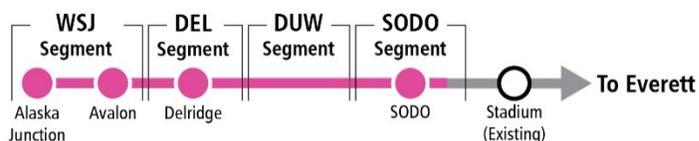


Table 4.2.12-7. Potential High-Risk Sites Affected by Alternative – Delridge Segment

Site Name (Map I.D.)	Potential Impact	Preferred Dakota Street Station Alternative (DEL-1a)	Dakota Street Station North Alignment Option (DEL-1b)	Preferred Dakota Street Station Lower Height Alternative (DEL-2a)*	Dakota Street Station Lower Height North Alignment Option (DEL-2b)*	Delridge Way Station Alternative (DEL-3)	Delridge Way Station Lower Height Alternative (DEL-4)*	Andover Street Station Alternative (DEL-5)	Andover Street Station Lower Height Alternative (DEL-6)*
Nucor Steel (#805)	Encounter soil and groundwater contaminated with polychlorinated biphenyls, polycyclic aromatic hydrocarbons, metals, or solvents	Affected	Affected	Affected	Affected	Affected	Affected	Affected	Affected
Total Sites Affected	Not Applicable	1	1	1	1	1	1	1	1

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

Note: All high-risk sites have documented releases. The potential for each alternative to affect high-risk sites is based on direct construction impacts. If a high-risk site falls within the construction area, it could be affected, which could result in associated impacts.

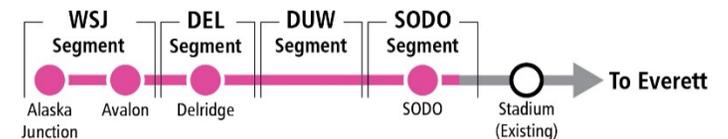
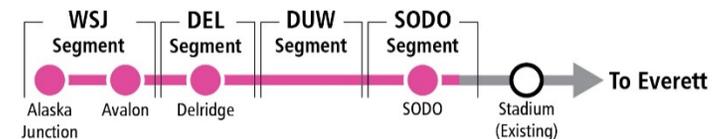


Table 4.2.12-8. Potential High-Risk Sites Affected by Alternative – West Seattle Junction Segment

Site Name (Map I.D.)	Potential Impact	Preferred Elevated 41st/42nd Avenue Station Alternative (WSJ-1)	Preferred Elevated Fautleroy Way Station Alternative (WSJ-2)	Preferred Tunnel 41st Avenue Station Alternative (WSJ-3a)*	Preferred Tunnel 42nd Avenue Station Option (WSJ-3b)*	Short Tunnel 41st Avenue Station Alternative (WSJ-4)*	Medium Tunnel 41st Avenue Station Alternative (WSJ-5)*
Conoco Phillips 30124 (#943)	Encounter soil and groundwater contaminated with petroleum and soil vapor. Active remediation system in place.	Not Affected	Affected	Not Affected	Not Affected	Not Affected	Not Affected
House of Kleen Inc. (#931)	Encounter soil and groundwater contaminated with tetrachloroethylene, trichloroethylene, and petroleum.	Affected	Affected	Affected	Affected	Affected	Affected
Total Sites Affected	Not Applicable	1	2	1	1	1	1

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

Note: All high-risk sites have documented releases. The potential for each alternative to affect high-risk sites is based on direct construction impacts. If a high-risk site falls within the construction area, it could be affected, which could result in associated impacts.



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4.2.13 Electromagnetic Fields

4.2.13.1 Affected Environment

Sound Transit reviewed existing and planned property uses where potential electromagnetic fields from light rail trains and facilities (such as traction power substations) might interfere with normal operation and function of sensitive equipment. The study area for electromagnetic field impacts extends 300 feet from the Build Alternatives track alignments, including stations. In the West Seattle Link Extension study area, no properties with sensitive equipment were identified.

4.2.13.2 Environmental Impacts of the No Build Alternative

The existing electromagnetic field environment would not change if the project is not built.

4.2.13.3 Environmental Impacts of the Build Alternatives during Operations

To evaluate the potential for localized electromagnetic field effects to sensitive equipment from the project, Sound Transit evaluated the potential for electromagnetic interference at properties with sensitive equipment, as well as areas along the alternatives where electromagnetic fields generated from operating the project are expected to be greater, such as at traction power substations and where trains must accelerate or ascend an incline.

The impacts of electromagnetic fields and stray currents from construction and operation of the West Seattle Link Extension would be the same for all Build Alternatives.

4.2.13.3.1 Electromagnetic Field Impacts to Sensitive Equipment and Human Health

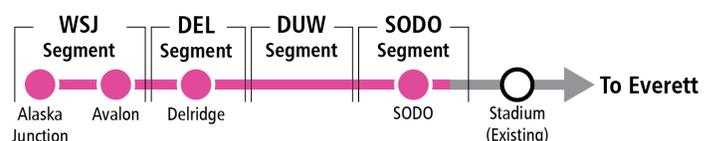
There are no properties with sensitive equipment in West Seattle Link Extension study area, so no long-term electromagnetic field impacts on sensitive equipment are expected from any of the Build Alternatives.

Electromagnetic fields from the project operation would be generated from direct-current electricity flowing from the traction power substation through overhead catenary wires to the light rail trains, from movement of the large metal trains, and from radio frequency fields from wireless systems such as communications, data transmission, and monitoring systems on the light rail vehicles and along the corridor. The strongest electromagnetic field source would be the slowly varying magnetic fields from direct current flowing from the traction power substations through overhead catenary wires to the light rail trains. These slowly varying electromagnetic fields would diminish in level with lateral distance from the rail line.

The direct current from the traction power substations carried by the catenary wires to the light rail trains would slowly vary in amplitude depending on train acceleration. The direct current also includes low levels of low-

Key Electricity Terms

A **volt** is the base unit of electric potential 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 frequency of reversal 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 one hour).



frequency alternating currents. These low-frequency alternating currents also generate electromagnetic fields, which could interfere with low-frequency radio waves from other sources such as AM radios. Such interference might annoy the listener, but does not damage the radio equipment. Additional detail on traction power substations can be found in Chapter 2, Alternatives Considered.

The 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 the Institute of Electrical and Electronics Engineers (2019). The light rail system would not be a notable source of magnetic fields for human exposure. Example sources of electromagnetic fields are listed in Section 4.1.13, Electromagnetic Fields.

Within the SODO Segment, all Build Alternatives would relocate an overhead 230-kilovolt, 60-hertz, alternating-current power line from the SODO Busway to the east side of 6th Avenue South between South Massachusetts Street and the substation south of South Spokane Street. There are existing 26-kilovolt lines on both sides of the road. The relocated 230-kilovolt power line would move farther from the SODO Busway businesses and closer to some 6th Avenue South businesses and would potentially increase the 6th Avenue South 60-hertz electromagnetic field. However, businesses in Seattle already operate near 230-kilovolt and 26-kilovolt power lines with no negative effect. Further, the field of the combined 230-kilovolt and 26-kilovolt would be far lower than the broadly accepted human health limit of 9 gauss for exposure of the general public to 60-hertz fields, in the Institute of Electrical and Electronics Engineers (2019) standard. Therefore, there are no expected impacts to business operations or human health. A portion of this relocation would occur within the limits of the Ballard Link Extension project, but the relocation would occur as part of the West Seattle Link Extension project.

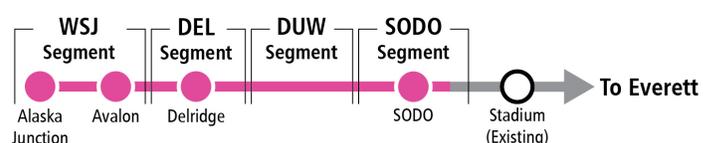
4.2.13.3.2 Impacts from Stray Currents

Without control measures, a portion of the electrical current flowing from the traction power substations to the light rail trains may produce stray currents, where the current flows in alternative conducting paths such as metal structures, water, or the earth. The stray currents can corrode adjacent metal structures if they are not sufficiently controlled and if the metal structures are not sufficiently protected. Sound Transit would minimize or avoid the effect of stray currents on neighboring facilities by incorporating best management practices appropriate for the project. The best management practices may include:

- Installing cathodic protections systems in nearby utility lines to protect them from corrosion
- Installing insulating unions to break the electrical conductivity of nearby utility pipes 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

4.2.13.4 Environmental Impacts of the Build Alternatives during Construction

No electromagnetic field impacts would occur as a result of construction of any of the Build Alternatives because there are no sensitive properties in the West Seattle Link Extension study area. However, there could be an impact on construction activities associated with the Delridge Segment alternatives caused by a nearby AM radio tower. Under some conditions, the electric



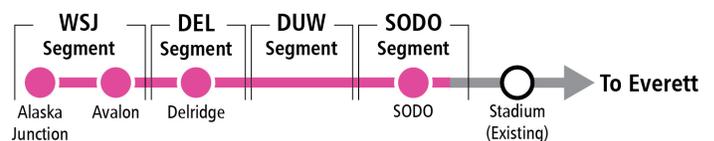
field from the radio tower could cause a touch potential on cranes. A touch potential is a substantial voltage that could shock a worker who stood on the ground and touched the crane hook. Given the distance of the construction area from the AM radio tower, there is low probability that this impact would occur. Sound Transit would employ best management practices such as insulating or grounding the crane to avoid this impact.

4.2.13.5 Indirect Impacts of the Build Alternatives

There are no sensitive properties in the study area, and no indirect electromagnetic field impacts are expected from any of the West Seattle Link Extension Build Alternatives.

4.2.13.6 Mitigation Measures

There would be no electromagnetic field impacts from construction and operation of the West Seattle Link Extension; therefore, no mitigation measures would be needed.



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4.2.14 Public Services, Safety, and Security

4.2.14.1 Affected Environment

The study area for public services is 0.5 mile from the edge of the West Seattle Link Extension project limits for operations and construction. The project limits include permanent project improvements and areas needed for project construction. Table 4.2.14-1 identifies the public service providers that have facilities in the study area. Information on public transit facilities can be found in Section 3.4, West Seattle Link Extension Affected Environment and Impacts during Operation – Transit, and Section 3.11, West Seattle Link Extension Construction Impacts, in Chapter 3, Transportation Environment and Consequences. Facility locations are shown on Figures 4.2.14-1 through 4.2.14-4.

Table 4.2.14-1. Public Service Providers in West Seattle Link Extension Study Area

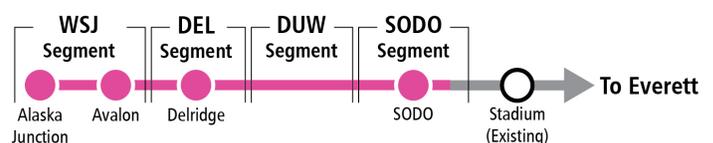
Type	Service Provider	Locations in Study Area
Police	Seattle Police Department	<ul style="list-style-type: none"> Seattle Police Support Facility, 730 South Stacy Street and 2203 Airport Way South
Fire/ Emergency Medical, Local	Seattle Fire Department	<ul style="list-style-type: none"> Seattle Fire Department Fire Station 14, 3224 4th Avenue South Seattle Fire Department Fire Station 32, 3715 Southwest Alaska Street Seattle Fire Department Fire Station 36, 3600 23rd Avenue Southwest
Public Schools	Seattle Public Schools	<ul style="list-style-type: none"> Fairmount Park Elementary School, 3800 Southwest Findlay Street Genesee Hill Elementary School, 5013 Southwest Dakota Street Pathfinder K-8 School, 1901 Southwest Genesee Street
Private Schools	Multiple	<ul style="list-style-type: none"> Holy Rosary School, 4142 42nd Avenue Southwest Hope Lutheran School, 4446 42nd Avenue Southwest Seattle Lutheran High School/Saint Christopher Academy, 4100 Southwest Genesee Street Tilden School, 4105 California Avenue Southwest
Other Government Facilities	Seattle Public Schools	<ul style="list-style-type: none"> Seattle Public Schools John Stanford Center for Educational Excellence (Administrative Building), 2445 3rd Avenue South
	United States Postal Service	<ul style="list-style-type: none"> United States Postal Service Carrier Annex and Distribution Center/Terminal Post Office, 2460 4th Avenue South West Seattle Post Office, 4412 California Avenue Southwest

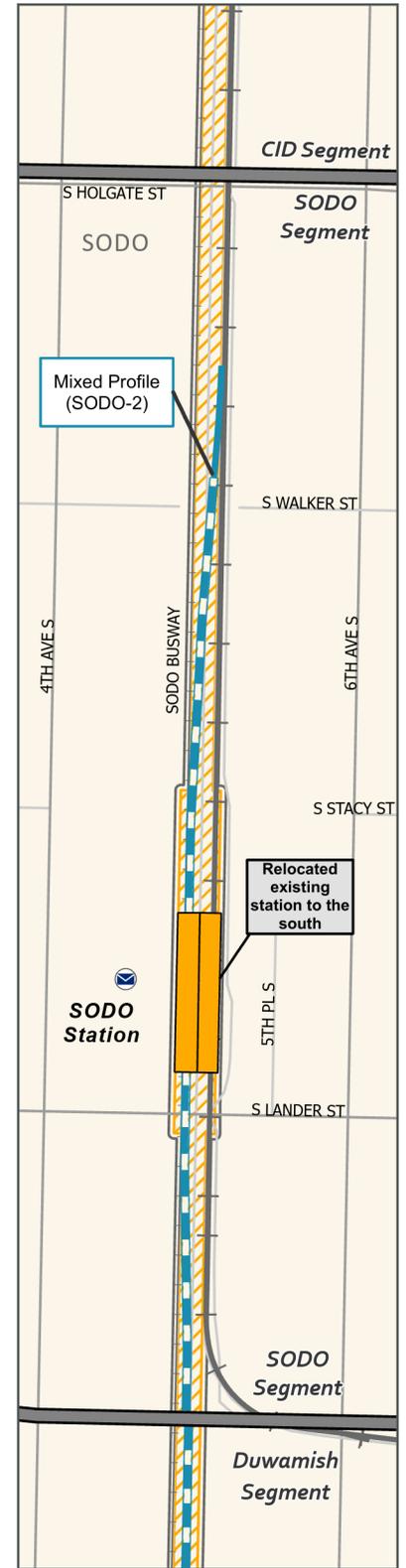
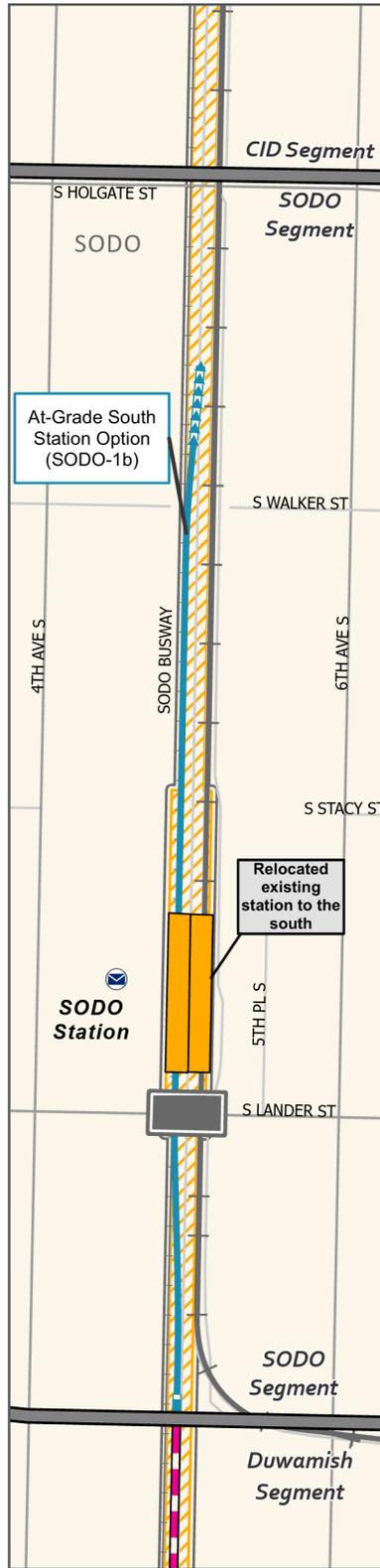
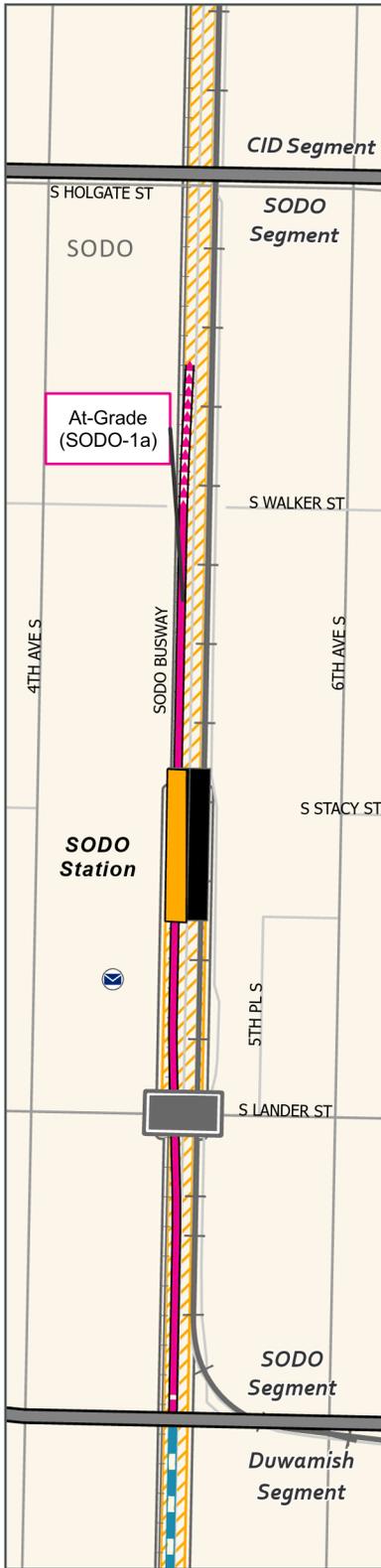
Source: City of Seattle 2020.

4.2.14.1.1 Fire and Emergency Medical Services

The Seattle Fire Department provides fire and emergency medical services in the study area. In 2020, the Seattle Fire Department’s average response time from dispatch to arrival was as follows (City of Seattle 2021):

- 78% of the time arrived within 4 minutes for the first-arriving engine for fires and hazardous materials responses (standard is 90%)
- 92% of the time arrived within 8 minutes for full alarm assignment (15 firefighters) for fires and hazardous materials responses (standard is 90%)
- 73% of the time arrived within 4 minutes for basic life support services (standard is 90%)
- 81% of the time arrived within 8 minutes for advanced life support services (standard is 90%)





Source: City of Seattle, King County (2019, 2020, 2021).

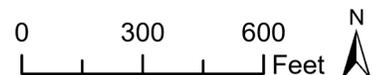
- | | |
|--|--------------------------|
| Alternatives | Segment Line |
| Preferred Alternative | Existing Link Light Rail |
| Preferred Alternative with Third-party Funding | Railroad |
| Other Alternatives | SODO Busway |
| Alternative Profile | Proposed Overpass |
| Elevated | Tunnel |
| At-Grade | Retained Cut |
| Station | |
| New | |
| Existing | |

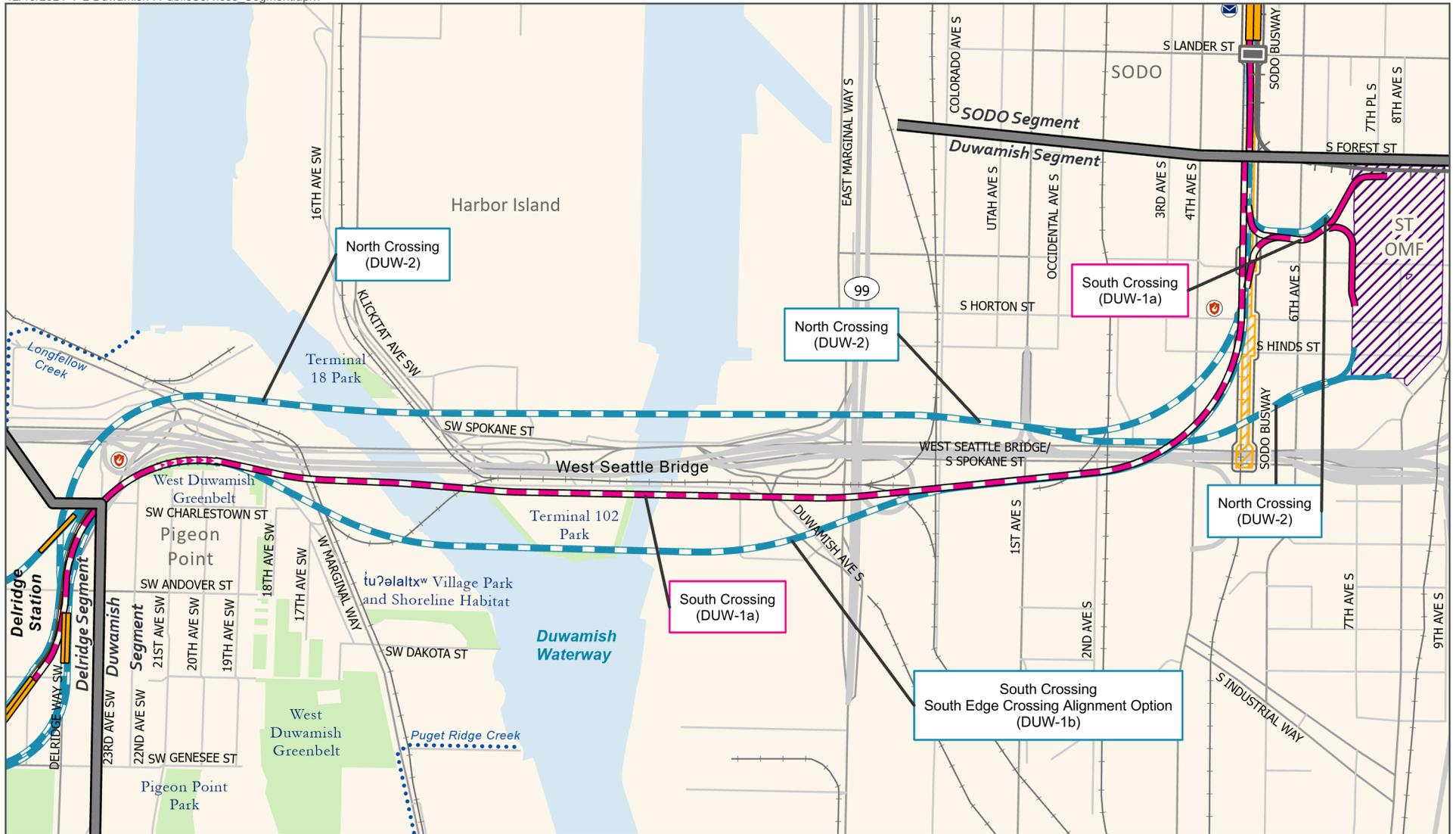
Post Office

Note: Seattle Public Schools John Stanford Center for Educational Excellence and Seattle Police Support Facility are located within the West Seattle - SODO Segment but outside of the map extent.

FIGURE 4.2.14-1
Public Services
West Seattle Link Extension -
SODO Segment

West Seattle and Ballard Link Extensions



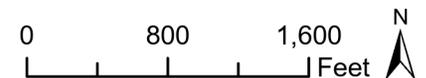


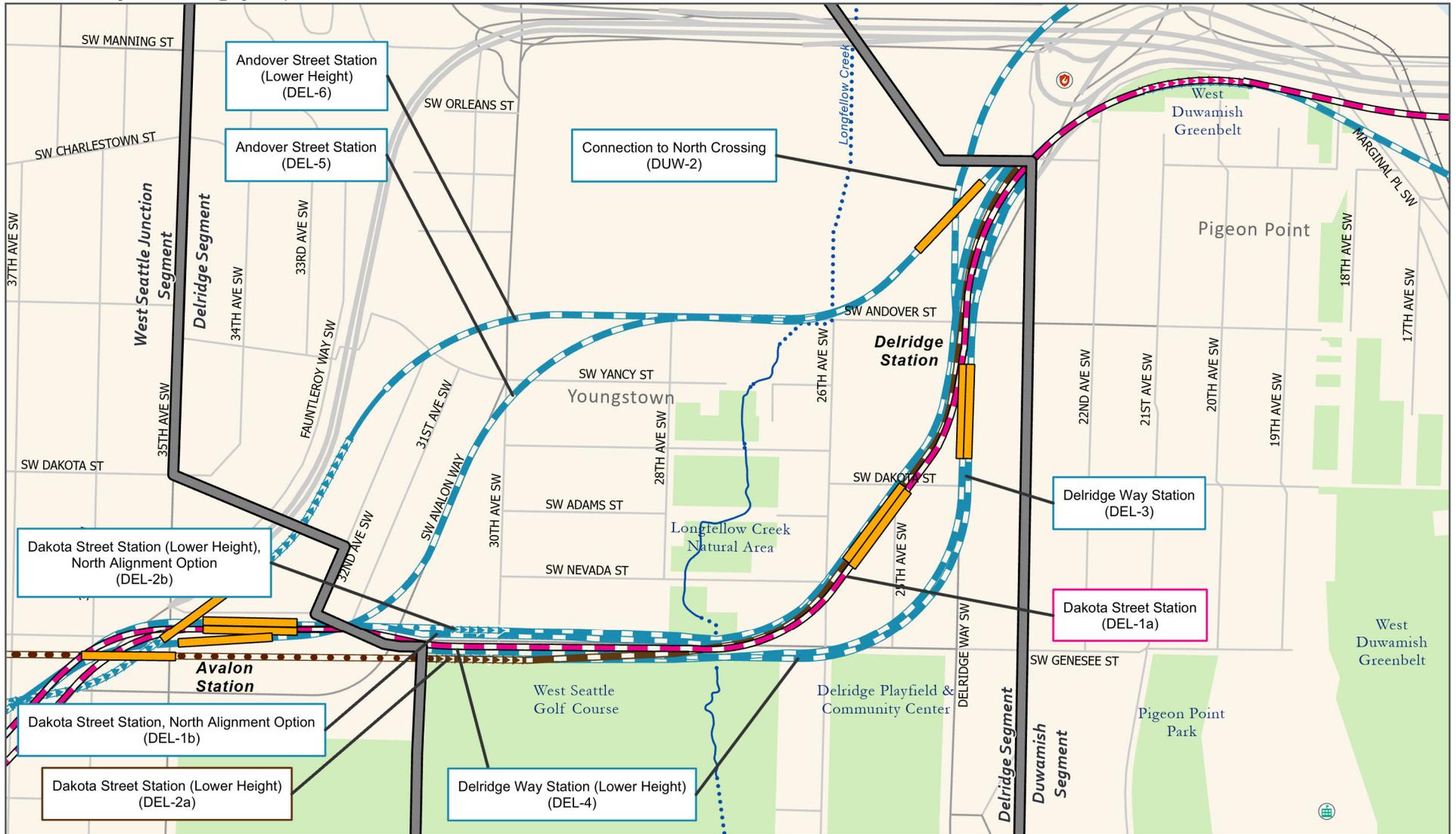
Source: City of Seattle, King County (2019, 2020, 2021).

- | | | |
|--|--|--------------|
| Alternatives | Segment Line | Fire Station |
| Preferred Alternative | Existing Link Light Rail | Post Office |
| Preferred Alternative with Third-party Funding | Railroad | |
| Other Alternatives | SODO Busway | |
| Alternative Profile | Proposed Overpass | |
| Elevated | Sound Transit Operations and Maintenance Facility (ST OMF) | |
| At-Grade | Piped Stream | |
| Station | Park | |
| New | | |

Note: Pathfinder K-8 School is located within the Duwamish Segment but outside of the map extent.

FIGURE 4.2.14-2
Public Services
 West Seattle Link Extension -
 Duwamish Segment
*West Seattle and
 Ballard Link Extensions*



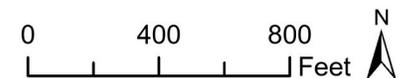


Source: City of Seattle, King County (2019, 2020, 2021).

- Alternatives**
- Preferred Alternative
 - Preferred Alternative with Third-party Funding
 - Other Alternatives
- Alternative Profile**
- Elevated
 - Tunnel
 - At-Grade
 - Retained Cut
- Station**
- New
- Segment Line
 - Railroad
 - Stream
 - Piped Stream
 - Park
 - ⦿ Fire Station
 - ⦿ School and Facilities

FIGURE 4.2.14-3
Public Services
 West Seattle Link Extension -
 Delridge Segment

*West Seattle and
 Ballard Link Extensions*



Fire Station 14 in SODO houses Rescue 1, the technical rescue team (tunnel rescue, structural collapse, trench/cave-in rescue, dive rescue, and similar) and their equipment. Fire Station 36 in the Delridge neighborhood houses Marine 1, a land-based team that fights fires on or near the water, and contains specialty equipment for this team. All other fire stations serve their surrounding areas.

4.2.14.1.2 Police Services

The Seattle Police Department provides law enforcement, public safety services, and emergency response to 911 calls throughout Seattle. The West Seattle Link Extension is within the South and Southwest Seattle Police Department precincts. The King County Metro Transit (Metro) Police and King County Sheriff provide law enforcement services for Sound Transit. Sound Transit operates its own transit police composed of contracted security personnel, law enforcement officers, or a combination of both at its facilities. See Appendix L4.14, Public Services, Safety, and Security, for information on Seattle Police Department's response times and crime data for the city of Seattle, the state of Washington, and the areas near existing Link light rail stations.

Seattle Police Harbor Patrol is on the north shore of Lake Union. While the headquarters and boat docks are outside the study area, Harbor Patrol operates in waterways within the study area, including Elliott Bay and the Duwamish Waterway, and provides marine law enforcement, rescue, fire response, and assistance.

4.2.14.1.3 Solid Waste and Recycling Collection Services

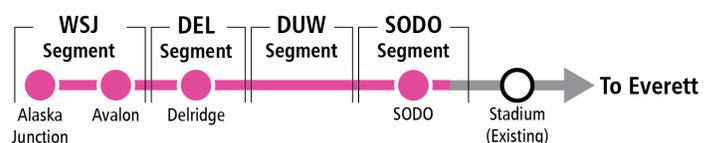
Waste Management is currently contracted to provide solid waste, yard waste, and recycling collection within the study area. Nonhazardous solid waste collected in the study area is taken to the South Transfer Station at 130 South Kenyon Street and then to a landfill outside of King County. Collection vehicles travel throughout the roadways in the study area.

4.2.14.1.4 Schools

The study area is served by the Seattle Public Schools. There are also a number of private schools in the study area (see Table 4.2.14-1). Collectively, the public schools in the West Seattle Link Extension study area served approximately 1,700 students in the 2019 to 2020 school year. The John Stanford Center for Educational Excellence is the main administrative building for Seattle Public Schools and is also in the study area. There are also four private schools in the study area, which are concentrated around the West Seattle Junction. Many students attending private and public schools use school bus transportation. Middle school and high school students also use Metro buses and Link light rail through an ORCA card program. Seattle Public Schools provide school walking and bicycling routes, with designated school crosswalks.

4.2.14.1.5 Other Government Facilities

United States Postal Service facilities and an administrative school building for Seattle Public Schools are in the study area (see Table 4.2.14-1). There are two United States Postal Service facilities in the SODO Segment and one in the West Seattle Junction Segment. The United States Postal Service Carrier Annex and Distribution Center/Terminal Post Office in SODO is on an about 4.6-acre site. The site includes an approximately 4,000-square-foot warehouse, an approximately 4,000-square-foot office building, an approximately 345-stall parking garage, and surface parking. The facility provides customer service similar to other post offices, and also



includes mail sorting for the City, maintenance, and a parking garage for mail delivery trucks and partner delivery trucks.

4.2.14.2 Environmental Impacts of the No Build Alternative

The No Build Alternative would have no direct impacts on public services in the area. However, continued population and employment growth in the study area would increase public service demands. It would also increase traffic congestion, and therefore increase emergency service response times (see Chapter 3).

4.2.14.3 Environmental Impacts of the Build Alternatives during Operation

4.2.14.3.1 Impacts Common to All Alternatives

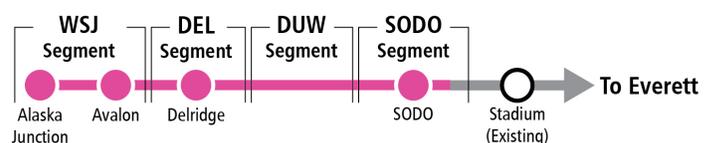
Fire and Emergency Medical Services

Sound Transit's safety design criteria are used to avoid conflicts with vehicular, bicycle, and pedestrian traffic. Sound Transit would prepare a safety and security management plan for the WSBLE Project. The management plan would establish the safety and security measures required throughout the project lifecycle (design, construction, and operation).

The West Seattle Link Extension would operate within its own exclusive grade-separated right-of-way, and light rail operations would not directly affect fire and emergency medical services routes or response times on public roadways. Increased congestion at station areas, particularly those that are close to fire stations, could affect response times but traffic impacts would be mitigated. Chapter 3 identifies locations where traffic congestion could occur and potential mitigation to improve traffic conditions.

In accordance with the City of Seattle's fire code, Sound Transit would maintain access to fire hydrants, fire lanes, and fire response access points adjacent to the West Seattle Link Extension where possible. Where it is not possible, Sound Transit would coordinate with the Seattle Fire Department to redesign access. Design for elevated and tunnel emergency access and evaluation would conform with state and local fire codes and with National Fire Protection Association 130, Standard for Fixed Guideway Transit and Passenger Rail Systems (2020). Access to trains could generally be provided by trains on the adjacent track. When a second train is not practical, Sound Transit would follow the local and state fire codes and National Fire Protection Association 130. Emergency access to tunnels would be maintained for prompt response times and for the safety of passengers and emergency service providers. Tunnel stations would include several safety design features to address fire prevention, ventilation and fire protection, and evacuation, such as automatic fire suppression equipment; emergency ventilation shafts, fans, and dampers; and emergency lighting, communications equipment, and exit signage. Emergency services providers and Sound Transit personnel would be trained to respond to emergencies on elevated guideways, tunnels, and in retained cut profiles. Provisions for emergency access would be included at the stations.

Sound Transit's Fire/Life Safety Committee would 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; specific emergency procedures and necessary equipment would be determined during final design.



Police

Police vehicles are not anticipated to experience increased response times. Police could have difficulty responding to calls at elevated or tunneled sections of guideway or at stations not easily accessible from the existing roadway network. Sound Transit would coordinate with local emergency service providers to provide additional planning for these situations; however, trains would generally proceed to the nearest station for a police response. Sound Transit would also coordinate with emergency responders to have a plan for unanticipated emergencies.

All Build Alternatives would require additional police and security staff to monitor stations, entryways, and adjacent areas to protect people and property. Sound Transit's transit police would remain at some stations throughout the day and patrol other facilities and respond to incidents in coordination with local law enforcement.

Previous studies have shown that crime at transit stations generally mirrors crime levels in the surrounding area (Moudon et al. 2018, Billings et al. 2011, City of Seattle 1999). Over 90 percent of crimes in transit facilities relate to quality of life crimes (e.g., vandalism, drunkenness, and panhandling) and property crimes. An increase in the number of people in the area from light rail and implementation of security measures could deter crime along the project corridor.

Design of access points and the location of facilities could influence crime if stations provide places where crimes can go unseen by others. The *Sound Transit Agency Safety Plan* (Sound Transit 2020) requires a threat and vulnerability assessment for all new transit facilities during the preliminary design phase. For this assessment, Sound Transit would review existing crime data in new station locations and interview law enforcement to identify possible security threats and risks. Stations would be designed using the principles of Crime Prevention Through Environmental Design to include numerous features such as abundant light, open access, and visibility to address security issues. Crime Prevention Through Environmental Design measures would also minimize impacts by controlling passenger movements with specific traffic flow patterns and installing closed-circuit television cameras, emergency telephones, controlled exits, and sealed fare boxes. Sound Transit would continue consultation with police and public safety services throughout the design process to minimize risk.

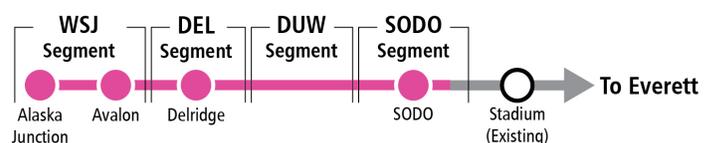
Sound Transit would build upon existing safety and security management plans from other Link projects and apply lessons learned from these projects to meet the latest Federal Transit Administration guidelines on safety and security. Sound Transit would work with the United States Department of Homeland Security, Federal Transit Administration, emergency service providers, and local law-enforcement agencies to create a project-specific safety and security management plan that would meet all federal, state, and local requirements and develop strategies to prevent and respond to potential threats to public safety.

Solid Waste

Operation of the West Seattle Link Extension would not impact solid waste collection and disposal within the study area. Sound Transit would not acquire any property currently used by recycling, composting, and solid waste facilities or operating bases. No collection routes would be negatively affected or experience delay or altered services due to minor changes in existing roadways. In addition, the project would not increase demand for waste services.

Schools

Because the West Seattle Link Extension would be entirely grade separated, the project would not affect school bus/van travel through residential neighborhoods. In areas where new stations



are within walking distance to schools, students and staff could experience improved travel times. For information on overall travel times, see Chapter 3.

Other Government Facilities

Sound Transit would coordinate with United States Postal Service officials to ensure that changes in existing roadways resulting from project operations would not negatively affect postal routes or create delivery delays. Because the West Seattle Link Extension is entirely grade separate, conflicts with United States Postal Service routes are not anticipated.

4.2.14.3.2 SODO Segment

Preferred Alternative SODO-1a and Option SODO-1b would displace bus use of the SODO Busway. Impacts to the busway could create slightly longer travel times for staff and students at schools served by these routes who rely on Metro bus services to commute. These alternatives include an overpass on South Lander Street, which would remove the at-grade crossing of Central Link that creates a traffic delay for all vehicles on this road when trains pass. The new overpass would benefit emergency response and travel times since it would remove this traffic delay. Alternative SODO-2 would keep bus use of the SODO Busway but would not include the South Lander Street overpass.

Both Option SODO-1b and Alternative SODO-2 would displace the United States Postal Service Carrier Annex and Distribution Center/Terminal Post Office at 4th Avenue South and South Lander Street. Preferred Alternative SODO-1a would acquire part of this facility (a portion of the surface parking), which the United States Postal Service has indicated would require relocation of the facility. Relocation of the facility could be challenging due to its size, functions, and the service area that it would need to be within. Impacts of relocating the United States Postal Service facility are yet undefined, and should an alternative that triggers relocation of the facility move forward, additional environmental review will be conducted to evaluate and disclose impacts of relocating the facility. The staggered station configuration for Preferred Alternative SODO-1a would avoid permanent impacts (i.e., operation and maintenance) to the United States Postal Service facility. Accordingly, this station configuration would not require relocation of the facility.

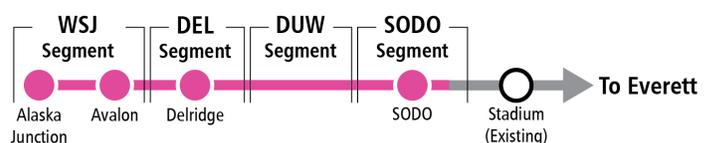
For the staggered station configuration for Preferred Alternative SODO-1a, the existing driveway at the United States Postal Service Carrier Annex and Distribution Center/Terminal Post Office’s southern access point would be connected under the new South Lander Street overpass to 4th Avenue South, which then provides access to South Lander Street.

The Ballard Link Extension-only Minimum Operable Segment (M.O.S.) would also have impacts to public services discussed here for the West Seattle Link Extension.

4.2.14.3.3 Duwamish Segment

Preferred Alternative DUW-1a and Option DUW-1b would acquire a portion of Fire Station 36 when connecting to Alternative DEL-3 or Alternative DEL-4* in the Delridge Segment. If Fire Station 36 needs to be relocated, Sound Transit would work closely with fire department officials to identify a suitable property within the surrounding area and ensure operations continue with minimal impacts during relocation.

All of the Duwamish Segment alternatives would have a moderate noise impact on Seattle Fire Department Fire Station 14 on 4th Avenue South, which could be mitigated with a sound wall



(see Section 4.2.7.3, Environmental Impacts of the Build Alternatives during Operation). Alternative DUW-2 would acquire part of the Fire Station 14 property but is not expected to require relocation of the station and no long-term effects are expected. The Ballard Link Extension-only M.O.S. would result in the same impacts at Fire Station 14 in the Duwamish Segment for the connection to the existing Operations and Maintenance Facility Central. These effects are described for the Ballard Link Extension SODO Segment in Section 4.3.14.3.2.

4.2.14.3.4 Delridge Segment

Alternatives in this segment would not cause additional impacts to public services, safety, and security other than those discussed above under Long-term Impacts Common to All Build Alternatives.

4.2.14.3.5 West Seattle Junction Segment

Alternatives in this segment would not cause additional impacts to public services, safety, and security other than those discussed above under Long-term Impacts Common to All Build Alternatives.

4.2.14.4 Environmental Impacts of the Build Alternatives during Construction

4.2.14.4.1 Impacts Common to All Build Alternatives

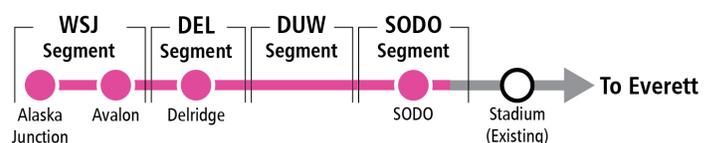
Construction of any West Seattle Link Extension alternative would require temporary lane and roadway closures, shifts in roadway alignments, and detours associated with the project, which could result in increased congestion along adjacent roadways. Prior to construction, Sound Transit would coordinate with public service providers to establish alternate routes and ensure required access during established time periods. Traffic control plans would be reviewed and approved by affected agencies before being implemented to minimize increases in travel and response times and to avoid interference with emergency response, collection of solid waste and recyclables, or transportation of students. Through continued coordination and communication with local agencies, Sound Transit anticipates that there would be no impact to public services, safety, and security during construction.

Fire and Emergency Medical Services

Temporary closures could affect access and response times for fire and emergency medical vehicles. Throughout the construction period, Sound Transit would maintain access and egress for fire and emergency medical vehicles to minimize impacts on response and travel times within project segments. Sound Transit would also develop contingency plans with emergency service providers to reduce response and travel times and ensure access to hydrants and water lines during construction of the project. City of Seattle fire and emergency medical providers would respond to potential emergencies at the construction sites.

Police

Temporary closures could affect access and response times for police vehicles. Additional police may be required to direct traffic in areas where project construction requires alterations to existing roadways, especially in areas where road closures would occur. Sound Transit would coordinate with the City of Seattle and Washington State Patrol to provide adequate police services. Traffic congestion and new traffic patterns resulting from construction could temporarily increase the number of traffic incidents and therefore increase demand on existing



police resources. New traffic patterns and circulation changes would be coordinated with local police and emergency service providers prior to their establishment. Seattle Police Department would respond to potential emergencies at the construction sites.

Solid Waste

As with other public service providers, waste and recycling vehicles could experience delays along collection routes close to the project. Sound Transit would maintain access and egress for solid waste and recycling collection vehicles to minimize impacts on collection. Sound Transit would work with collection companies to identify if any access points are required to be closed and develop alternative access points, collection locations, or other needed measures. Project construction would likely increase the amount of debris and refuse; however, there are several waste facilities in the region that could accept this waste with no impacts to solid waste operations.

Schools

The West Seattle Link Extension Build Alternatives are not in close proximity to schools and therefore are unlikely to result in any construction-related impacts, such as noise and dust, on students or school staff. Full and partial road closures during construction could result in the temporary rerouting of school and/or transit buses, which could affect student and staff travel times. However, Sound Transit would work with local school bus operators and other transit authorities to identify relocated bus stops near those temporarily closed stops. See Chapter 3 for further discussion of impacts to buses during construction.

Other Government Facilities

United States Postal Service vehicles could experience delays during construction; however, Sound Transit would ensure that access and egress for such vehicles would be maintained and closure of an access point would be remedied by an alternate access developed in coordination with local post offices.

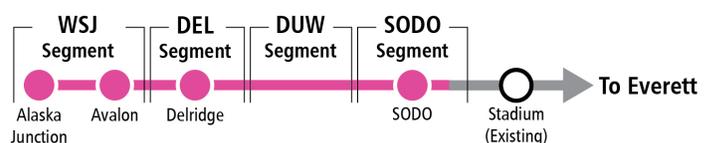
4.2.14.4.2 SODO Segment

Preferred Alternative SODO-1a and Option SODO-1b would close South Lander Street between 4th Avenue South and 6th Avenue South for construction of the South Lander Street overpass. This could increase emergency response and travel times for vehicles that typically use this road, especially at the nearby Seattle Police Support Facility, but detours would be coordinated with service providers.

The staggered station configuration for Preferred Alternative SODO-1a would not occupy property owned by the United States Postal Service and would not require replacement of the Carrier Annex and Distribution Center/Terminal Post Office. During construction of the South Lander Street overpass, access from the United States Postal Service facility would be maintained at their southern access point, except for short durations over nights and weekends. The majority of the United States Postal Service access road interruptions are anticipated to occur over a 1.5-year period.

The north entrance to the United States Postal Service facility from 4th Avenue South would remain open. Sound Transit would coordinate with United States Postal Service officials to minimize construction impacts to United States Postal Service operations.

All of the alternatives would also close the SODO Busway during construction. After construction, service would be restored on the SODO Busway for Alternative SODO-2. While



Sound Transit would work with Metro and the Seattle Department of Transportation to find alternate bus routes, impacts to the busway could create slightly longer travel times for staff and students at schools served by these routes who rely on Metro bus services to commute.

With all alternatives, utility relocations could result in temporary roadway closures that could affect Metro's access to their Atlantic/Central Bus Base. However, it is accessible on all four sides, and construction would be coordinated to maintain access at one or more points.

The Ballard Link Extension-only M.O.S. would also have impacts to public services discussed here for the West Seattle Link Extension.

4.2.14.4.3 Duwamish Segment

The Southwest Klickitat Way bridge allows access to the Port of Seattle Harbor Marina Corporate Center at Terminal 102 when the Spokane Street Bridge is inaccessible from freight train movement on the existing BNSF Railway line. The Preferred Alternative DUW-1a and Option DUW-1b would require construction close to the Southwest Klickitat Way bridge, but the bridge would remain open to maintain emergency access.

Fire Station 36 would need to be temporarily relocated during construction with Preferred Alternative DUW-1a and Option DUW-1b if connecting to Alternative DEL-3 or Alternative DEL-4* in the Delridge Segment. Alternative DUW-2 would require temporary relocation of some uses at Fire Station 14, including parking for electric fleet vehicles and training functions that currently use the eastern portion of this fire station property. If these relocations were necessary, Sound Transit would work closely with fire department officials to identify a suitable property within the surrounding area and ensure operations continue with minimal impacts during relocation. Contingency response routes would be developed to identify alternate response pathways, as necessary. The Ballard Link Extension-only M.O.S. would result in the same impacts at Fire Station 14 in the Duwamish Segment for the connection to the existing Operations and Maintenance Facility Central. These effects are described for the Ballard Link Extension SODO Segment in Section 4.3.14.4.2.

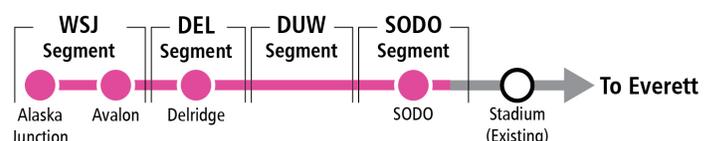
Response times of Seattle Police Harbor Patrol to the Duwamish Waterway could be impacted during construction during temporary closures of the navigation channel and from increased waterway congestion (refer to Section 3.11.3.6, Navigation, in Chapter 3 for additional information). Sound Transit would coordinate with Seattle Police Harbor Patrol prior to and throughout construction at key milestones or phases where navigation conditions could change.

4.2.14.4.4 Delridge Segment

Alternatives in this segment would not cause additional construction impacts to public services, safety, and security other than those discussed above under Construction Impacts Common to All Build Alternatives.

4.2.14.4.5 West Seattle Junction Segment

The full closure of Southwest Alaska Street between Fauntleroy Way Southwest and 38th Avenue Southwest for construction of Preferred Alternative WSJ-2 could affect response times from Fire Station 32. The temporary partial closure of Fauntleroy Way Southwest between the West Seattle Bridge and Southwest Avalon Way with each of the tunnel alternatives (Preferred Alternative WSJ-3a*, Preferred Option WSJ-3b*, and Alternatives WSJ-4* and WSJ-5*) could also affect emergency response times. The elevated alternatives (Preferred Alternative WSJ-1 and Preferred Alternative WSJ-2) would fully close this section of Fauntleroy Way Southwest during nights and weekends, and therefore could affect responses times during this time period.



Contingency response routes would be developed to identify alternate response pathways, as necessary, but access to and from the fire station would need to be maintained at all times. The alternatives in this segment would have no further impacts to public services, safety, and security.

4.2.14.5 Indirect Impacts of the Build Alternatives

The project would not lead to unplanned or induced increase in the population of Seattle or King County and would be unlikely to cause an increased demand for public services beyond those already planned. There could be a redistribution of some populations and employment growth to areas adjacent to new stations, which is consistent with City and regional plans. For more information on changes to populations and areas surrounding stations, see Section 4.2.2, Land Use.

4.2.14.6 Mitigation Measures

If Preferred Alternative DUW-1a or Option DUW-1b would require relocation of Fire Station 36, Sound Transit would work closely with fire department officials to identify a suitable property within the surrounding area and ensure operations continue with minimal impacts during relocation.

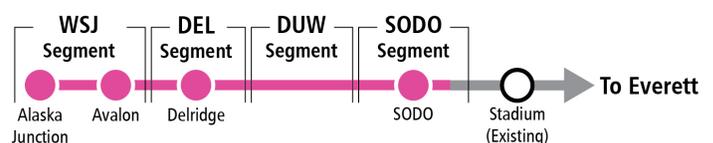
For Option SODO-1b and Alternative SODO-2, Sound Transit would identify a replacement property for the Carrier Annex and Distribution Center/Terminal Post Office at 4th Avenue South and South Lander Street. For Preferred Alternative SODO-1a, Sound Transit would identify replacement parking adjacent to the existing facility that is acceptable to the United States Postal Service or, if full relocation is required, replacement property.

For Preferred Alternative SODO-1a, Option SODO-1b, and Alternative SODO-2, Sound Transit would be responsible for future environmental review that further analyzes potential impacts of relocating the facility and the design and construction of replacement parking or a replacement facility. The replacement parking or facility would meet siting criteria and requirements that would be identified by the United States Postal Service. Relocation would occur in accordance with the Uniform Relocation Assistance and Real Property Acquisitions Policies Act of 1970 and the Sound Transit *Real Property Acquisition and Relocation Policy, Procedures and Guidelines* (Sound Transit 2017). Postal parking or operations would be relocated prior to the project impacting the existing facility. The staggered station configuration for Preferred Alternative SODO-1a would avoid permanent impacts.

Relocation of Fire Station 36 and the United States Postal Service Carrier Annex and Distribution Center/Terminal Post Office would occur in accordance with the Uniform Relocation Assistance and Real Property Acquisitions Policies Act of 1970 and the Sound Transit Real Estate Property Acquisition and Relocation Policy, Procedures, and Guidelines.

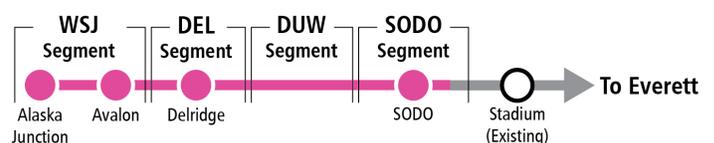
Sound Transit would coordinate with public service providers before and during construction to maintain reliable emergency access and alternative plans or routes to minimize delays in response times. This would include coordination with Seattle Police Harbor Patrol prior to and throughout construction at key milestones or phases where navigation conditions could change.

Sound Transit would also coordinate with solid waste and recycling companies and schools should rerouting of collection or school bus routes need to occur. No other mitigation would be needed, given the project commitments to:



4.2.14 Public Services, Safety and Security

- Provide mitigation measures as identified in Chapter 3 for long-term and construction impacts on traffic.
- Design the project in accordance with Link light rail's design standards that fully address emergency, safety, and security.
- Operate the light rail in accordance with Link light rail's existing approaches to ensure safety and security throughout the system.
- Develop emergency response and safety and security plans and programs in cooperation with affected agencies.



4.2.15 Utilities

4.2.15.1 Affected Environment

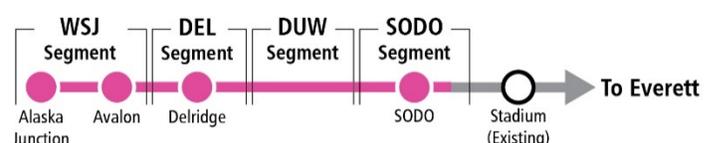
The West Seattle Link Extension study area for utilities is the area within 100 feet of the track alignment, stations, and associated facilities (operation and construction). Existing and planned utilities considered in this analysis include water, sanitary sewer, storm sewer, electrical power, natural gas, telephone and communications infrastructure, and petroleum product pipelines. Table 4.2.15-1 summarizes the utility providers in the study area.

Table 4.2.15-1. Summary of Existing Utility Providers in the West Seattle Link Extension Study Area

Utility	Provider
Electricity	<ul style="list-style-type: none"> Seattle City Light
Natural gas	<ul style="list-style-type: none"> Puget Sound Energy
Water	<ul style="list-style-type: none"> Seattle Public Utilities
Stormwater Management	<ul style="list-style-type: none"> King County Wastewater Treatment Division Port of Seattle Seattle Public Utilities Washington State Department of Transportation
Wastewater Management	<ul style="list-style-type: none"> King County Wastewater Treatment Division Seattle Public Utilities
Petroleum	<ul style="list-style-type: none"> Olympic Pipeline
Communications and cable providers	<ul style="list-style-type: none"> CenturyLink, Inc. (and Level 3) Seattle Information Technology Mobilite (Sound Transit systems) Verizon Communications Inc. Comcast Corporation Sprint WaveDivision Holdings LLC T-Mobile Atlas Networks Earthlink AT&T Inc Crown Castle Fiber Zayo Group
Steam	<ul style="list-style-type: none"> Enwave

Sources: Federal Communications Commission 2018, City of Seattle 2019.

Water and high-pressure gas lines are typically 3 to 6 feet underground, while sewer lines are usually 6 or more feet underground. Some smaller utilities, such as fiber optic cables and telephone lines, are buried less than 3 feet underground. Water, sewer, and storm drain pipelines typically run parallel beneath streets, while fiber optic cables, telephone lines, and power lines often run below sidewalks. Seattle Public Utilities owns and maintains the Southwest Genesee Street Detention Dam, a flood control and stormwater detention dam on Longfellow Creek on the south side of Southwest Genesee Street. See Section 4.2.8, Water Resources, for additional information on this dam and potential impacts.



Information on major utility upgrades or expansions in the study area was gathered from the City of Seattle Capital Improvement Program (City of Seattle 2018) and Regional Wastewater Services Plan (King County 2018) and is summarized in Appendix L4.15. Sound Transit would continue to coordinate with King County and appropriate departments within the City of Seattle through final design on any conflicts between the West Seattle Link Extension and these upgrades.

4.2.15.2 Environmental Impacts of the No Build Alternative

The No Build Alternative would not impact utilities in the study area.

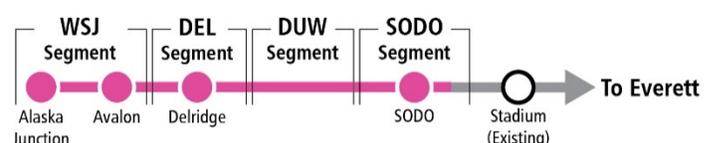
4.2.15.3 Environmental Impacts of the Build Alternatives during Operation

The West Seattle Link Extension would increase electricity usage in the study area through the operation of light rail trains using direct-current power taken from 26-kilovolt electric distribution facilities, as well as through lighting installed at stations and safety lighting along the alignment and other light rail facilities. Seattle City Light would provide the electricity to operate the project's light rail vehicles, stations, and facilities. Section 4.2.10, Energy Impacts, describes the Build Alternatives' energy consumption and identifies energy-related impacts. Seattle City Light has the capacity to supply the electricity needed for the light rail extension, and Sound Transit will continue to coordinate with Seattle City Light to determine if improvements to Seattle City Light infrastructure would be necessary.

Traction power substations placed at or near light rail stations would provide power to the overhead catenary system that would power the light rail vehicles. The substations would be powered by 26-kilovolt electric lines connecting to the nearest power pole. In some cases, additional distribution lines might be needed to serve individual substations. Stray electrical current from a light rail system's traction power electrical system can cause damage and corrosion to nearby underground utilities if not properly controlled. Section 4.2.13, Electromagnetic Fields, provides additional discussion of potential stray current effects on utilities.

Major service disruptions to utility customers during light rail repair and maintenance operations are unlikely. Sound Transit would design the light rail to maintain access to utilities for maintenance and repair. In some cases, that would require Sound Transit to relocate sewer maintenance holes, pipes, vaults, or other access points. Sound Transit would work with utility providers to maintain required access to these utilities and relocated sewer maintenance holes and vaults, utility mains, fire hydrants, and other features.

Sound Transit would integrate efficient operating practices at existing and new facilities and use equipment to reduce energy and water demand and to recycle water. Sound Transit's sustainability requirements are described further in Section 4.2.10, Energy Impacts. Implementing these and other sustainable practices would reduce consumption and demand on utilities.



4.2.15.4 Environmental Impacts of the Build Alternatives during Construction

4.2.15.4.1 Impacts Common to All Alternatives

Sound Transit inventoried major utilities in the study area to identify potential conflicts that might require utility relocation and to understand the degree of utility impacts. Major utilities were defined as follows:

- Water mains that are 16 inches in diameter or greater
- Sanitary sewer force mains and gravity sewers that are 24 inches in diameter or greater
- Stormwater drains that are 36 inches in diameter or greater and drainage ponds
- Electrical transmission lines that are 115-kilovolt or greater
- High-pressure gas mains
- Intermediate-pressure gas lines that are 8 inches in diameter or greater
- Telephone and fiber optic duct banks with three or more conduits
- Petroleum product pipelines
- Steam pipelines that are 12 inches in diameter (carrier pipe diameter) or greater

Sound Transit did not evaluate or inventory impacts to minor utilities but will evaluate and inventory them as the project design progresses from preliminary to final design.

The purpose of identifying these conflicts is to plan for relocating the utilities during construction to remove possible conflicts, prevent disturbing the route during future maintenance of overhead or underground utilities, ensure that the light rail infrastructure is separated from the utility by the minimum distance required, and account for relocation costs.

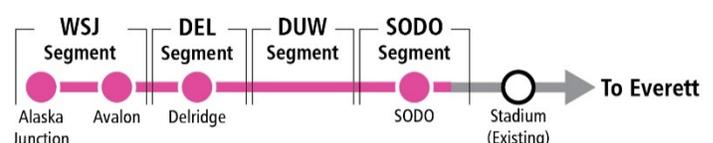
Potential impacts during construction may require the following:

- Relocating utility poles supporting overhead lines
- Raising overhead power lines to heights that do not interfere with guideway or catenary system
- Constructing new distribution lines to provide power to substations
- Relocating underground utilities
- Inspecting, repairing, and casing underground utilities at guideway track crossings
- Service disruptions

There also may be potential settling of ground around utilities, as described in Section 4.2.11, Geology and Soils.

Construction could affect access to underground utility providers, and in some cases, utilities would need to be relocated in consultation with the utility provider and the City of Seattle.

Construction could lead to impacts such as displacement, relocation, or interrupted service to utilities. The degree of impact would depend on depth, material composition, excavation limits, construction methods, project alignment, and other factors. Within the study area, most underground utilities are within about 6 feet of the surface and within 35 feet of the centerline of each alternative. To allow for excavation and to minimize load impacts from the weight of light rail vehicles, underground utilities would be relocated or cased for protection. Utilities within public road rights-of-way would generally be moved to a different location within the right-of-



way. In some cases, utilities may need to be relocated to adjacent rights-of-way and/or require additional easements from affected private properties.

Where feasible, columns for elevated guideways would avoid impacts on underground utilities. Elevated guideways might also require that existing power lines be relocated or elevated over the overhead catenary system. Bored tunnel profiles would generally avoid utility lines, except at stations, where Sound Transit would use cut-and-cover construction.

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. Sound Transit would work with utility companies to identify damaged utility lines or connections and restore service as soon as possible. Efforts to minimize impacts would also include potholing and pre-construction surveys to identify utility locations as well as outreach to inform customers of potential service disruptions.

The following subsections summarize the notable utility conflicts in each segment. Appendix L4.15 summarizes all major conflicts for each West Seattle Link Extension Build Alternative. Where major utilities would be directly under or above the project limits, the approximate length of the relocation is provided. Where major utilities would intersect with an alternative, the number of crossings is identified because the length of the relocation has not yet been determined. Sound Transit would determine relocation lengths during final design.

4.2.15.4.2 SODO Segment

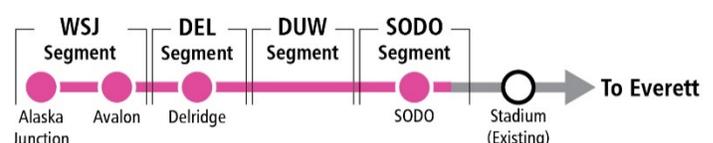
All SODO Segment Build Alternatives would relocate an overhead 230-kilovolt power line from the SODO Busway to 6th Avenue South between Massachusetts Street and the substation south of South Spokane Street. Although a portion of this relocation would occur within the limits of the Ballard Link Extension project, the relocation would occur as part of the West Seattle Link Extension. This relocation would require rebuilding portions of 6th Avenue South, but existing underground utilities would be protected in place. Preferred Alternative SODO-1a and Option SODO-1b would also affect a water line on South Lander Street, but it would be cased to accommodate light rail weight.

The Ballard Link Extension-only minimum operable segment (M.O.S.) condition would result in utility conflicts identified here in the SODO Segment for the West Seattle Link Extension.

4.2.15.4.3 Duwamish Segment

All Build Alternatives in the Duwamish Segment would relocate gas lines and fiber optic lines for guideway columns at the Duwamish Waterway (also known as the Duwamish River). All Build Alternatives would also relocate an overhead 230-kilovolt power line from 5th Avenue South to 6th Avenue South and raise an overhead 230-kilovolt power line along 2nd Avenue South. Option DUW-1b and Alternative DUW-2 could place guideway columns near a 96-inch pressurized sewer force main, which would need to be relocated. Alternative DUW-2 is the only alternative that would require the relocation of a portion of Olympic Pipeline's oil pipeline on Harbor Island. Preferred Alternative DUW-1a and Option DUW-1b would both relocate storm drain outfalls at the Duwamish Waterway. Portions of sewer lines at West Marginal Way Southwest would need to be replaced with Alternative DUW-2.

The Ballard Link Extension-only M.O.S. condition would result in utility conflicts in the Duwamish Segment for the connection to the existing Operations and Maintenance Facility Central. These effects are described for the Ballard Link Extension SODO Segment in Section 4.3.15.4.2.



4.2.15.4.4 Delridge Segment

All Build Alternatives in the Delridge Segment would conflict with a gas line because of conflicts with guideway columns. A fiber optic telecommunications line on Southwest Genesee Street would need to be relocated for Option DEL-2b*, Alternative DEL-3, Alternative DEL-4*, and Alternative DEL-5. All alternatives except Option DEL-1b would relocate a fiber optic telecommunications line at 23rd Avenue Southwest. Preferred Alternative DEL-2a* and Option DEL-2b* would relocate a fiber optic telecommunications line at 22nd Avenue Southwest. A sewer line at 26th Avenue Southwest would be relocated with Preferred Alternative DEL-1a, Option DEL-1b, Preferred Alternative DEL-2a*, Alternative DEL-5, and Alternative DEL-6*. None of the Build Alternatives in this segment would conflict with any major water or power lines.

4.2.15.4.5 West Seattle Junction Segment

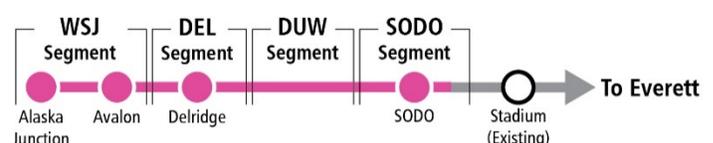
All Build Alternatives in the West Seattle Junction Segment except Alternative WSJ-4* would require the relocation of existing gas lines for guideway columns and Avalon Station. Preferred Alternative WSJ-2, Preferred Option WSJ-3b*, and Alternative WSJ-4* would relocate fiber optic lines. None of the alternatives would affect major power or sanitary sewer utilities.

4.2.15.5 Indirect Impacts of the Build Alternatives

For the West Seattle Link Extension, indirect impacts would be the same for all Build Alternatives. The improved transit access would support planned transit-oriented development or redevelopment near the West Seattle Link Extension stations. This increase in population and development would also likely increase demand for utility services in some areas surrounding stations. The project corridor is entirely within Seattle's urban growth boundary, and development near the project would not be denser than allowed within the adopted land use plan. Increased development and associated utility demands within these areas are addressed by City plans. Section 4.2.2, Land Use, provides more details on adopted land use plans and potential project impacts.

4.2.15.6 Mitigation Measures

Through pre-construction measures and coordination with utility providers, no impacts on major utilities are expected during construction of the West Seattle Link Extension and no mitigation would be needed.



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4.2.16 Historic and Archaeological Resources

4.2.16.1 Affected Environment

Appendix N.5, Historic and Archaeological Resources Technical Report, includes a history of the West Seattle Link Extension study area; additional information about federal, state, and local regulations affecting cultural resources; and further detail on the resources eligible for the National Register of Historic Places (National Register) that are described in the following sections. It also includes information on the area of potential effects for the project and detailed information for each of the parcels inventoried as part of the built environment survey.

The area of potential effects for each alternative extends from elements of the project limits (e.g., guideway, stations, and construction staging areas) to the nearest tax parcel or a maximum of 200 feet where large tax parcels are adjacent to project elements. One parcel is a standard area of potential effects extent for linear transportation projects, because potential direct and indirect effects to historic properties typically do not extend beyond one parcel. The area of potential effects is larger in the following areas to account for potential visual effects:

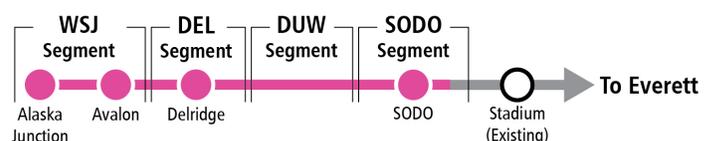
- SODO Segment.** Area of potential effects extended one additional parcel from the guideway where project alternatives would reconstruct South Lander Street to cross over the existing and new light rail alignments.
- Delridge Segment.** For Southwest Genesee Street between 26th Avenue Southwest and 30th Avenue Southwest, the high guideway height of some alternatives extends the area of potential effects to two parcels to the north of Southwest Genesee Street.

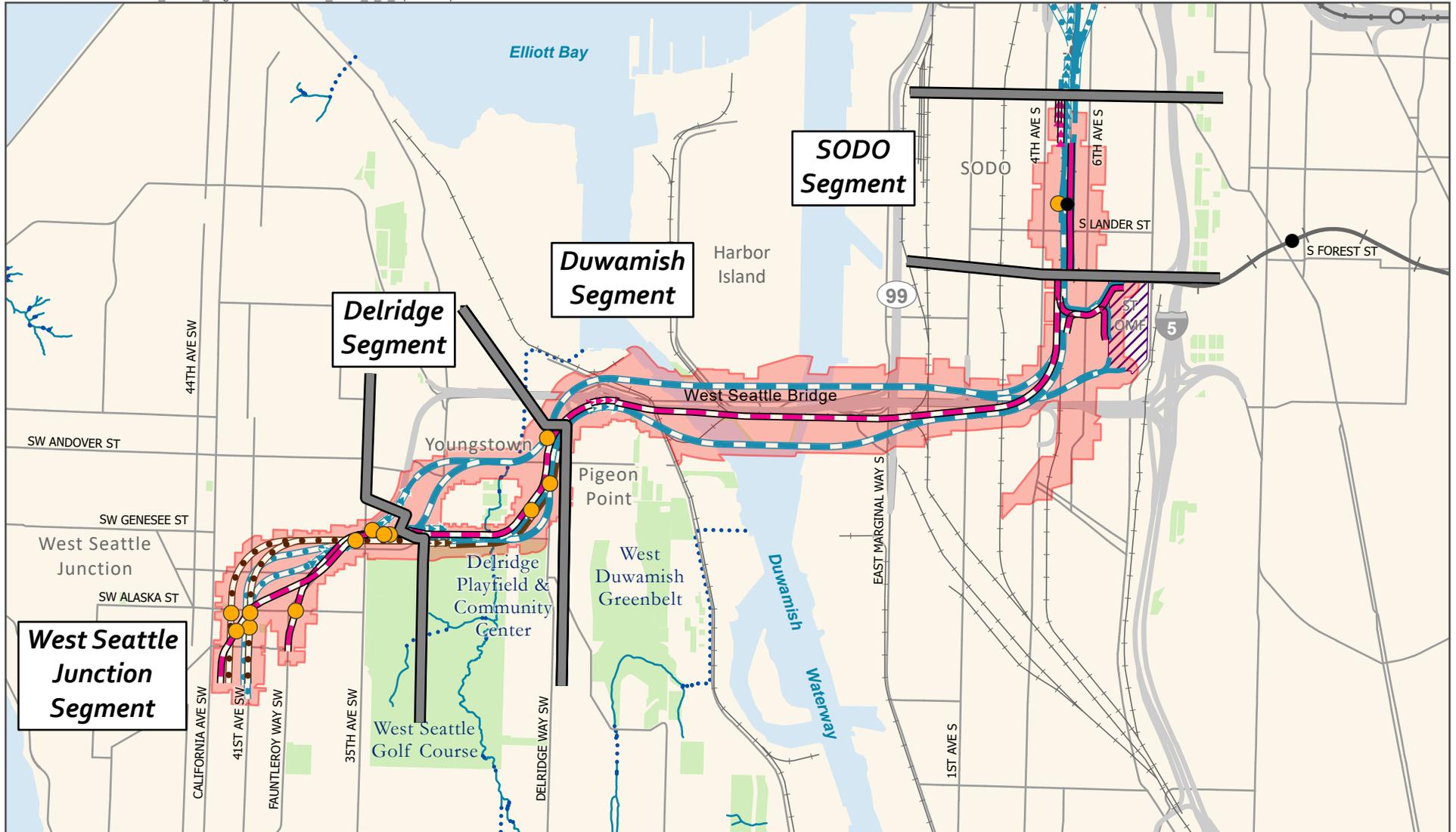
Area of Potential Effects

In accordance with Section 106 of National Historic Preservation Act, the area of potential effects includes all areas where one or more alternatives or project elements has the potential to adversely affect historic and/or archaeological resources. FTA, in consultation with the State Historic Preservation Officer, Tribes, and other consulting parties, determines the Section 106 area of potential effects for historic and archaeological resources.

The State Historic Preservation Officer concurred with Federal Transit Administration’s (FTA’s) area of potential effects in February 2020. On March 25, 2021, FTA, in cooperation with Sound Transit, defined a revised area of potential effects that includes proposed station locations, staging areas, and other project elements that had not previously been identified; the State Historic Preservation Officer concurred with the revised area of potential effects on March 26, 2021. Since then, Sound Transit identified new construction elements that required additional revisions to the area of potential effects. On September 7, 2021, FTA, in consultation with the State Historic Preservation Officer, defined the area of potential effects based on these additional revisions. On October 5, 2021, the State Historic Preservation Officer conditionally concurred with FTA’s revised area of potential effects. Subsequently, the State Historic Preservation Officer, FTA, and Sound Transit met on November 18, 2021, to discuss conditional concurrence and area of potential effects concerns voiced by consulting parties and the State Historic Preservation Officer. As the project advances, FTA and Sound Transit will continue to consult with the State Historic Preservation Officer and other consulting parties on the area of potential effects to address specific concerns regarding historic districts and individual resources.

The area of potential effects for the West Seattle Link Extension, as defined by FTA in September 2021, is depicted on Figure 4.2.16-1.





Source: City of Seattle, King County (2019, 2020, 2021).

Alternatives

- Preferred Alternative
- Preferred Alternative with Third-party Funding
- Other Alternatives

Alternative Profile

- Elevated
- Tunnel
- At-Grade
- Retained Cut

Station

- New
- Existing

Segment Line

 Sound Transit Operations and Maintenance Facility (ST OMF)

Existing Link Light Rail

East Link Light Rail (Under Construction)

Railroad

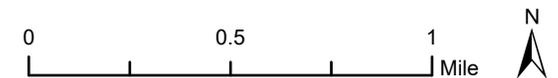
Stream

Piped Stream

Park

Area of Potential Effects

FIGURE 4.2.16-1
Area of Potential Effects
 West Seattle Link Extension
West Seattle and Ballard Link Extensions



To better understand the potential to encounter archaeological resources within the area of potential effects, known sites within an additional 0.25-mile area were studied. Additional information on methods for the review of archaeological resources within the study area and area of potential effects is in Appendix N.5.

4.2.16.1.1 Historic Built Environment Resources

Historic built environment resources in the area of potential effects that were built in or before 1980 were surveyed and inventoried. Table 4.2.16-1 summarizes the National Register-listed and eligible historic properties (either previously identified or determined as part of this evaluation) and designated Seattle landmarks within each segment within the area of potential effects. These resources are also listed by segment in Section 4.2.16.3, Environmental Impacts of the Build Alternatives during Operation. All National Register-listed or eligible resources, including districts, would also meet Seattle Landmark eligibility criteria.

Table 4.2.16-1. Historic Built Environment Resources within the West Seattle Link Extension Area of Potential Effects

Segment	National Register Resources		Designated Seattle Landmarks
	Listed	Determined Eligible ^a	
SODO	0	5	0
Duwamish	0	57	2
Delridge	0	12	0
West Seattle Junction	0	28	1
Linear resources spanning multiple segments	0	1	0
Total	0	103	3

^a FTA continues to consult with the State Historic Preservation Officer about National Register eligibility of historic-age resources within the area of potential effects; therefore, this information is subject to change.

4.2.16.1.2 Archaeological Resources

No archaeological field investigation has occurred in the area of potential effects because access has not been secured. Archaeological monitoring of the geotechnical borings currently being conducted in support of design has provided some insight into the archaeological potential of the project corridor. Desktop research included examination of the history of the area of potential effects, the presence of previously identified archaeological resources, the archaeological predictive model (developed by the Washington State Department of Archaeology and Historic Preservation), ethnographic information, and archival resources. U.S. Meander lines were also used in the analysis to help determine probability for archaeological resources near modern day or historically documented shorelines.

A total of 10 archaeological resources were identified within 0.25 mile of the area of potential effects for the four segments of the West Seattle Link Extension using the Washington Information System for Architectural and Archaeological Records Data (WISAARD) system. None of these resources have been determined eligible for listing in the National Register. Site types identified during the search included both precontact and historical-period resources. Table 4.2.16-2 identifies the number of archaeological resources associated with the West Seattle Link Extension by segment. The area of potential effects is shown on Figure 4.2.16-1.

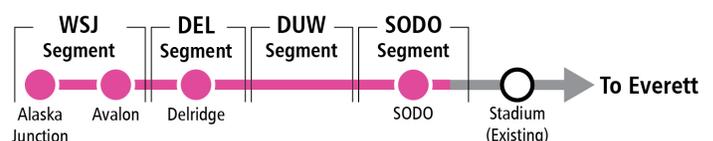


Table 4.2.16-2. Archaeological Resources within 0.25 Miles of the West Seattle Link Extension Area of Potential Effects

Segment	Archaeological Resources within 0.25 mile of Area of Potential Effects	National Register-Eligible Archaeological Resources in Area of Potential Effects	Non-National Register-Eligible Archaeological Resources in Area of Potential Effects	Unevaluated or Undetermined Eligibility Archaeological Resources in Area of Potential Effects
SODO	0	0	0	0
Duwamish	8	0	3	1
Delridge	0	0	0	0
West Seattle Junction	2	0	0	0
Total	10	0	3	1

Of the 10 resources identified, only four fall within the area of potential effects (45KI529, 45KI530, 45KI688, and 45KI1353), all of them within the Duwamish Segment of the alignment. The remaining six resources are within 0.25 mile of the area of potential effects and were identified for context. Of the four resources in the area of potential effects, 45KI1353 is a precontact archaeological site (a potential midden site), while the other three (45KI529, 45KI530, and 45KI688) are historical-period refuse dumps and a named landfill. Archaeological site 45KI1353 has not been evaluated for eligibility for listing in the National Register. The three historical-period archaeological sites have all been archaeologically tested and determined not eligible for listing in the National Register.

Geotechnical borings to support the Draft Environmental Impact Statement began in 2018 and concluded in 2021. Of the 131 boreholes completed, 16 were archaeologically monitored within the West Seattle Link Extension, following the recommendations developed within the *Geotechnical Investigation, Cultural Resources Assessment and Inadvertent Discovery Plan* (Bumback et al. 2019). No archaeological features or artifacts were identified in any of the boreholes.

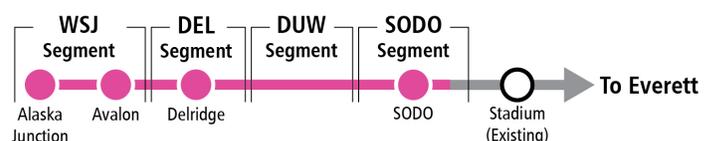
4.2.16.2 Environmental Impacts of the No Build Alternative

Archaeological resources may be identified through other construction activities as the area continues to expand and develop. Similarly, the number of historic built environment resources could decrease with increased development or through neglect.

4.2.16.3 Environmental Impacts of the Build Alternatives during Operation and Construction

This section discusses potential impacts during operations (long-term impacts) and construction (short-term impacts) of the West Seattle Link Extension on historic properties. In cases where historic resources or districts exceed the one-parcel or 200-foot boundary, effects to historic properties are still considered on the entire resource or district.

Under federal regulations (National Historic Preservation Act, 36 Code of Federal Regulations, part 800.5), a project would have an adverse effect if it would alter, directly or indirectly, any of the characteristics of a historic property that qualify it for inclusion in the National Register in a manner that would diminish the property's integrity of location, design, setting, materials, workmanship, feeling, or association. All qualifying characteristics of a historic property shall be



considered, including those that may have been identified after the original evaluation of the property's National Register eligibility.

The following sections discuss the potential direct impacts of project construction and operation on archaeological sites and historic built environment resources.

To determine the effects on historic properties with the West Seattle Link Extension area of potential effects, the following information was used:

- The location of project elements and proximity to historic properties
- Potential partial or complete acquisition and/or demolition of historic properties
- Construction methods and location
- Potential for vibration (short- or long-term) that could damage historic properties
- Potential for settlement that could damage historic properties
- Potential changes to the visual setting that adversely affect the historic setting
- Traffic detours related to roadway closures

4.2.16.3.1 Historic Built Environment Resources

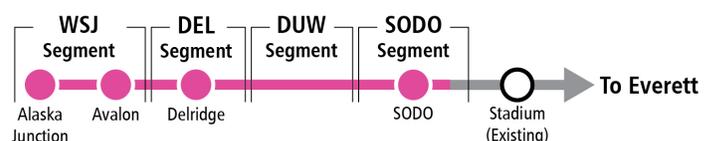
For this project, property-specific adverse effects are characterized as follows:

- **Property demolition.** Property would be acquired and demolished.
- **Partial property acquisition.** Part of the property would be acquired for the project but would not necessitate demolition of the historic built environment resource. An adverse effect would occur if the acquisition diminished one or more aspects of the property's integrity. Not all partial property acquisitions would result in an adverse effect.
- **Permanent proximity effects.** Proximity to the project and/or visual intrusion would cause permanent diminishment of setting, feeling, and/or other aspects of integrity.
- **Construction disruption.** A property in direct proximity (typically within one parcel) would be affected by reduced access, extensive noise, and/or vibration over an extended duration, diminishing one or more aspect of integrity. Construction in proximity of a historic property would not necessarily diminish integrity or result in an adverse effect.

Operation-related impacts are defined in this section as long-term, permanent impacts when revenue service begins. These on-going impacts are typically associated with the introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features.

What are Adverse Effects on Historic Properties?

- Physical destruction of or damage to all or part of the property.
- Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation, and provision of handicapped access, that is not consistent with the Secretary of the Interior's Standards for the Treatment of Historic Properties (36 *Code of Federal Regulations* 68) and applicable guidelines.
- Removal of the property from its historic location.
- Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance.
- Introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features.
- Neglect of a property that causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an indigenous Tribe or Native Hawaiian organization.
- Transfer, lease, or sale of property out of federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance.



Construction-related impacts to historic 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. Together, these factors can lead to reduced commercial activity, and reduced investment in historic properties. Typically, these effects would not be considered adverse unless they would diminish characteristics that contribute to a historic property's National Register eligibility.

Construction-related vibration would potentially affect built environment historic properties. As described in Appendix N.3, Noise and Vibration Technical Report, the primary concern from vibration as a result of construction activities is the potential for damage to buildings, particularly historic properties. Because the details of the construction means and methods for this project are not available at this time and there are several Build Alternatives, the construction vibration analysis focused on determining the distance beyond which the damage risk criteria and annoyance criteria would not be exceeded. A construction vibration control plan would be developed to address locations where there are historic properties that would have the potential to be affected. Properties in the West Seattle Link Extension area of potential effects that would experience adverse construction-related effects are noted in Tables 4.2.16-3 through 4.2.16-6.

Designated Seattle landmarks and districts that would be directly modified would be subject to review and issuance of certificate of approval from the Landmarks Board and/or District Review Boards.

4.2.16.3.2 Archaeological Resources

Based on the archaeological predictive model, there is a very high potential that unknown archaeological sites exist in areas where ground disturbance would occur for the project and could be impacted by construction of any of the West Seattle Link Extension alternatives.

4.2.16.3.3 Linear Resources Spanning Multiple Segments

A segment of Seattle and Walla Walla Railroad/Puget Sound Shore Railroad Company/Seattle, Lake Shore and Eastern Railroad/Northern Pacific Railway Black River Junction to the Lake Washington Ship Canal is contained within both the SODO and Duwamish segments. However, it would be avoided in its entirety and would not be adversely affected by any project alternatives.

4.2.16.3.4 SODO Segment

Historic Built Environment Resources

As summarized in Table 4.2.16-3, none of the alternatives would adversely affect historic properties in the SODO Segment. Any effects would be associated with proximity to the new alignments, but those effects are not anticipated to be adverse.

There are no National Register-eligible historic districts in this segment.

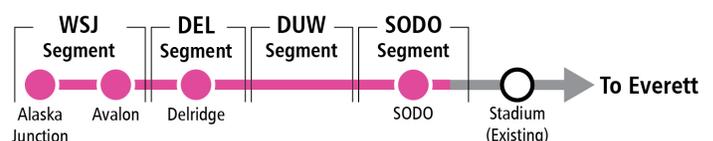


Table 4.2.16-3. Effects to Built Environment Historic Properties: West Seattle Link Extension Area of Potential Effects – SODO Segment

Survey Number	WISAARD Number	Property Name	Address	Date Built	National Register Eligibility Status ^a	Preferred At-Grade Alternative (SODO-1a)	At-Grade South Station Option (SODO-1b)	Mixed Profile Alternative (SODO-2)
1028 ^b	342325	Lincoln Moving & Storage, Alaska Orient Van Lines Building	1924 4th Avenue South	1966	Eligible (Criterion C)	See Table 4.3.16-3	See Table 4.3.16-3	See Table 4.3.16-3
1030 ^b	720609	Graybar Electric Company Building	1919 6th Avenue South	1960	Eligible (Criterion C)	See Table 4.3.16-3	See Table 4.3.16-3	See Table 4.3.16-3
1276	720594	Platt Electric Supply Co.	2757 6th Avenue South	1970	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
2085a	343198	Mill & Mine Supply Co. Building and Warehouse	625 South Lander Street	1953	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
3317	721855	Northwest Wire Works	2752 6th Avenue South	1947	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
Total Number of Adversely Affected Properties	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	0	0	0

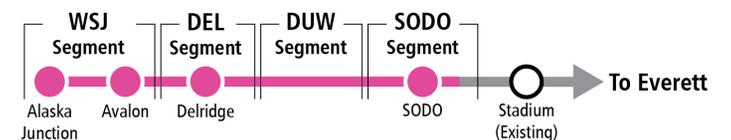
Notes:

Assessments of effects to individual historic properties are preliminary and have not been formally determined by FTA. Final effects determinations are pending additional consultation with the State Historic Preservation Officer, Tribes, and other consulting parties.

Property names correspond with the resource names documented on the Historic Property Inventory forms prepared for the Department of Archaeology and Historic Preservation. Property names typically reflect historic names of businesses or individuals that occupied the building in the past.

^a Unless noted as “pending consultation,” the State Historic Preservation Officer has concurred with determinations of National Register eligibility.

^b This building is evaluated in the SODO Segment of both the West Seattle Link Extension and the Ballard Link Extension because it is located on the border of both segments. Effects to these properties are presented in Table 4.3.16-3 below and also in the Appendix N.5, West Seattle and Ballard Link Extensions Historic and Archaeological Resources Technical Report, in Table 10-6, Effects to Built Environment Resources: Ballard Link Extension Area of Potential Effects – SODO Segment.



Archaeological Resources

All of the SODO Segment alternatives fall within a zone defined by the archaeological predictive model as “survey highly advised: very high risk” for archaeological resources, indicating that there is a very high risk of impacting previously unidentified archaeological resources in this area across most of the segment. There are no recorded archaeological sites within the area of potential effects or within 0.25 mile of the area of potential effects for this segment.

4.2.16.3.5 Duwamish Segment

Historic Built Environment Resources

All three Duwamish Segment alternatives would adversely affect built environment historic properties. (Table 4.2.16-4).

There are no previously identified historic districts within the Duwamish Segment. Two National Register-eligible historic districts were identified within this segment: the Pacific Forge Company/Bethlehem Steel Nut and Bolt Factory (1122) and the Spokane Street Manufacturing Historic District (multiple identification numbers). None of the individual buildings within Pacific Forge Company/Bethlehem Steel Nut and Bolt Factory are individually eligible for listing in the National Register; therefore, each contributing building is not listed in Table 4.2.16-4. The Spokane Street Manufacturing District contains five buildings that are individually eligible for listing in the National Register, and each is listed in Table 4.2.16-4.

Common to all alternatives in this segment is the relocation of a 230-kilovolt power line along 6th Avenue South and Diagonal Avenue, south of South Spokane Street, leading to the Seattle City Light Substation. This project element would not directly or indirectly alter or diminish any aspect of integrity of adjacent historic properties.

The Ballard Link Extension-only minimum operable segment (M.O.S.) would adversely affect resources in the Duwamish Segment in order to connect to the existing Operations and Maintenance Facility Central. If the Ballard Link Extension-only M.O.S. is constructed, these properties would no longer be affected by the West Seattle Link Extension when it is built. These adverse effects are described for the Ballard Link Extension SODO Segment in Section 4.3.16.3.2.

Archaeological Resources

All of the Duwamish Segment alternatives fall within a zone defined by the archaeological predictive model as “survey highly advised: very high risk” for archaeological resources. There are no recorded archaeological sites within the area of potential effects or within 0.25 mile of the area of potential effects for this segment.

There are four recorded archaeological sites within the Duwamish Segment (45KI529, 45KI530, 45KI688, and 45KI1353) three of which (45KI529, 45KI530, and 45KI688) have been determined not eligible for listing in the National Register and are therefore subject to impact with no additional evaluation. Archaeological site 45KI1353 could be a precontact midden site that has the potential to be directly impacted by Preferred Alternative DUW-1a and Option DUW-1b.

An additional archaeological resource (45KI52), while not currently within the area of potential effects, has been mapped within approximately 900 feet of both Preferred Alternative DUW-1a and Option DUW-1b. The boundary of this archaeological resource is based solely on documentary information and this site has not previously been verified.

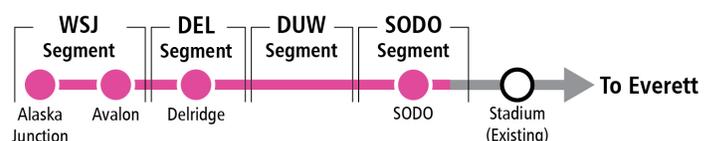
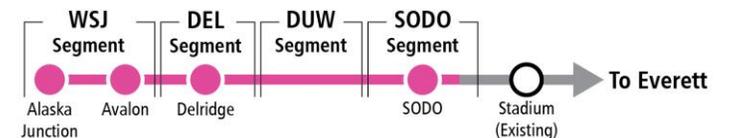


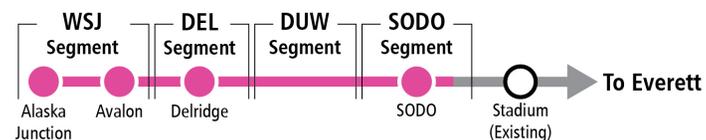
Table 4.2.16-4. Effects to Built Environment Historic Properties: Duwamish Segment

Survey Number	WISAARD Number	Property Name	Address	Built Date	National Register Eligibility Status ^a	Preferred South Crossing Alternative (DUW-1a) ^b	South Crossing South Edge Crossing Alignment Option (DUW-1b) ^b	North Crossing Alternative (DUW-2) ^c
Not Applicable	Multiple	Spokane Street Manufacturing Historic District	Multiple	1908 to 1968	Eligible Historic District (Criterion A)	Adversely Affected: <i>Property Demolition</i>	Adversely Affected: <i>Property Demolition</i>	Not Adversely Affected
273a	342489	Military Cold Storage Plant/Rainier Market Center	3625 1st Avenue South	1944	Eligible (Criteria A and C), contributes to Spokane Street Manufacturing Historic District (Criterion A)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
273b	720604	Truck Storage Battery Charging Building	3625 1st Avenue South	1944	Eligible (Criterion A), contributes to Spokane Street Manufacturing Historic District (Criterion A)	Adversely Affected: <i>Property Demolition</i>	Adversely Affected: <i>Property Demolition</i>	Not Adversely Affected
881	342274	Seattle Pacific Sales Company Warehouse	3800 1st Avenue South	1968	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
1005	45159	Link-Belt Company Property	3405 6th Avenue South	1946	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
1083	718431	Viking Automatic Sprinkler Company	3434 1st Avenue South	1964	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected	Adversely Affected: <i>Property Demolition</i>



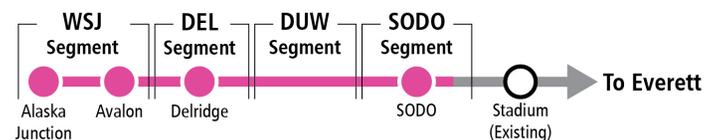
4.2.16 Historic and Archaeological Resources

Survey Number	WISAARD Number	Property Name	Address	Built Date	National Register Eligibility Status ^a	Preferred South Crossing Alternative (DUW-1a) ^b	South Crossing South Edge Crossing Alignment Option (DUW-1b) ^b	North Crossing Alternative (DUW-2) ^c
1089a	337707	Ehrlich-Harrison Company Industrial Building	60 South Spokane Street	1941	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
1089b	720508	Ehrlich-Harrison Company Industrial Building	60 South Spokane Street	1941	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
1090a	720509	Transportation Equipment Rentals Office Building	3443 1st Avenue South	1968	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Adversely Affected: Property Demolition
1090b	720510	Transportation Equipment Rentals Maintenance Warehouse	3443 1st Avenue South	1968	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Adversely Affected: Property Demolition
1094a	720511	Acme Tool Works	3626 East Marginal Way South	1941	Eligible (Criterion A), contributes to Spokane Street Manufacturing Historic District (Criterion A)	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition	Not Adversely Affected
1122a through 1122e	721620, 721624, 721625, 721628, 721629	Pacific Forge Company/ Bethlehem Steel Nut and Bolt Factory Historic District	3800 West Marginal Way Southwest	1917 to 1968	Pacific Forge Company/ Bethlehem Steel Nut and Bolt Factory Historic District (Criteria A and C)	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition	Not Adversely Affected



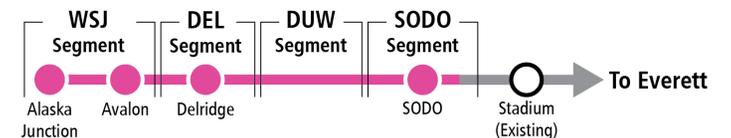
4.2.16 Historic and Archaeological Resources

Survey Number	WISAARD Number	Property Name	Address	Built Date	National Register Eligibility Status ^a	Preferred South Crossing Alternative (DUW-1a) ^b	South Crossing South Edge Crossing Alignment Option (DUW-1b) ^b	North Crossing Alternative (DUW-2) ^c
1138	45086	Fire Station 14	3224 4th Avenue South	1922	Eligible (Criterion C), Designated Seattle Landmark	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
1274	45085	Pacific Hoist and Warehouse Company	3200 4th Avenue South	1931	Eligible (Criterion C)	Not Adversely Affected ^d	Not Adversely Affected	Not Adversely Affected
1275a	342730	Langendorf United Bakeries	2901 6th Avenue South	1952	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
1275b	720593	Langendorf United Bakeries Repair Garage	2901 6th Avenue South	1955	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
1388	38533	A.M. Castle and Company	3640-60 East Marginal Way South	1945	Eligible (Criteria A and C), contributes to Spokane Street Manufacturing Historic District (Criterion A)	Not Adversely Affected	Adversely Affected: Property Demolition	Not Adversely Affected
1915	38532	Alaskan Copper Works/Eagle Brass Foundry Company	3600 East Marginal Way South	1918	Eligible (Criterion A), contributes to Spokane Street Manufacturing Historic District (Criterion A)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
1943	48502	Alaskan Copper and Brass Company	3223 6th Avenue South	1953	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected



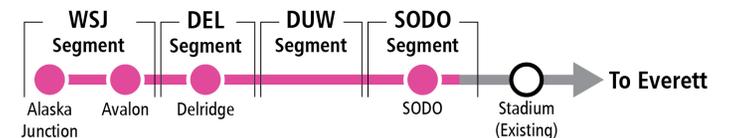
4.2.16 Historic and Archaeological Resources

Survey Number	WISAARD Number	Property Name	Address	Built Date	National Register Eligibility Status ^a	Preferred South Crossing Alternative (DUW-1a) ^b	South Crossing South Edge Crossing Alignment Option (DUW-1b) ^b	North Crossing Alternative (DUW-2) ^c
3214	294616	Single-Family Residence	3842 23rd Avenue Southwest	1914	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
3320b	722008	NW Motor Parts Corporation Building	2930 6th Avenue South	1951	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
3321	721857	M.J.B. Coffee Company Warehouse	2940 6th Avenue South	1954	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
3322a	342997	Alaskan Copper Company Employment Office	2958 6th Avenue South	1941	Eligible (Criterion C)	Adversely Affected: <i>Property Demolition</i>	Adversely Affected: <i>Property Demolition</i>	Adversely Affected: <i>Property Demolition</i>
3322b	721997	Auto Repair Garage	2958 6th Avenue South	1948	Eligible (Criterion A)	Adversely Affected: <i>Property Demolition</i>	Adversely Affected: <i>Property Demolition</i>	Not Adversely Affected
3324	340010	Los Angeles-Seattle Motor Express Company	3200 6th Avenue South	1945	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
3327	342709	Scientific Supplies Company	600 South Spokane Street	1954	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected



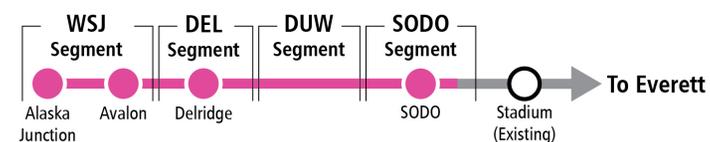
4.2.16 Historic and Archaeological Resources

Survey Number	WISAARD Number	Property Name	Address	Built Date	National Register Eligibility Status ^a	Preferred South Crossing Alternative (DUW-1a) ^b	South Crossing South Edge Crossing Alignment Option (DUW-1b) ^b	North Crossing Alternative (DUW-2) ^c
3329a	86871	Department of Highways District No. 1 Headquarters/ Maintenance Facility – Office/ Administrative Building	450 South Spokane Street	1931	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected	Adversely Affected: <i>Partial Property Acquisition</i>
3329b	722096	Department of Highways District No. 1 Headquarters/ Maintenance Facility – Maintenance Building	450 South Spokane Street	1931	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected	Adversely Affected: <i>Partial Property Acquisition</i>
3329c	722098	Department of Highways District No. 1 Headquarters/ Maintenance Facility – Storage Building	450 South Spokane Street	1931	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected	Adversely Affected: <i>Partial Property Acquisition</i>
3329d	722100	Department of Highways District No. 1 Headquarters/ Maintenance Facility – Car/Paint Building	450 South Spokane Street	1931	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected	Adversely Affected: <i>Property Demolition</i>



4.2.16 Historic and Archaeological Resources

Survey Number	WISAARD Number	Property Name	Address	Built Date	National Register Eligibility Status ^a	Preferred South Crossing Alternative (DUW-1a) ^b	South Crossing South Edge Crossing Alignment Option (DUW-1b) ^b	North Crossing Alternative (DUW-2) ^c
3329e	722101	Department of Highways District No. 1 Headquarters/ Maintenance Facility – Maintenance/ Garage Building	450 South Spokane Street	1959	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected	Adversely Affected: <i>Property Demolition</i>
3339	342259	Riches & Adams Co./Seattle Opportunities Industrialization Center, Inc.	3627 1st Avenue South	1954	Eligible (Criterion A)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
3344	344061	General Construction Company Office	3840 West Marginal Way Southwest	1931	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
5136	725824	Air Mac, Inc.	3838 4th Avenue South	1953	Eligible (Criterion C) (pending consultation)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
5137	725825	Warehouse and Office Building	3623 6th Avenue South	1961	Eligible (Criterion C) (pending consultation)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
5139a	45089	Seattle City Light South Receiving Substation	3839 4th Avenue South	1938	Eligible (Criteria A and C) (pending consultation)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected



Survey Number	WISAARD Number	Property Name	Address	Built Date	National Register Eligibility Status ^a	Preferred South Crossing Alternative (DUW-1a) ^b	South Crossing South Edge Crossing Alignment Option (DUW-1b) ^b	North Crossing Alternative (DUW-2) ^c
LIN-12	44440	Northern Pacific Railway Bridge Over the West Duwamish Waterway	South of Spokane Street, near Klickitat Way Southwest	1911	Eligible (Criterion C), Designated Seattle Landmark	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
Total Number of Adversely Affected Properties	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	6	7	9

Notes:

Assessments of effects to individual historic properties are preliminary and have not been formally determined by FTA. Final effects determinations are pending additional consultation with the State Historic Preservation Officer, Tribes, and other consulting parties.

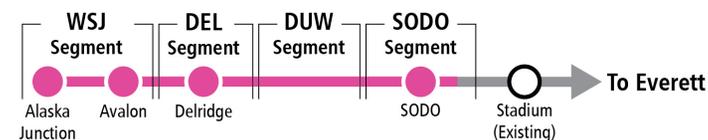
Property names correspond with the resource names documented on the Historic Property Inventory forms prepared for the Department of Archaeology and Historic Preservation. Property names typically reflect historic names of businesses or individuals that occupied the building in the past.

^a Unless noted as “pending consultation,” the State Historic Preservation Officer has concurred with determinations of National Register eligibility.

^b The Ballard Link Extension-only M.O.S. would adversely affect two resources in the Duwamish Segment for the connection to the existing Operations and Maintenance Facility Central. These effects are described for the Ballard Link Extension SODO Segment in Section 4.3.16.3.2.

^c The Ballard Link Extension-only M.O.S. would adversely affect one resource in the Duwamish Segment for the connection to the existing Operations and Maintenance Facility Central. These effects are described for the Ballard Link Extension SODO Segment in Section 4.3.16.3.2.

^d A portion of this property—but not the building or access to the facility—would be acquired only if it this alternative connects to Alternatives DEL-3 and DEL4*. Although this would result in alteration of setting, the effect would not be adverse, and no other aspects of integrity would be altered or diminish. No portion of the property would be acquired when connecting to any of the other Delridge Segment Build Alternatives.



The extent of the boundary and the actual proximity of the site to either of the southern alignments is currently unknown.

4.2.16.3.6 Delridge Segment

Historic Built Environment Resources

As summarized in Table 4.2.16-5, Alternative DEL-6* would cause no adverse effects to historic properties in the Delridge Segment. All other alternatives would adversely affect one or more historic property.

Archaeological Resources

All of the Delridge Segment alternatives fall within a zone defined by the archaeological predictive model as “survey highly advised: very high risk” for archaeological resources. There are no recorded archaeological sites within the area of potential effects or within 0.25 mile of the area of potential effects for this segment.

4.2.16.3.7 West Seattle Junction Segment

Historic Built Environment Resources

As summarized in Table 4.2.16-6, all West Seattle Junction Segment alternatives would cause adverse effects to one or more built environment historic properties.

Archaeological Resources

All of the West Seattle Junction Segment alternatives fall within a zone defined by the archaeological predictive model as “survey recommended: moderate risk” for archaeological resources. There is a small area of all segment alternatives (extending from the Delridge Segment south to Southwest Alaska Street) that is identified as “survey highly advised: very high risk” for archaeological resources.

There are no recorded archaeological sites within the area of potential effects or within 0.25 mile of the area of potential effects for this segment.

4.2.16.4 Indirect Impacts of the Build Alternatives

4.2.16.4.1 Historic Built Environment Resources

Construction of the West Seattle Link Extension could encourage population growth and transit-oriented development in the station areas. Potential effects could include demolition or substantial alteration of historic properties for redevelopment. However, future redevelopment in station areas would be consistent with adopted zoning and the City of Seattle’s Comprehensive Plan, which currently allows greater density in the station areas than exists today. The City’s Landmark ordinance, which would apply to the demolition or substantial alteration of resources that meet the City of Seattle’s Landmark criteria would help to reduce loss of historic properties.

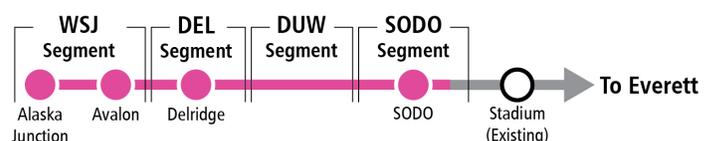
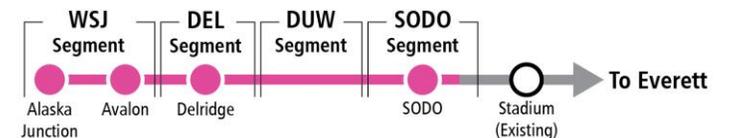


Table 4.2.16-5. Effects to Built Environment Historic Properties: Delridge Segment

Survey Number	WISAARD Number	Historic Property	Address	Construction Date	National Register Eligibility Status ^a	Preferred Dakota Street Station Alternative (DEL-1a)	Dakota Street Station North Alignment Option (DEL-1b)	Preferred Dakota Street Station Lower Height Alternative (DEL-2a)*	Dakota Street Station Lower Height North Alignment Option (DEL-2b)*	Delridge Way Station Alternative (DEL-3)	Delridge Way Station Lower Height Alternative (DEL-4)*	Andover Street Station Alternative (DEL-5)	Andover Street Station Lower Height Alternative (DEL-6)*
242	717063	West Seattle Golf Course	4600 35th Avenue Southwest	1936	Eligible (Criteria A and C)	Adversely Affected: Permanent Proximity Effects	Adversely Affected: Permanent Proximity Effects	Adversely Affected: Partial Property Acquisition; Permanent Proximity Effects	Adversely Affected: Permanent Proximity Effects	Adversely Affected: Permanent Proximity Effects	Adversely Affected: Partial Property Acquisition; Permanent Proximity Effects	Not Adversely Affected	Not Adversely Affected
443	344641	Bethlehem Pacific Coast Steel Company Office Building	4045 Delridge Way Southwest	1960	Eligible (Criteria A and C)	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition	Not Adversely Affected	Not Adversely Affected
444	721070	Residence	4030 Delridge Way Southwest	1906	Eligible (Criteria A and C)	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition	Not Adversely Affected	Not Adversely Affected
449	38466	Seattle Steel Company/ Bethlehem Pacific Coast Steel Corporation	2424 Southwest Andover Street	1966	Eligible (Criterion A)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
453	47869	Mrachke & Son	3860 – 3864 Delridge Way Southwest	1930	Eligible (Criteria A and C)	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition	Not Adversely Affected	Not Adversely Affected
1166	376099	Single-Family Craftsman Residence	4108 25th Avenue Southwest	1907	Eligible (Criteria A and C)	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected



4.2.16 Historic and Archaeological Resources

Survey Number	WISAARD Number	Historic Property	Address	Construction Date	National Register Eligibility Status ^a	Preferred Dakota Street Station Alternative (DEL-1a)	Dakota Street Station North Alignment Option (DEL-1b)	Preferred Dakota Street Station Lower Height Alternative (DEL-2a)*	Dakota Street Station Lower Height North Alignment Option (DEL-2b)*	Delridge Way Station Alternative (DEL-3)	Delridge Way Station Lower Height Alternative (DEL-4)*	Andover Street Station Alternative (DEL-5)	Andover Street Station Lower Height Alternative (DEL-6)*
1787	721178	Single-Family Residence	4139 25th Avenue Southwest	1909	Eligible (Criterion C)	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
1977	418305	Contemporary Ranch House	4150 32nd Avenue Southwest	1959	Eligible (Criterion C) (pending consultation)	Not Adversely Affected	Adversely Affected: Property Demolition	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Adversely Affected: Property Demolition	Not Adversely Affected
2254	335189	Kirlow Four-Plex	3074 Southwest Avalon Way	1967	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Adversely Affected: Property Demolition	Not Adversely Affected
3345	287692	Residence	4017 23rd Avenue Southwest	1907	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
3391	300990	Residence	4044 32nd Avenue Southwest	1925	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
3396	45978	Cettolin House	4022 32nd Avenue Southwest	1928	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
Total Number of Adversely Affected Properties	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	6	7	6	6	4	4	2	0

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement, some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

Notes:

Assessments of effects to individual historic properties are preliminary and have not been formally determined by FTA. Final effects determinations are pending additional consultation with the State Historic Preservation Officer, Tribes, and other consulting parties.

Property names correspond with the resource names documented on the Historic Property Inventory forms prepared for the Department of Archaeology and Historic Preservation. Property names typically reflect historic names of businesses or individuals that occupied the building in the past.

^a Unless noted as “pending consultation,” the State Historic Preservation Officer has concurred with determinations of National Register eligibility.

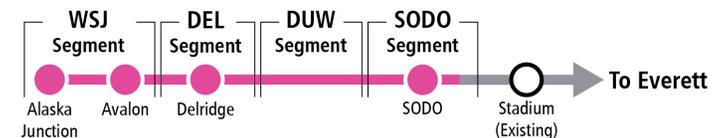
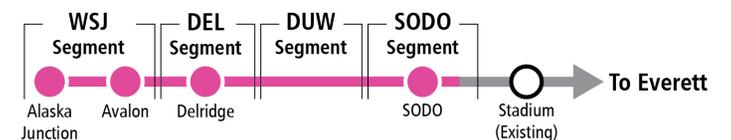


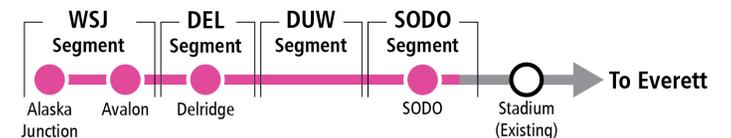
Table 4.2.16-6. Effects to Built Environment Historic Properties: West Seattle Junction Segment

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	Preferred Elevated 41st/42nd Avenue Station Alternative (WSJ-1)	Preferred Elevated Fauntleroy Way Station Alternative (WSJ-2)	Preferred Tunnel 41st Avenue Station Alternative (WSJ-3a)*	Preferred Tunnel 42nd Avenue Station Option (WSJ-3b)*	Short Tunnel 41st Avenue Station Alternative (WSJ-4)*	Medium Tunnel 41st Avenue Station Alternative (WSJ-5)*
77	719318	Limcrest Apartments	3600 Southwest Genesee Street	1956	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Adversely Affected: <i>Property Demolition</i> ^b	Adversely Affected: <i>Property Demolition</i> ^c	Not Adversely Affected	Not Adversely Affected
89	720836	Single-Family Residence	4406 37th Avenue Southwest	1953	Eligible (Criterion C)	Not Adversely Affected	Adversely Affected: <i>Property Demolition</i>	Adversely Affected: <i>Property Demolition</i>	Adversely Affected: <i>Property Demolition</i>	Adversely Affected: <i>Property Demolition</i>	Adversely Affected: <i>Property Demolition</i>
91	720871	Carlsen & Winquist Auto	4480 Fauntleroy Way Southwest	1946	Eligible (Criteria A and C)	Adversely Affected: <i>Property Demolition</i>	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
92b	720875	West Seattle Brake Service	4464 37th Avenue Southwest	1948	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
97	720988	Jim's Shell Service	4457 Fauntleroy Way Southwest	1965	Eligible (Criterion A)	Adversely Affected: <i>Property Demolition</i>	Adversely Affected: <i>Property Demolition</i>	Not Adversely Affected	Not Adversely Affected	Adversely Affected: <i>Property Demolition</i>	Not Adversely Affected
103	420560	Residence	4407 38th Avenue Southwest	1924	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
177	721552	Campbell Building	4554 California Avenue Southwest	1918	Eligible (Criteria A and C); designated Seattle Landmark	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
181	721486	Alaska House	4545 42nd Avenue Southwest	1979	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected



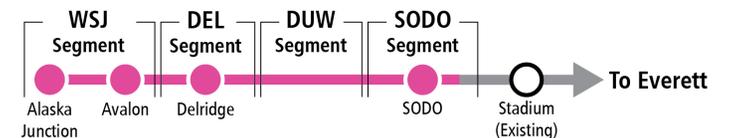
4.2.16 Historic and Archaeological Resources

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	Preferred Elevated 41st/42nd Avenue Station Alternative (WSJ-1)	Preferred Elevated Fauntleroy Way Station Alternative (WSJ-2)	Preferred Tunnel 41st Avenue Station Alternative (WSJ-3a)*	Preferred Tunnel 42nd Avenue Station Option (WSJ-3b)*	Short Tunnel 41st Avenue Station Alternative (WSJ-4)*	Medium Tunnel 41st Avenue Station Alternative (WSJ-5)*
236	343799	Wardrobe Cleaners	4500 Fauntleroy Way Southwest	1949	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
239	365276	Craftsman Bungalow	4015 Southwest Hudson Street	1906	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
1215	442141	Contemporary Ranch House	3221 Southwest Genesee Street	1959	Eligible (Criterion C)	Adversely Affected: Property Demolition	Adversely Affected: Property Demolition	Not Adversely Affected	Not Adversely Affected	Adversely Affected: Property Demolition	Not Adversely Affected
1230	338613	Golden Tee Apartments	3201 Southwest Avalon Way	1967	Eligible (Criterion C)	Adversely Affected: Property Demolition ^d	Adversely Affected: Property Demolition ^d	Adversely Affected: Property Demolition ^e	Adversely Affected: Property Demolition ^e	Adversely Affected: Property Demolition ^d	Not Adversely Affected
1309	303008	Single-Family Residence	4157 38th Avenue Southwest	1956	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
1984	338612	Golden Tee Apartments	3211 Southwest Avalon Way	1967	Eligible (Criterion C)	Adversely Affected: Permanent Proximity Effects;	Adversely Affected: Permanent Proximity Effects	Adversely Affected: Permanent Proximity Effects	Adversely Affected: Permanent Proximity Effects	Adversely Affected: Permanent Proximity Effects	Not Adversely Affected
2068	679043	Bartell Drugs	4548 California Avenue Southwest	1929	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
2110	334059	Chinook Apartments	4431 37th Avenue Southwest	1959	Eligible (Criterion C)	Not Adversely Affected	Adversely Affected: Property Demolition	Not Adversely Affected	Not Adversely Affected	Adversely Affected: Property Demolition	Not Adversely Affected
2126	365104	Residence	4446 40th Avenue Southwest	1908	Eligible (Criterion A)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected



4.2.16 Historic and Archaeological Resources

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	Preferred Elevated 41st/42nd Avenue Station Alternative (WSJ-1)	Preferred Elevated Fauntleroy Way Station Alternative (WSJ-2)	Preferred Tunnel 41st Avenue Station Alternative (WSJ-3a)*	Preferred Tunnel 42nd Avenue Station Option (WSJ-3b)*	Short Tunnel 41st Avenue Station Alternative (WSJ-4)*	Medium Tunnel 41st Avenue Station Alternative (WSJ-5)*
2150	343495	West Seattle Bowl	4505 39th Avenue Southwest	1948	Eligible (Criterion A)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
2217	343979	Venable and Wing Law Office	4826 California Avenue Southwest	1963	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
2224	721512	Residence	5011 41st Avenue Southwest	1925	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Adversely Affected: Property Demolition	Not Adversely Affected
2228	278849	Residence	4115 Southwest Hudson Street	1913	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
3026	654505	Residence	4426 38th Avenue Southwest	1932	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Adversely Affected: Property Demolition	Not Adversely Affected
3042	721838	J.C. Penney/Russell Building	4520 California Avenue Southwest	1926	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
3043	721839	Marier Foto Studio	4528 California Avenue Southwest	1928	Eligible (Criteria A and C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
3243	722760	Single-Family Residence	4714 38th Avenue Southwest	1939	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
3250	722762	Single-Family Residence	4755 38th Avenue Southwest	1957	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
3251a	723076	Apartment Complex	4821 Fauntleroy Way Southwest	1957	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected



4.2.16 Historic and Archaeological Resources

Survey Number	WISAARD Property Number	Property Name	Address	Construction Date	National Register Eligibility Status ^a	Preferred Elevated 41st/42nd Avenue Station Alternative (WSJ-1)	Preferred Elevated Fauntleroy Way Station Alternative (WSJ-2)	Preferred Tunnel 41st Avenue Station Alternative (WSJ-3a)*	Preferred Tunnel 42nd Avenue Station Option (WSJ-3b)*	Short Tunnel 41st Avenue Station Alternative (WSJ-4)*	Medium Tunnel 41st Avenue Station Alternative (WSJ-5)*
3251b	723077	Apartment Complex	4821 Fauntleroy Way Southwest	1957	Eligible (Criterion C)	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected	Not Adversely Affected
Total Number of Adversely Affected Properties	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	5	6	4	4	8	1

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement, some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

Notes:

Assessments of effects to individual historic properties are preliminary and have not been formally determined by FTA. Final effects determinations are pending additional consultation with the State Historic Preservation Officer, Tribes, and other consulting parties.

Property names correspond with the resource names documented on the Historic Property Inventory forms prepared for the Department of Archaeology and Historic Preservation. Property names typically reflect historic names of businesses or individuals that occupied the building in the past.

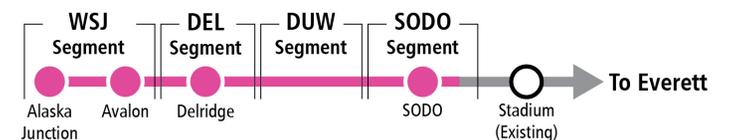
^a Unless noted as “pending consultation,” the State Historic Preservation Officer has concurred with determinations of National Register eligibility.

^b This property would be demolished as a result of Preferred Alternative WSJ-3a* only if it this alternative connects to Option DEL-2b*. The property would not be acquired or affected if the alternative connects to Preferred Alternative DEL-2a*.

^c This property would be demolished as a result of Preferred Option WSJ-3b* only if it this option connects to Option DEL-2b*. The property would not be acquired or affected if the option connects to Preferred Alternative DEL-2a*.

^d This property would be demolished only if it this alternative connects to Preferred Alternative DEL-1a or Alternative DEL-3.

^e This property would be demolished only if it this alternative connects to Preferred Alternative DEL-2a* or Alternative DEL-4*.



4.2.16.4.2 Archaeological Resources

Archaeological sites are generally only affected by direct impacts. Potential effects from redevelopment in station areas could result in disturbance of archaeological resources in areas not previously disturbed. Future redevelopment in station areas would be subject to review under state and federal regulations that require analysis of potential impacts to archaeological resources. No indirect effects to sites through vibration, restricting access, or land modifications that increase exposure to eligible properties are anticipated.

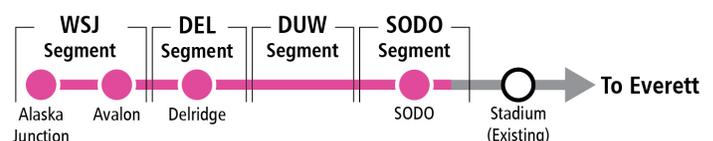
4.2.16.5 Mitigation Measures

Where adverse effects to National Register-eligible or -listed resources cannot be avoided or minimized, FTA and Sound Transit would develop a memorandum of agreement or programmatic agreement in consultation with the State Historic Preservation Officer, Tribes, and other consulting parties under Section 106.

Typical mitigation measures that could be included in the memorandum of agreement or programmatic agreement are listed below.

- Modifying the undertaking through redesign, re-orientation, or other similar changes
- Documenting historic properties or resources that would be impacted
- Installing interpretive/educational signage, or other options that provide a direct public benefit (e.g., exhibits, HistoryLink essays, documentaries, or historic property nominations)
- Implementing data recovery of archaeological or architectural information and materials
- Preparing a National Register nomination for an archaeological site
- Preparing City of Seattle landmark nominations for potentially eligible buildings, structures, objects, and/or sites
- Preparing an ethnographic study, historic essays, documentaries, or formal documentation
- Developing museum exhibits
- Offering lecture series, trainings, or workshops
- Performing additional consultation to ensure compatible replacement buildings or structures
- Supporting preservation non-profit organizations

Sound Transit would develop a detailed monitoring and inadvertent discovery plan for review by the State Historic Preservation Officer and Tribes. The plan would include research questions and outline protocols to ensure the proper treatment of archaeological resources that may be identified during construction.



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4.2.17 Parks and Recreational Resources

4.2.17.1 Affected Environment

Parks and recreational resources include designated public parks, recreation sites, public shoreline access areas, open space, greenbelts, recreational trails, playgrounds, golf courses, swimming pools, and school play areas available for public use during non-school hours. The study area for this evaluation includes resources that are:

- Within 250 feet of the project limits, including areas used for construction.
- Within 0.5 mile (approximately 2,640 feet) from each station structure.

The following sections summarize by segment the resources within the West Seattle Link Extension study area that are closest to the project and have the potential to be directly or indirectly impacted. Figures 4.2.17-1 through 4.2.17-3 shows all parks and recreational resources in the West Seattle Link Extension study area, and Table L4.17-1 in Appendix L4.17, Parks and Recreational Resources, contains a list of all resources in the study area.

Five trails in the West Seattle Link Extension study area are used by both commuters and recreationists. The primary function of these trails is transportation, and therefore potential impacts are not analyzed in this section. For a discussion of potential impacts on these trails, refer to Section 3.4.1.1, Non-motorized Facilities, in Chapter 3, Transportation Environment and Consequences.

- **SODO Trail** is a 1-mile paved trail east of the existing light rail between South Royal Brougham Way and South Forest Street, in the SODO and Duwamish segments.
- **West Seattle Bridge Trail** is a 2-mile paved trail in the Duwamish Segment that follows Southwest Spokane Street over the East and West Duwamish waterways (also known as Duwamish River). It connects to the Elliott Bay Trail and the Alki Trail.
- **Duwamish Trail** is a 1.9-mile on-street trail on West Marginal Way, south of South Spokane Street in the Duwamish Segment. It connects to the Alki Trail.
- **Delridge Connector Trail** is a 0.4-mile paved trail in the Delridge Segment between Southwest Andover Street and the West Seattle Bridge. It connects the Delridge neighborhood to parks, Longfellow Creek, and the West Seattle Bridge Trail.
- **Alki Trail** is a 4.4-mile paved trail in the Delridge Segment that runs from Alki Beach to the Duwamish Waterway.

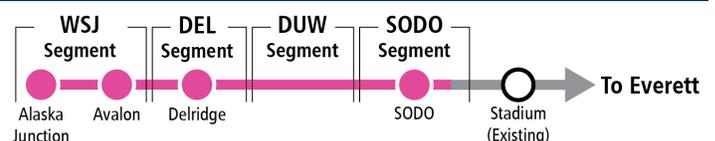
4.2.17.1.1 SODO Segment

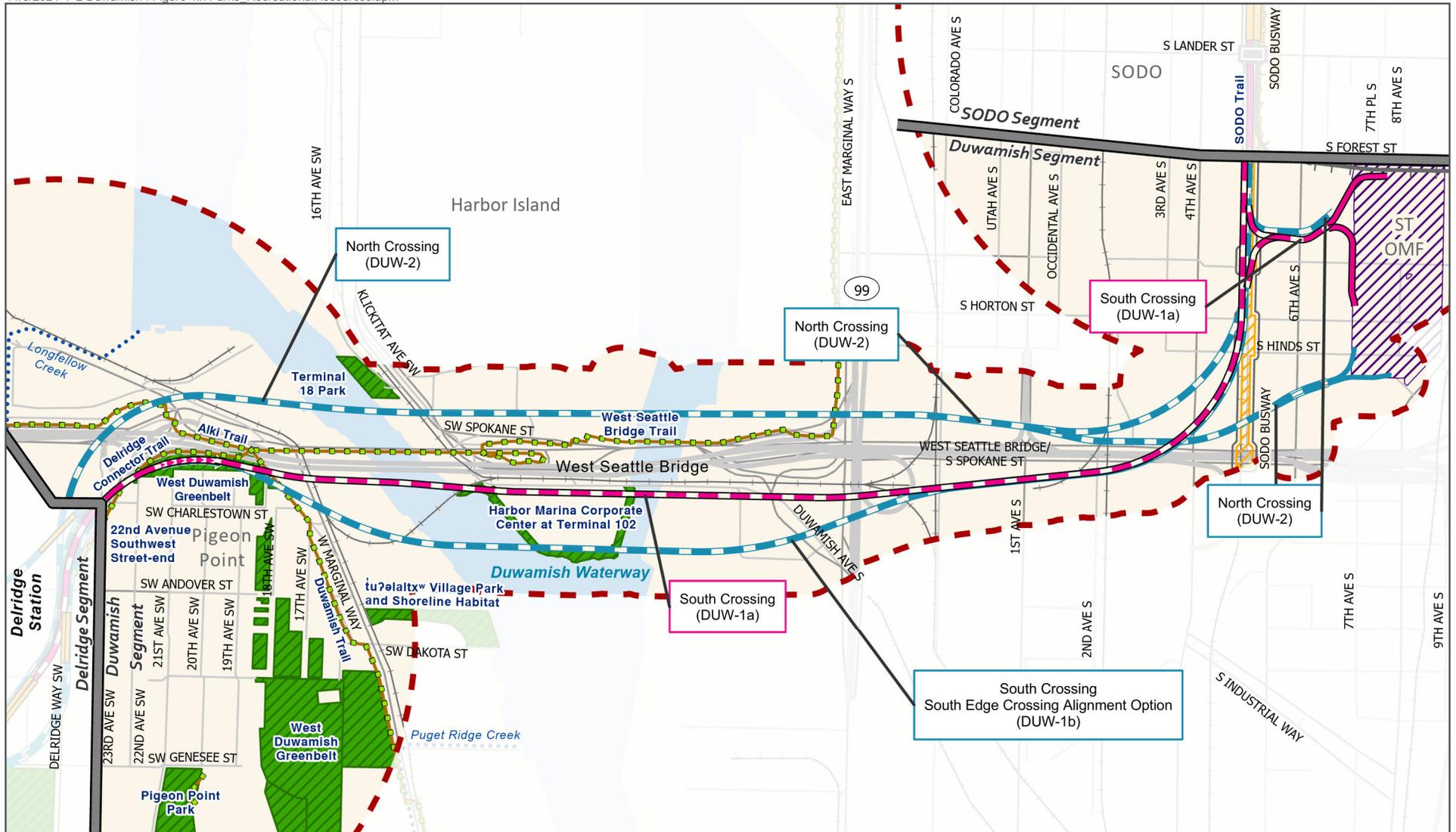
There are no parks and recreational resources in the SODO Segment study area.

4.2.17.1.2 Duwamish Segment

There are six parks and recreational resources in the Duwamish Segment study area. The following four resources are closest to the project (Figure 4.2.17-1):

- Terminal 18 Park is a 1.1-acre waterfront park on Harbor Island, north of the West Seattle Bridge, with a paved path that runs the length of the park. It has picnic tables, shelters, and views of shipping activity. This park is accessed by land and cannot be accessed by water.



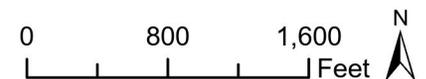


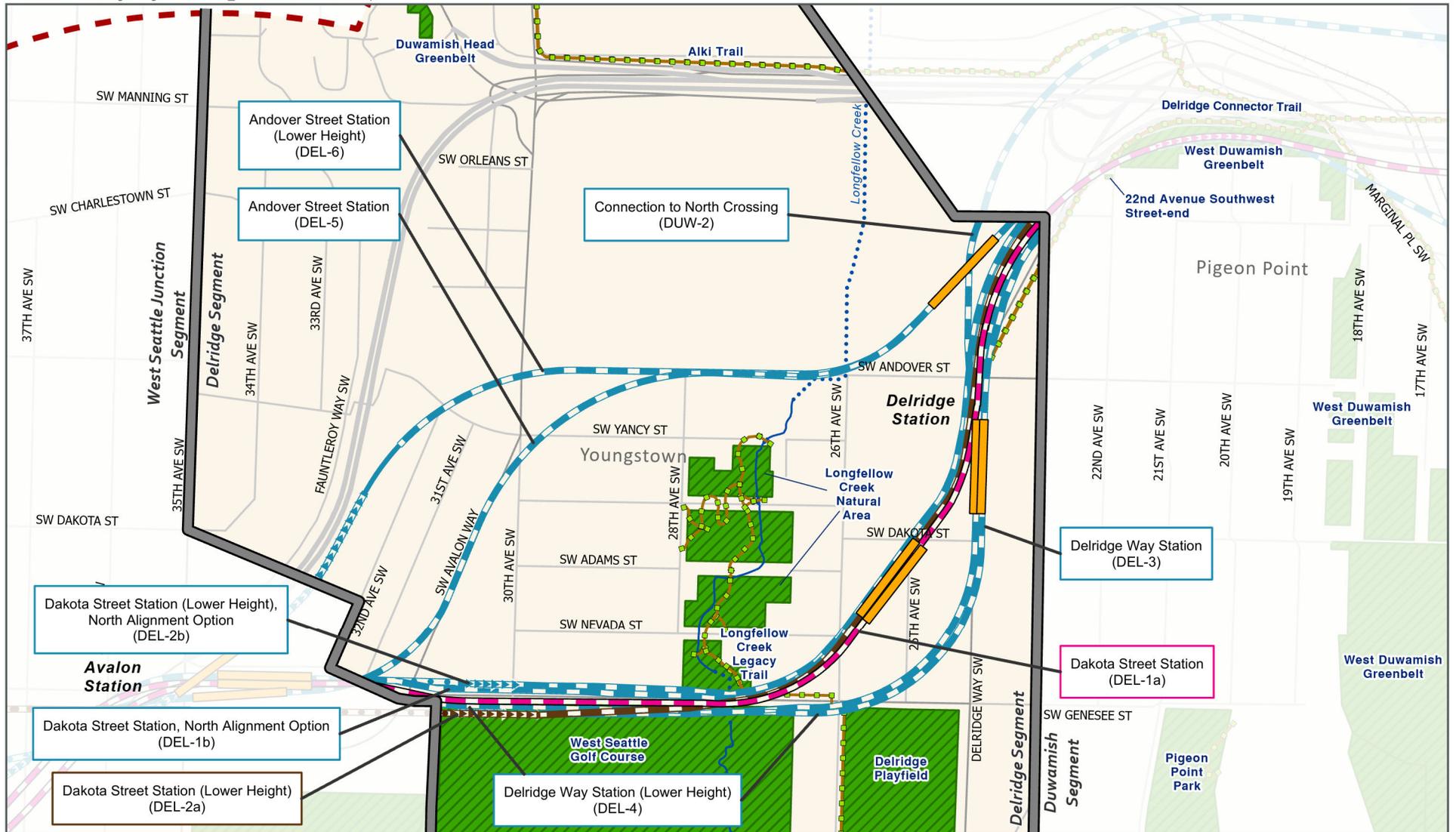
Source: City of Seattle, King County (2019, 2020, 2021).

- | | | |
|--|--|--|
| Alternatives | Segment Line | Study Area |
| Preferred Alternative | Existing Link Light Rail | Parks and Recreational Resources in Study Area |
| Preferred Alternative with Third-party Funding | Railroad | Trail |
| Other Alternatives | SODO Busway | Proposed Overpass |
| Alternative Profile | Sound Transit Operations and Maintenance Facility (ST OMF) | Piped Stream |
| Elevated | Tunnel | |
| At-Grade | Retained Cut | |
| Station | | |
| New | | |

FIGURE 4.2.17-1
Parks and Recreational Resources in the Study Area
 West Seattle Link Extension - Duwamish Segment

West Seattle and Ballard Link Extensions

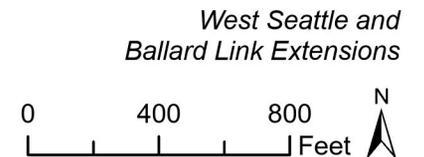


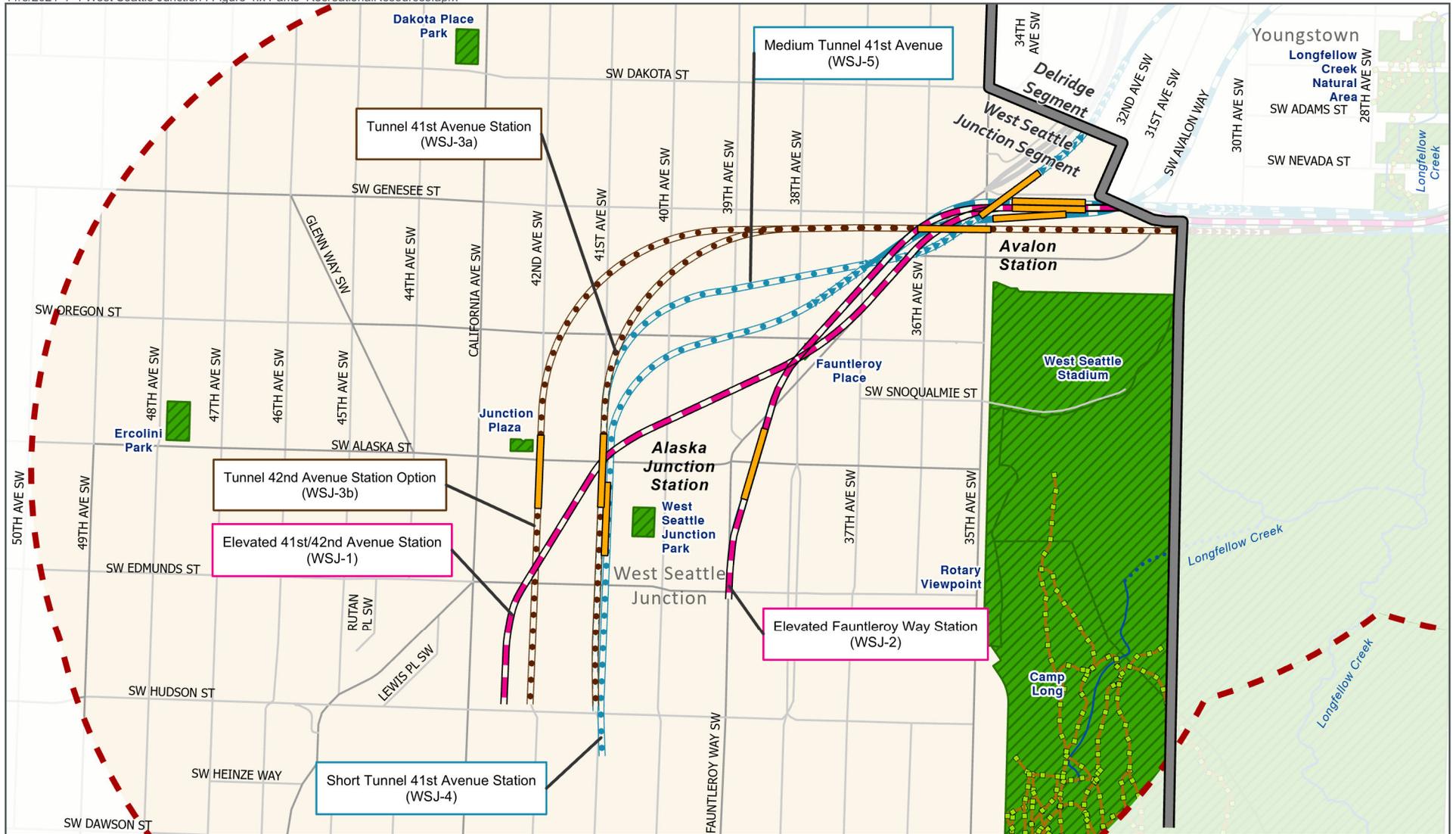


Source: City of Seattle, King County (2019, 2020, 2021).

- Alternatives**
- Preferred Alternative
 - Preferred Alternative with Third-party Funding
 - Other Alternatives
- Alternative Profile**
- Elevated
 - Tunnel
 - At-Grade
 - Retained Cut
- Station**
- New
- Legend:**
- Segment Line
 - Railroad
 - Stream
 - Piped Stream
 - Study Area
 - Parks and Recreational Resources in Study Area
 - o-o- Trail

FIGURE 4.2.17-2
Parks and Recreational Resources in the Study Area
 West Seattle Link Extension - Delridge Segment



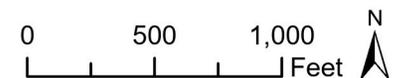


Source: City of Seattle, King County (2019, 2020, 2021).

- Alternatives**
- Preferred Alternative
 - Preferred Alternative with Third-party Funding
 - Other Alternatives
- Alternative Profile**
- Elevated
 - Tunnel
 - At-Grade
 - Retained Cut
- Station**
- New
- Legend**
- Segment Line
 - Stream
 - Piped Stream
 - Parks and Recreational Resources in Study Area
 - - - - Trail
 - Study Area

**FIGURE 4.2.17-3
Parks and Recreational
Resources in the Study Area
West Seattle Link Extension -
West Seattle Junction Segment**

*West Seattle and
Ballard Link Extensions*



- **Harbor Marina Corporate Center at Terminal 102** is a 2.4-acre public shoreline access area south of the West Seattle Bridge along three sides of the south end of Harbor Island, between the shoreline and an office park. The resource provides public access to the Duwamish Waterway along 600 feet of shoreline, as well as a paved pathway, picnic tables, and a small lawn area. The pathway can be used to access Harbor Island Marina.
- **West Duwamish Greenbelt** is 197 acres, is comprised of multiple parcels, and is the largest greenbelt in Seattle. There are recreational use trails in the greenbelt; however, the portion of the greenbelt within the study area is a bluff with some wildlife habitat function, and is not designed for public access. The greenbelt also serves as a linear visual buffer for the Pigeon Point community. A paved stairway in the greenbelt connects West Marginal Place with Southwest Charlestown Street but does not provide access to the recreational trails farther south in the greenbelt.
- **22nd Avenue Southwest Street-end** is an improved street end adjacent to the western edge of the West Duwamish Greenbelt and is less than 0.1 acre. It has landscaping and is Seattle Department of Transportation right-of-way.

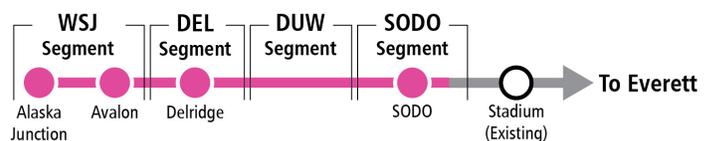
4.2.17.1.3 Delridge Segment

There are five parks and recreational resources in the Delridge Segment study area. The following four resources are closest to the project (Figure 4.2.17-2):

- **Delridge Playfield** is 14 acres and features the Delridge Community Center, open space, benches, picnic amenities, tennis courts, play equipment, multi-use athletic fields, public art, a skate park, and a wading pool.
- **Longfellow Creek Natural Area** is a 5.9-acre protected greenspace in the Longfellow Creek watershed that features the Longfellow Creek Legacy Trail. In the natural area there is a garden, sculpture, and pavilion in the Dragonfly Garden area; salmon habitat; and a bridge with an overhead wishbone structure.
- **Longfellow Creek Legacy Trail** is a 4.2-mile recreational trail connecting the Delridge and Westwood neighborhoods and multiple parks. In the study area, the trail is located on 26th Avenue Southwest and Southwest Genesee Street and connects via a staircase to the Longfellow Creek Natural Area, where the trail is gravel and dirt. It can be accessed from the Dragonfly Garden Pavilion and along Southwest Genesee Street or from 28th Avenue Southwest.
- **West Seattle Golf Course**, designed in 1936, is 138 acres and one of five public golf courses in the city of Seattle. This historic 18-hole course (refer to Section 4.2.16, Historic and Archaeological Resources) features hills with scenic views of Downtown Seattle and Elliott Bay. The West Seattle Golf Course has many mature trees that line much of the north side of the property along the south edge of Southwest Genesee Street. These trees form the northern backdrop of the golf course. This resource is also in the West Seattle Junction Segment study area.

4.2.17.1.4 West Seattle Junction Segment

There are nine existing parks and recreational resources and one planned resource in the West Seattle Junction Segment study area. The following three resources are closest to the project (Figure 4.2.17-3):



- **Fauntleroy Place** is a street triangle greenspace that is less than 0.1 acre with grass, trees, and a bench. It is surrounded by street right-of-way.
- **Junction Plaza Park** is a 0.2-acre neighborhood park, primarily used for passive use and festivals. It has landscaping, benches, hardscape, and art.
- **West Seattle Junction Park** is a planned 0.4-acre park in development. The new park design includes landscaping, hardscape, a play area, and a picnic area.

4.2.17.2 Environmental Impacts of the No Build Alternative

The No Build Alternative would not affect any parks or recreational resources in the West Seattle Link Extension study area. Unlike the Build Alternatives, the No Build Alternative would not improve access to such resources.

4.2.17.3 Environmental Impacts of the Build Alternatives during Operation

Sound Transit analyzed the potential long-term impacts of operation of the West Seattle Link Extension Build Alternatives on parks and recreational resources in the study area. If a recreational resource or alternative is not mentioned, no impacts would occur for that resource or alternative.

Long-term impacts would include permanent changes to parks and recreational resources from the West Seattle Link Extension operations. Impacts could include permanent property acquisition or easements, and changes to resource amenities, activities, parking, or access, and substantial change in the experience of users due to changes in visual conditions and noise levels adjacent to the resource.

The visual and aesthetic resource analysis approach is based upon the Federal Highway Administration (FHWA) methodology for assessing visual impacts related to transportation projects (FHWA 1988), along with more recent guidelines (FHWA 2015). Further detail on the methods and analysis, including larger visual simulations, is provided in Appendix N.2, Visual and Aesthetics Technical Report. The noise sensitivity analysis was conducted according to the Federal Transit Administration (FTA) *Transit Noise and Vibration Impact Assessment Manual* (FTA 2018). Noise-sensitive parks and recreational resources are those where quiet is an essential element in their intended purpose or where it is important to avoid interference with activities such as speech, meditation, and reading.

4.2.17.3.1 SODO Segment

The SODO Segment study area does not contain any parks or recreational resources; therefore, there are no impacts in this segment.

4.2.17.3.2 Duwamish Segment

Two Duwamish Segment alternatives would have long-term impacts on the Harbor Marina Corporate Center at Terminal 102, West Duwamish Greenbelt, and the 22nd Avenue Southwest Street-end (Table 4.2.17-1). Alternative DUW-2 would avoid permanent impacts to parks and recreational resources and designated open space areas.

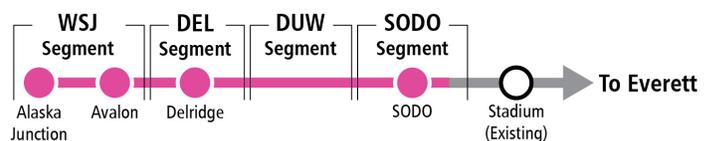


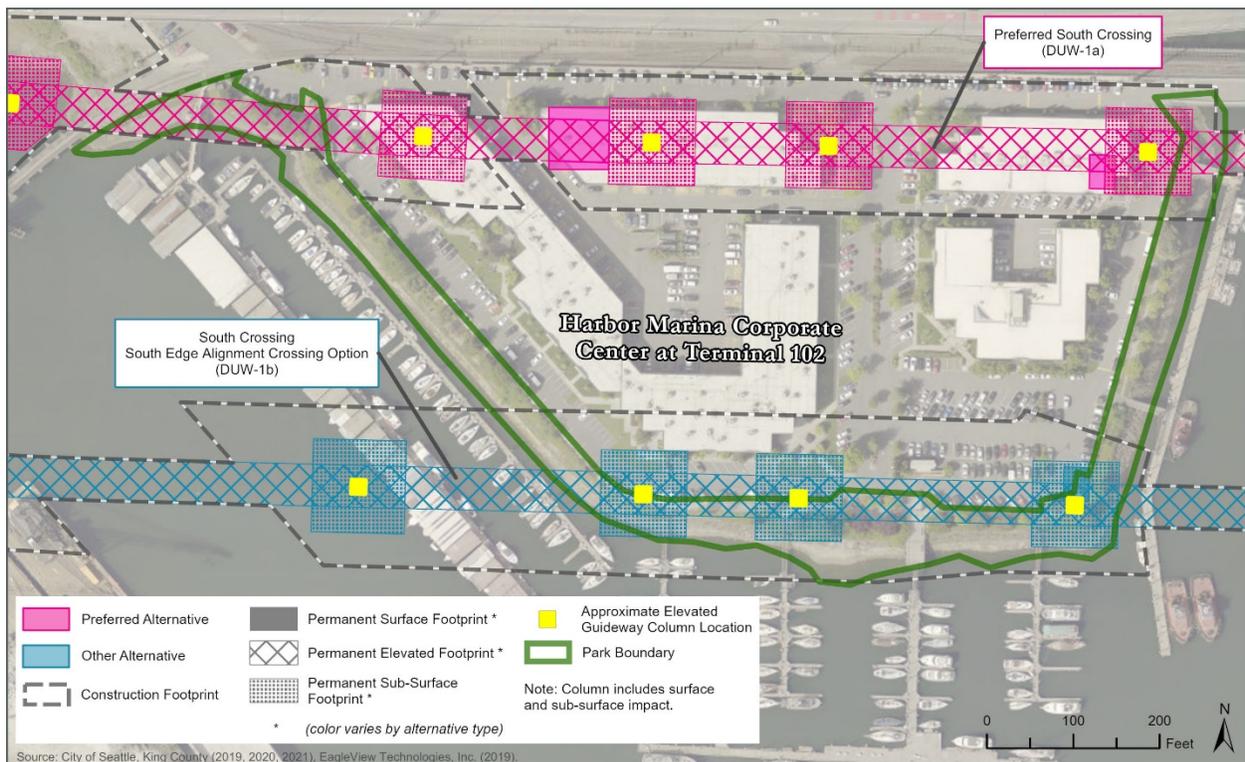
Table 4.2.17-1. Permanent Impacts to Parks and Recreational Resources in the Duwamish Segment

Alternative	Harbor Marina Corporate Center at Terminal 102	West Duwamish Greenbelt	22nd Avenue Southwest Street-end
Preferred South Crossing (DUW-1a)	0.3 acre	1.1 to 1.2 acres	<0.1 acre
South Crossing South Edge Crossing Alignment Option (DUW-1b)	0.6 acre	1.2 to 1.3 acres	<0.1 acre
North Crossing (DUW-2)	None	None	None

Harbor Marina Corporate Center at Terminal 102

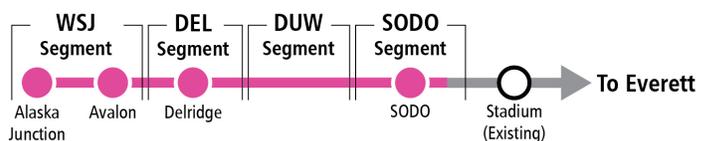
Figure 4.2.17-4 shows the permanent impacts to this resource from the Duwamish Segment alternatives.

Figure 4.2.17-4. Harbor Marina Corporate Center at Terminal 102 Permanent and Construction Impacts, West Seattle Link Extension – Duwamish Segment



Preferred Alternative DUW-1a would have guideway columns in the Harbor Marina Corporate Center at Terminal 102, but would not permanently impact the walking path or access to the Harbor Island Marina.

Option DUW-1b would pass directly above Harbor Island Marina and would have guideway columns constructed along the walkway that accesses the marina from the Harbor Marina Corporate Center at Terminal 102. The guideway columns would permanently displace the walking path, which would be relocated.



West Duwamish Greenbelt

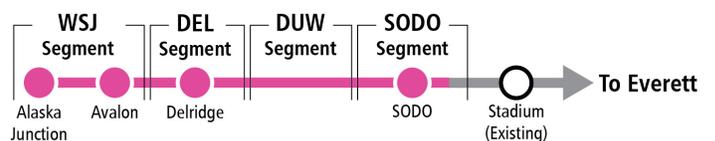
Figure 4.2.17-5 shows the permanent impacts to this resource from the Duwamish Segment alternatives.

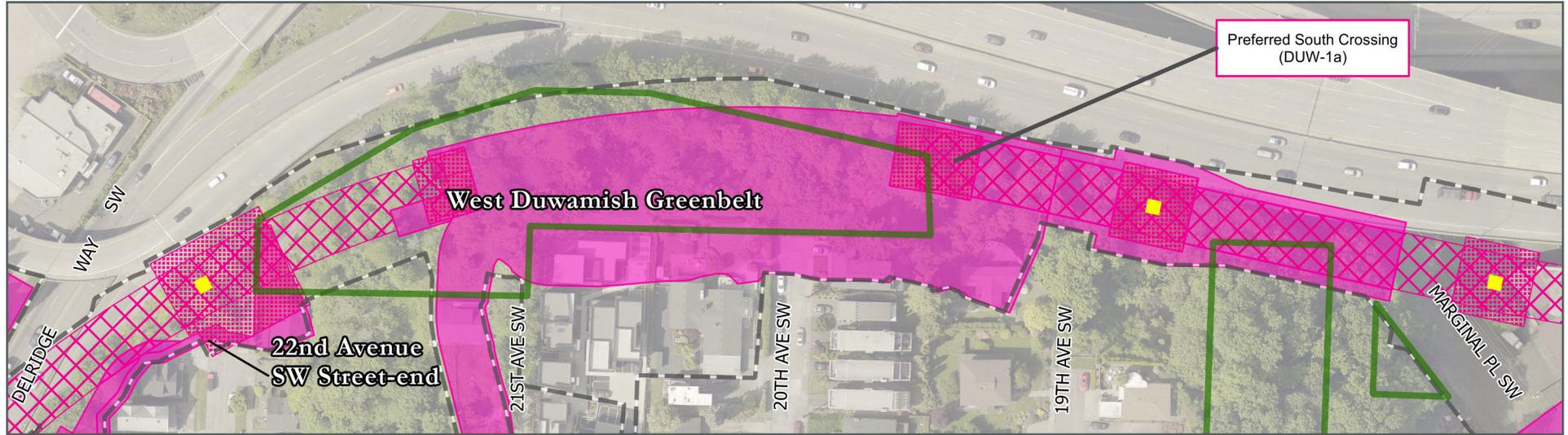
Preferred Alternative DUW-1a and Option DUW-1b would have similar permanent impacts to the north end of the West Duwamish Greenbelt. Both alternatives would remove existing trees for the guideway, which would be either elevated or in a retained cut depending on the alternative it would connect to in the adjacent Delridge Segment. The impacted area would also include a maintenance access road and slope stabilization features. Permanent conditions may allow limited revegetation of the areas adjacent to the guideway and maintenance road. Trees would not likely be allowed due to restrictions on tall vegetation near the guideway.

This area of the greenbelt has a steep grade and does not contain recreational activities, nor is it designed for public access. Preferred Alternative DUW-1a and Option DUW-1b would not affect the greenbelt’s recreational trails, which are south of the study area, or the stairway from West Marginal Place to Southwest Charlestown Street in the greenbelt. Selective removal of hazard trees near the guideway could occur. Removal of trees and other vegetation could degrade the current wildlife habitat, which includes a nearby great blue heron rookery (refer to Section 4.2.9, Ecosystems).

22nd Avenue Southwest Street-end

Figure 4.2.17-5 shows the permanent impacts to this resource from the Duwamish Segment alternatives. Preferred Alternative DUW-1a and Option DUW-1b would displace the 22nd Avenue Southwest Street-end. Alternative DUW-2 would avoid impacts to this resource.





Source: City of Seattle, King County (2019, 2020, 2021), EagleView Technologies, Inc.(2019).

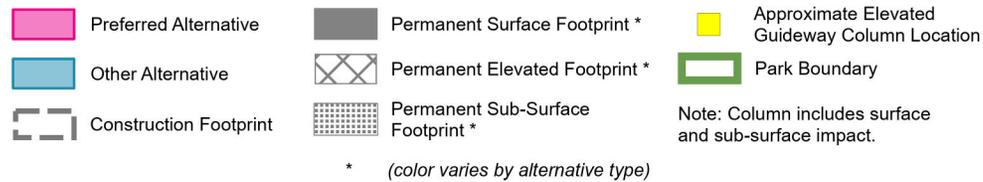


FIGURE 4.2.17-5
West Duwamish Greenbelt and 22nd Avenue Southwest
Street-end Permanent and Construction Impacts
 West Seattle Link Extension - Duwamish Segment

West Seattle and Ballard Link Extensions



4.2.17.3.3 Delridge Segment

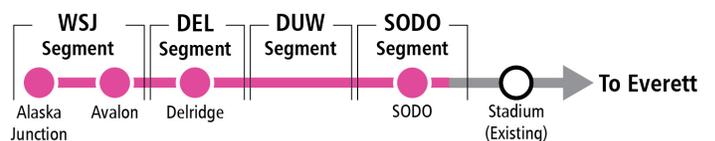
The Delridge Segment alternatives would have long-term impacts on three parks and recreational resources in the study area (Table 4.2.17-2): Delridge Playfield, Longfellow Creek Natural Area, and West Seattle Golf Course. A summary of the visual impacts to parks and recreational resources in the Delridge Segment is presented in Table L4.17-2 in Appendix L4.17. A detailed discussion of the visual impact analysis and findings is in Section 4.2.5, Visual and Aesthetic Resources.

Table 4.2.17-2. Permanent Impacts to Parks and Recreational Resources in the Delridge Segment

Alternative	Delridge Playfield	Longfellow Creek Legacy Trail	Longfellow Creek Natural Area	West Seattle Golf Course
Preferred Dakota Street Station (DEL-1a)	None	None	None	0.5 acre ^a
Dakota Street Station North Alignment Option (DEL-1b)	None	20 linear feet	0.1 acre	<0.1 acre ^a
Preferred Dakota Street Station Lower Height (DEL-2a)*	None	None	None	1.4 acres
Dakota Street Station Lower Height North Alignment Option (DEL-2b)*	None	< 20 linear feet	<0.1 acre	<0.1 acre ^a
Delridge Way Station (DEL-3)	<0.1 acre	None	None	0.6 acre ^a
Delridge Way Station Lower Height (DEL-4)*	None	None	None	1.3 acres
Andover Street Station (DEL-5)	None	None	None	None
Andover Street Station Lower Height (DEL-6)*	None	None	None	None

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

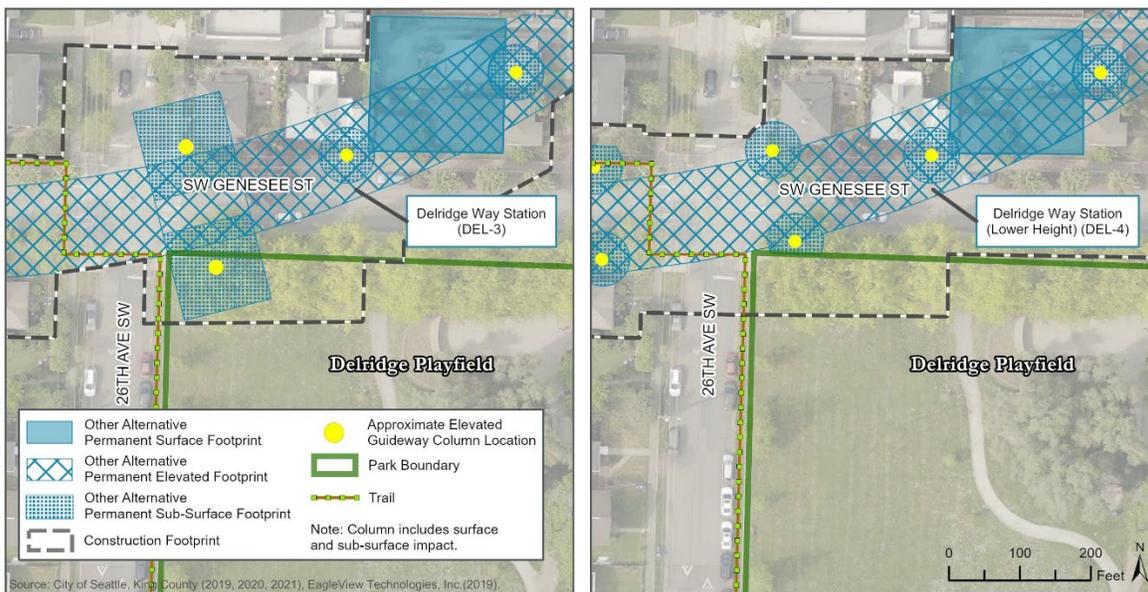
^a Area represents estimate of aerial easement needed over golf course. A smaller area of underground easement for guideway column foundations would also be needed.



Delridge Playfield

Figure 4.2.17-6 shows the permanent impacts to this resource from the Delridge Segment alternatives.

Figure 4.2.17-6. Delridge Playfield Permanent and Construction Impacts, West Seattle Link Extension – Delridge Segment



Preferred Alternative DEL-1a, Option DEL-1b, Preferred Alternative DEL-2a*, and Option DEL-2b* would have all project elements outside the Delridge Playfield. Preferred Alternative DEL-1a and Option DEL-1b would reduce the quality of views from the park, which is a visual impact. Preferred Alternative DEL-2a* would change the character of the views, which is also a visual impact. Figure 4.2.17-7 shows the view of these alternatives from the Delridge Playfield.

Alternative DEL-3 and Alternative DEL-4* would have the elevated guideway and guideway column permanently impacting a small vegetated portion of the northwest corner of the Delridge Playfield. Both Alternative DEL-3 and Alternative DEL-4* would avoid impacts to all built amenities and active-use areas in the park, whereas Alternative DEL-5 and Alternative DEL-6* would avoid impacts.

Longfellow Creek Natural Area

Figure 4.2.17-8 shows the permanent impacts to this resource from the Delridge Segment alternatives.

All Delridge Segment alternatives would avoid placement of guideway columns in the Longfellow Creek Natural Area. These alternatives would also avoid permanent impacts to the Longfellow Creek Legacy Trail access from Southwest Genesee Street.

Both Option DEL-1b and Option DEL-2b* would require minor property acquisition from the Longfellow Creek Natural Area to relocate the sidewalk to the north around the guideway columns. Both would remove vegetated landscaping in the area needed for sidewalk relocation.

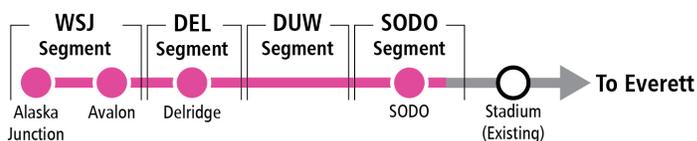


Figure 4.2.17-7. View from Delridge Playfield

Existing Conditions



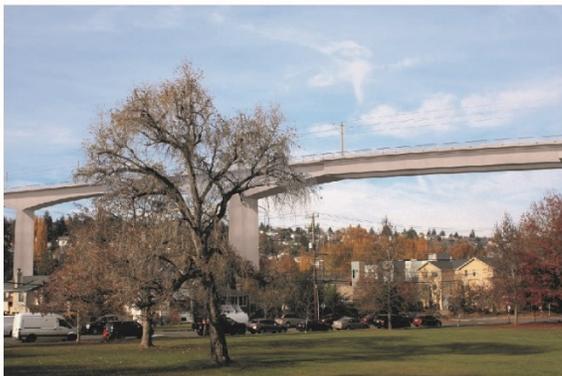
Preferred Dakota Street Station Alternative (DEL-1a)



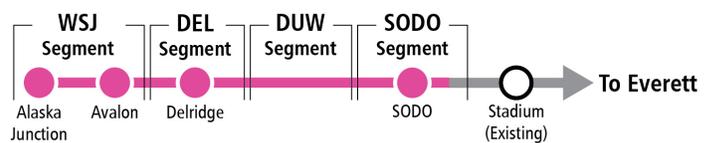
Preferred Dakota Street Station Lower Height Alternative (DEL-2a)*

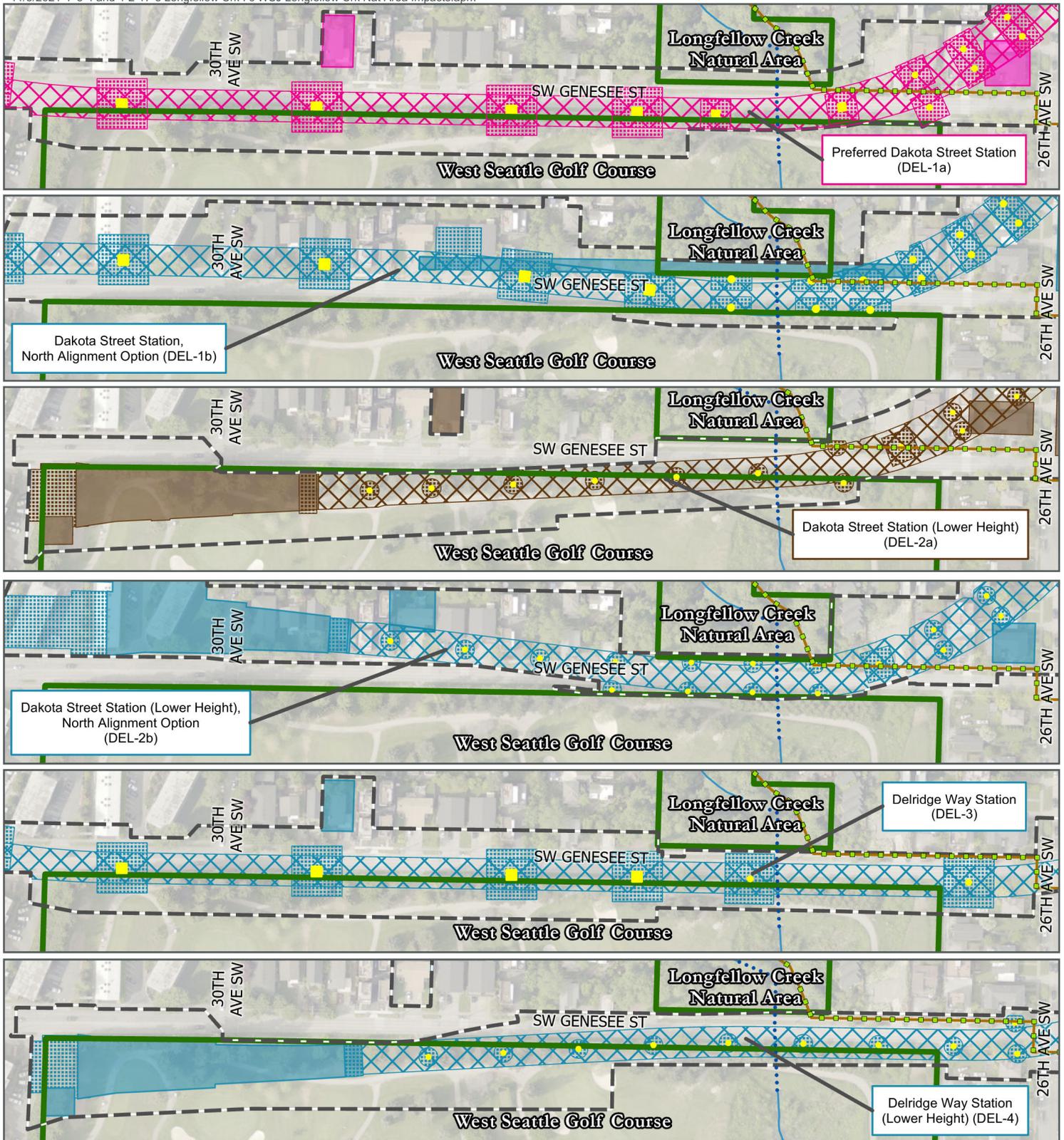


Delridge Way Station Alternative (DEL-3)



Delridge Way Station Lower Height Alternative (DEL-4)*





Source: City of Seattle, King County (2019, 2020, 2021), EagleView Technologies, Inc. (2019).

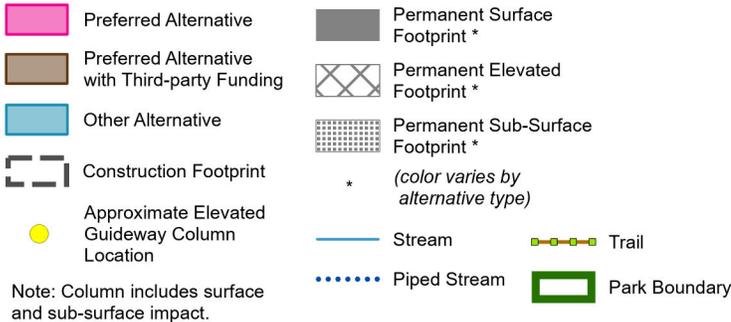


FIGURE 4.2.17-8
Longfellow Creek Natural Area, Longfellow Creek Legacy Trail and West Seattle Golf Course Permanent and Construction Impacts
 West Seattle Link Extension - Delridge Segment
 West Seattle and Ballard Link Extensions



The features, access, and functions of the Longfellow Creek Natural Area would not be adversely affected.

Based on passive park uses and existing noise levels, Longfellow Creek Natural Area is the only park in the study area found to be noise-sensitive. Alternative DEL-6* is the only alternative where noise impacts are predicted at the Longfellow Creek Natural Area.

Longfellow Creek Legacy Trail

Preferred Alternative DEL-1a, Option DEL-1b, Preferred Alternative DEL-2a*, Option DEL-2b*, Alternative DEL-3, and Alternative DEL-4* would all construct an elevated guideway over portions of Southwest Genesee Street in the vicinity of the Longfellow Creek Trail but would avoid placement of guideway columns on the trail inside the Longfellow Creek Natural Area. Alternatives DEL-5 and DEL-6* would not impact the trail.

Option DEL-1b and Option DEL-2b* would permanently encroach upon about 20 feet of the Longfellow Creek Legacy Trail near its access point off Southwest Genesee Street. After construction, the trail connection stairway to the sidewalk on Southwest Genesee Street would need to be relocated slightly northward due to road widening to accommodate placement of guideway columns. However, the relocated trail access would provide the same function as the current trail access, and trail users would be able to utilize the same trail in the same manner they do today.

Preferred Alternative DEL-1a and Option DEL-1b would also permanently reduce the quality of views along a few other sections of the trail, which would be a visual impact.

West Seattle Golf Course

Figure 4.2.17-8 shows the permanent impacts to this resource from the Delridge Segment alternatives.

All Delridge Segment alternatives except Alternative DEL-5 and Alternative DEL-6* would have a permanent impact to the West Seattle Golf Course (Table 4.2.17-2). The alternatives vary in height and the extent to which they would remove trees at the north end of the West Seattle Golf Course property. All Delridge Segment alternatives except Alternative DEL-5 and Alternative DEL-6* would change either or both the character or quality of views from the West Seattle Golf Course, which is a visual impact. Figure 4.2.17-9 shows the view of the alternatives from the golf course.

Preferred Alternative DEL-1a and Alternative DEL-3 would impact a small area along the north end of the golf course property and would require vegetation and tree removal. Guideway columns would be on the south side of the Southwest Genesee Street right-of-way, outside of park property, with the foundations requiring an underground easement along the north edge of the golf course property. Both of these alternatives would also require aerial easements where the guideway would overhang the property. This would not result in a permanent change to the playable area. Due to the height of the elevated guideway, no permanent impacts on golf course operations are anticipated.

Option DEL-1b and Option DEL-2b* would be on the north side of Southwest Genesee Street, with fewer impacts to the West Seattle Golf Course than the alternatives on the south side of Southwest Genesee Street. Both would construct an elevated guideway with straddle bents at the northeast end of the golf course before crossing to the north side of the street. The impact would consist of an underground easement for column foundation, but the column would be outside of park property. Neither alternative would permanently impact the playable area of the golf course.

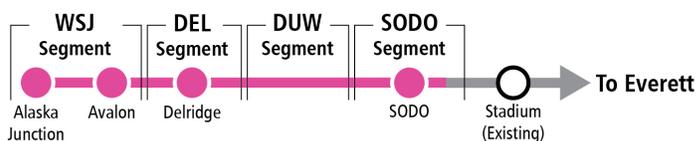


Figure 4.2.17-9. View from West Seattle Golf Course

Existing Conditions



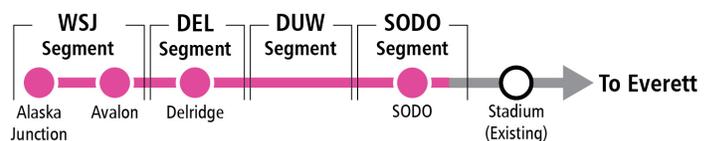
Preferred Dakota Street Station
Alternative (DEL-1a)



Preferred Dakota Street Station
Lower Height Alternative (DEL-2a)*



Both Preferred Alternative DEL-2a* and Alternative DEL-4* would have the greatest impact on the West Seattle Golf Course. These alternatives are aligned on the south side of Southwest Genesee Street, removing some playable area along the north property boundary. Both alternatives transition from an elevated guideway to a tunnel at the northwest end of the golf course and would permanently alter at least five holes and require shortening or reconfiguring of these holes. Changes to these holes could potentially affect the United States Golf Association Handicap System rating of the West Seattle Golf Course, which could make this course less desirable to play. Protective fencing would need to be installed for these alternatives between the course and the guideway to prevent golf balls from falling on the guideway or hitting passing trains.



4.2.17.3.4 West Seattle Junction Segment

The West Seattle Junction Segment alternatives would have long-term impacts on two parks and recreational resources in the study area: Fauntleroy Place and Junction Plaza Park.

Fauntleroy Place

Preferred Alternative WSJ-1 and Preferred Alternative WSJ-2 would fully acquire and permanently displace Fauntleroy Place. Both alternatives would have a guideway column within the park area.

Junction Plaza Park

Preferred Option WSJ-3b* would fully acquire and displace Junction Plaza Park. This area would be used for a station entrance.

Other alternatives in the West Seattle Junction Segment would not have long-term impacts on parks and recreational resources.

4.2.17.4 Environmental Impacts of the Build Alternatives during Construction

Sound Transit analyzed the potential construction impacts of the West Seattle Link Extension Build Alternatives on parks and recreational resources in the study area. If a recreational resource or alternative is not mentioned, no impacts would occur for that resource or alternative.

Construction effects in the West Seattle Link Extension study area would include construction activities and easements, road or lane closures and detours, construction traffic, visual impacts, light, glare, dust, noise, and trail closures and detours that could temporarily alter the resources, impact their function, or reduce or modify access to the resources.

4.2.17.4.1 Impacts Common to All Build Alternatives

Where construction would be adjacent to or on park property, park users might experience minor proximity effects, including increased noise, dust, and temporary use and access restrictions. Construction best management practices would be used to minimize these effects, and these effects are not likely to substantially affect the use of these resources.

For all alternatives, there is potential for temporary construction-related increases in noise levels at nearby parks. However, construction noise levels are not anticipated to substantially affect the use of these resources. Section 4.2.7, Noise and Vibration, and Appendix N.3, Noise and Vibration Technical Report, provide additional information on the potential construction-period noise levels.

4.2.17.4.2 SODO Segment

The SODO Segment does not contain any park or recreational resources and therefore there are no construction impacts in this segment.

4.2.17.4.3 Duwamish Segment

The Duwamish Segment alternatives would temporarily impact three parks and recreation resources in the study area (Table 4.2.17-3).

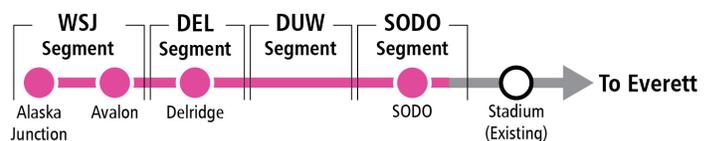


Table 4.2.17-3. Temporary Impacts to Parks and Recreational Resources in the Duwamish Segment

Alternative	Harbor Marina Corporate Center at Terminal 102	West Duwamish Greenbelt	Terminal 18 Park
Preferred South Crossing (DUW-1a)	0.1 acre	0.1 to 0.3 acre	None
South Crossing South Edge Crossing Alignment Option (DUW-1b)	0.5 acre	0.1 to 0.3 acre	None
North Crossing (DUW-2)	None	None	None ^a

^a No impact beyond minor proximity effects.

Harbor Marina Corporate Center at Terminal 102

Figure 4.2.17-4 shows the temporary construction impacts to this resource from the Duwamish Segment alternatives.

Preferred Alternative DUW-1a would temporarily impact Harbor Marina Corporate Center at Terminal 102, in addition to the area needed for permanent right-of-way acquisition. Access to the waterfront walkway from the west could be limited during construction of the bridge foundations for this alternative.

Option DUW-1b would construct the elevated guideway and bridge foundations within the Harbor Marina Corporate Center at Terminal 102 property. Construction of this alternative would require temporary closure of the waterfront walkway on the south end of Harbor Island for up to 4 years.

Alternative DUW-2 would avoid temporary impacts to the Harbor Marina Corporate Center at Terminal 102 during construction.

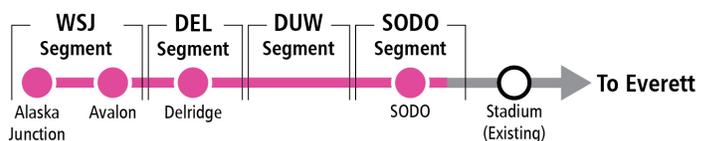
West Duwamish Greenbelt

Figure 4.2.17-5 shows the temporary construction impacts to the greenbelt from the Duwamish Segment alternatives.

Preferred Alternative DUW-1a and Option DUW-1b would, in addition to the permanent impacts to the north end of the greenbelt, temporarily impact between 0.1 and 0.3 acre of the West Duwamish Greenbelt, depending on the connection to the Delridge alternatives. Connections to Alternative DEL-5 and Alternative DEL-6* would have less impact than connections to other Delridge Segment alternatives. Both Preferred Alternative DUW-1a and Option DUW-1b would clear vegetation from the area needed for construction and use it for staging and equipment movement. Both alternatives propose temporary work trestles to minimize slope disturbance during construction. As discussed in Chapter 3, Transportation, construction activities for both alternatives would require temporary closure of the stairway in the greenbelt that connects West Marginal Place with Southwest Charlestown Street for up to 3 years while construction occurs across it.

Terminal 18 Park

Alternative DUW-2 could have minor temporary proximity effects at Terminal 18 Park during construction. This alternative could affect access to the park due to temporary roadway lane closures during the construction period. This park is not accessible by water, and therefore in-water work would not affect park access.



4.2.17.4.4 Delridge Segment

All Delridge Segment alternatives except Alternative DEL-5 and Alternative DEL-6* would have temporary impacts to parks and recreational resources in the study area (Table 4.2.17-4).

Table 4.2.17-4. Temporary Impacts to Parks and Recreational Resources in the Delridge Segment

Alternative	Delridge Playfield	Longfellow Creek Legacy Trail	Longfellow Creek Natural Area	West Seattle Golf Course
Preferred Dakota Street Station (DEL-1a)	None	None	0.1 acre	1.0 acre
Dakota Street Station North Alignment Option (DEL-1b)	None	600 linear feet	<0.1 acre	0.2 acre
Preferred Dakota Street Station Lower Height (DEL-2a)*	None	None	None	1.3 acres
Dakota Street Station Lower Height North Alignment Option (DEL-2b)*	None	600 linear feet	<0.1 acre	<0.1 acre
Delridge Way Station (DEL-3)	0.1 acre	None	None	1.2 acres
Delridge Way Station Lower Height (DEL-4)*	0.1 acre	None	None ^a	1.3 acres
Andover Street Station (DEL-5)	None	None	None	None
Andover Street Station Lower Height (DEL-6)*	None	None	None	None

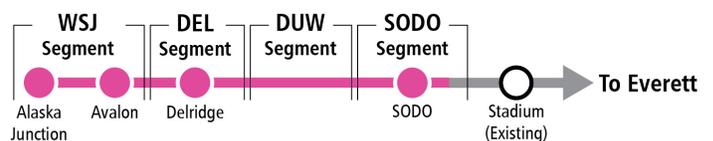
* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

^a No impact beyond minor proximity effects.

Delridge Playfield

Figure 4.2.17-6 shows the temporary construction impacts to this resource from the Delridge Segment alternatives.

Alternative DEL-3 and Alternative DEL-4* would have temporary construction impacts to Delridge Playfield. Both alternatives would use the northwest corner of the Delridge Playfield to construct the elevated guideway. There are no built park amenities in the affected area. Trees and grass would be cleared from the corner of the playfield affected by construction. Although the temporary effects of construction activity would not prohibit use of the playfield, both alternatives could temporarily impact access to the pathway within the park from Southwest Genesee Street for short periods of time. The pathway in the park would remain open during construction (approximately 1.5 years). These alternatives would not impact the alternate pathway, which accesses the resource from the east on Delridge Way Southwest.



Longfellow Creek Natural Area

Figure 4.2.17-8 shows the temporary construction impacts to this resource from the Delridge Segment alternatives.

Preferred Alternative DEL-1a, Option DEL-1b, and Option DEL-2b* would temporarily encroach upon the southern boundary of the Longfellow Creek Natural Area along Southwest Genesee Street (approximately 2 years). These alternatives would use a temporary work trestle to move equipment above the Longfellow Creek Natural Area and to minimize disturbance of this resource. Trees would be removed in the area of the temporary work trestle, and piers would be placed within the boundary of the resource.

Longfellow Creek Legacy Trail

Figure 4.2.17-8 shows the temporary construction impacts to this resource from the Delridge Segment alternatives.

Preferred Alternative DEL-1a, Option DEL-1b, Alternative DEL-2a* and Option DEL-2b*, Alternative DEL-3, and Alternative DEL-4* would all temporarily restrict user access to the Longfellow Creek Legacy Trail connection from the north side of Southwest Genesee Street for approximately 3 to 4 years during column placement and guideway construction. These alternatives would require the closure of about 600 linear feet of trail along Southwest Genesee Street and in the Natural Area between Southwest Genesee Street and Southwest Nevada Street. During these temporary closures, the project will provide a signed detour via 26th Avenue Southwest and Southwest Nevada Street and via Dakota Street during temporary closures of 26th Avenue Southwest to maintain continuity of the trail. These alternatives could also have minor temporary proximity effects on this resource.

West Seattle Golf Course

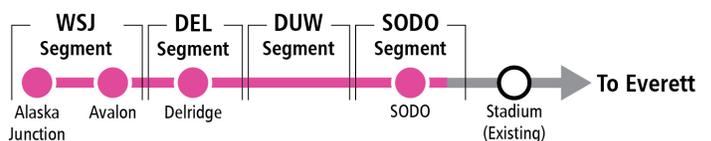
Figure 4.2.17-8 shows the temporary construction impacts to this resource from the Delridge Segment alternatives.

All alternatives except Alternative DEL-5 and Alternative DEL-6* would have additional impacts during construction at the West Seattle Golf Course. Temporary fencing along the north side of the golf course would be installed to prevent golf balls going into the construction area for all of these alternatives.

Preferred Alternative DEL-1a and Alternative DEL-3 would encroach on up to three greens and the golf cart path on the north end of the golf course. Alternative DEL-3 would have additional impacts on the golf course property but would not impact additional playable area. Some guideway construction activities that involve large cranes (e.g., girder placement) might affect use of the golf course nearby. Generally, these construction activities have short time durations of less than an hour, but could restrict play on nearby holes during that time.

Both Option DEL-1b and Option DEL-2b* would largely avoid additional construction impacts to the West Seattle Golf Course. A small construction area at the northeast corner of the golf course property would temporarily re-align the golf cart path for a short distance for the duration of the guideway construction, which would be about 2 years. These alternatives would use the least additional amount of golf course property since construction would mostly occur on the north side of Southwest Genesee Street, across from the golf course.

Preferred Alternative DEL-2a* and Alternative DEL-4* would have the greatest overall construction impacts to the West Seattle Golf Course and could include additional temporary impacts to greens that have permanent impacts. Alternative DEL-4* would have slightly greater



impacts because it would enter the West Seattle Golf Course property farther to the east, but it would not impact any additional playable area. Both alternatives would construct an elevated guideway that transitions into a tunnel along the north side of the golf course, and the temporary encroachment would extend farther into the playable area of the golf course than either Preferred Alternative DEL-1a or Alternative DEL-3. The duration of the impacts for Preferred Alternative DEL-2a* and Alternative DEL-4* would be about 2 years.

4.2.17.4.5 West Seattle Junction Segment

The construction of Preferred Alternative WSJ-3a*, Alternative WSJ-4*, and Alternative WSJ-5* would have minor temporary proximity effects at the West Seattle Junction Park.

4.2.17.5 Indirect Impacts of the Build Alternatives

Sound Transit analyzed the potential indirect impacts of the West Seattle Link Extension Build Alternatives on parks and recreational resources in the study area. If a recreational resource or alternative is not mentioned, no impacts would occur for that resource or alternative.

Potential indirect impacts during operation could include changed or reduced access, changes in the nature of surrounding land uses, increased noise and/or vibration, or a general increase in the level of activity near stations that could affect the continued use of the specific park or recreational facility.

4.2.17.5.1 Impacts Common to All Build Alternatives

Parks and recreation resources within 0.5 mile of light rail stations along the West Seattle Link Extension are listed in Appendix L4.17 (Table L4.17-1). The project would improve public access to most of these resources, particularly those closest to new stations. Underutilized parks could experience activation as the parks continue to see increasing numbers of visitors. The resources most likely to experience increased accessibility due to people walking to the parks from the stations are described for each segment below. If a physical barrier such as a freeway (e.g., Interstate 5) would prevent park or recreational resource users from readily accessing a new station, this benefit to the resource is not described.

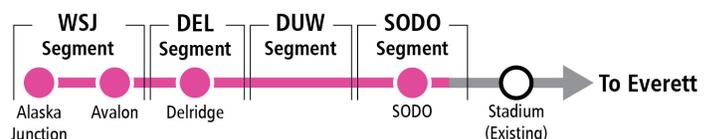
Transit-oriented development (TOD) that could occur around station areas is described in Section 4.2.2, Land Use. Development around station areas would be consistent with City of Seattle planning and zoning. TOD near station areas could increase use of the parks near the stations. TOD could also increase ambient noise heard in nearby parks. However, the parks are urban in nature and their use is not anticipated to be affected by increases in ambient noise.

4.2.17.5.2 SODO Segment

The SODO Segment does not contain any park or recreational resources, and therefore there would be no indirect impacts in this segment.

4.2.17.5.3 Duwamish Segment

Indirect effects from the Duwamish Segment Build Alternatives would not impact parks and recreational resources in the Duwamish Segment. There are no stations in this segment to provide increased access or that would spur TOD.



4.2.17.5.4 Delridge Segment

Indirect effects of the Delridge Segment Build Alternatives would not impact parks and recreational resources in the Delridge Segment. Resources most likely to benefit from increased accessibility from all Delridge Segment alternatives are the Longfellow Creek Natural Area and Delridge Playfield.

4.2.17.5.5 West Seattle Junction Segment

Indirect effects of the West Seattle Junction Segment Build Alternatives would not impact parks and recreational resources. The Rotary Viewpoint, West Seattle Stadium, Camp Long, and West Seattle Golf Course are the resources most likely to benefit from increased accessibility and potential activation from one or more of the new stations. The Avalon Station (for all alternatives) and the Alaska Junction Station (for Preferred Alternative WSJ-2) would likely increase use of these parks due to improved access.

All West Seattle Junction alternatives except Preferred Alternative WSJ-2 and Preferred Option WSJ-3b* would be close to the West Seattle Junction Park and the Junction Plaza Park. The proximity of these resources to the new station locations could result in increased use. Preferred Option WSJ-3b* would remove Junction Plaza Park, and therefore the station location would not improve access.

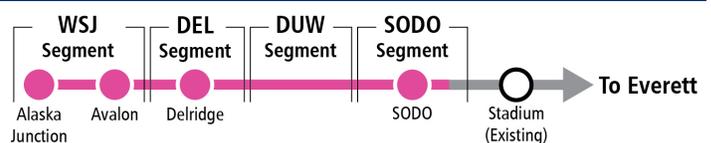
4.2.17.6 Mitigation Measures

According to City of Seattle Ordinance 118477, City park land acquired by the project would need to be replaced with land of equivalent or better size, value, location, and usefulness. Sound Transit would work with the City to identify appropriate replacement property for mitigation where park property would be permanently acquired for the West Seattle Link Extension consistent with Ordinance 118477.

Restoration of park facilities is assumed to be part of the project, and Sound Transit would coordinate with the resource owner to restore temporarily disturbed parks and recreational resources after construction, consistent with clear zone requirements for trees near the guideway. During construction, pedestrian access to parks and trails would be routed to the remaining open portions of the facilities.

Sound Transit would coordinate with the Washington State Recreation and Conservation Office regarding mitigation for parks and recreation resources they have funded. Up to two parcels in the West Duwamish Greenbelt that could be affected received funding from this office. Portions of the Longfellow Creek Natural Area that received funding from this office would not be affected.

Potential mitigation for visual impacts in parks is described in Section 4.2.5, Visual and Aesthetic Resources. Sound walls would mitigate noise impacts in the Longfellow Creek Natural Area, as described in Section 4.2.7, Noise and Vibration. Additional potential site-specific mitigation is described below. Other measures to mitigate affected resources could include financial compensation or park enhancement, where appropriate.



4.2.17.6.1 Duwamish Segment

22nd Avenue Southwest Street-end

Sound Transit would work with the Pigeon Point community and the City of Seattle to identify opportunities to replace the 22nd Avenue Street-end for Preferred Alternative DUW-1a and Option DUW-1b, which would displace this resource.

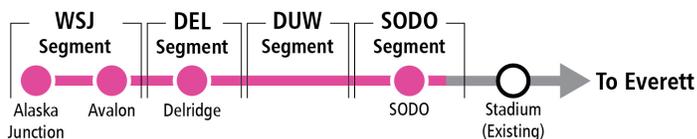
4.2.17.6.2 Delridge Segment

West Seattle Golf Course

Sound Transit would coordinate with the City of Seattle to minimize effects to the West Seattle Golf Course to the extent possible, if a Delridge Segment alternative that affects this resource is selected as the project to be built.

For Preferred Alternative DEL-1a and Alternative DEL-3, the playable area impacted could be reconfigured to minimize some of the construction impacts. This reconfiguration is not expected to close holes for an extended period of time, and modifications to holes and the pathway are expected to be temporary changes. The current configuration of holes and the pathway would be restored following guideway construction. Growth of new permanent turf can take up to 1 year.

For Preferred Alternative DEL-2a* and Alternative DEL-4*, Sound Transit would work with the City to reconfigure the playable area of at least the holes impacted by long-term operation and construction or make other improvements deemed appropriate to restore the function of the golf course. For these alternatives, design of the reconfigured holes could take 1 to 2 years. It could take an additional 18 months to 2 years for construction and growing of turf.



4.2.18 Section 4(f) Summary

4.2.18.1 Affected Environment

This section summarizes the Section 4(f) analysis completed in compliance with Section 4(f) of the United States Department of Transportation Act of 1966 (United States Code Title 49 Section 303[c]). The full Section 4(f) analysis can be found in Appendix H, Draft Section 4(f) Evaluation. The study area for the West Seattle Link Extension draft Section 4(f) evaluation, shown on Figure 4.2.18-1, includes both the direct impact study area used for the parks and recreational resources analysis (which is 250 feet around the alternatives, construction staging areas, and ancillary facilities) and the area of potential effects for historic and archaeological resources, which was established in accordance with Section 106 of the National Historic Preservation Act. As the project advances, FTA and Sound Transit will continue to consult with the State Historic Preservation Officer and other consulting parties on the area of potential effects to address specific concerns regarding historic districts and individual resources. See Section 4.2.16.1 for a description of the area of potential effects for the West Seattle Link Extension.

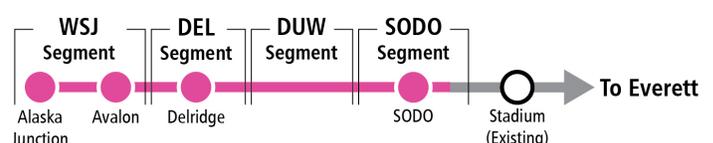
The Section 4(f) resources in the West Seattle Link Extension study area are mapped on Figures 3-1a through 3-1f of Appendix H and are summarized in Table 4.2.18-1. Attachment H.1, Section 4(f) Status of Parks and Recreational Resources in the Study Area, lists the parks and recreational facilities in the study area and identifies which 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 4.2.17, Parks and Recreational Resources. More information about historic and archaeological resources can be found in Section 4.2.16, Historic and Archaeological Resources, and Appendix N.5, Historic and Archaeological Resources Technical Report.

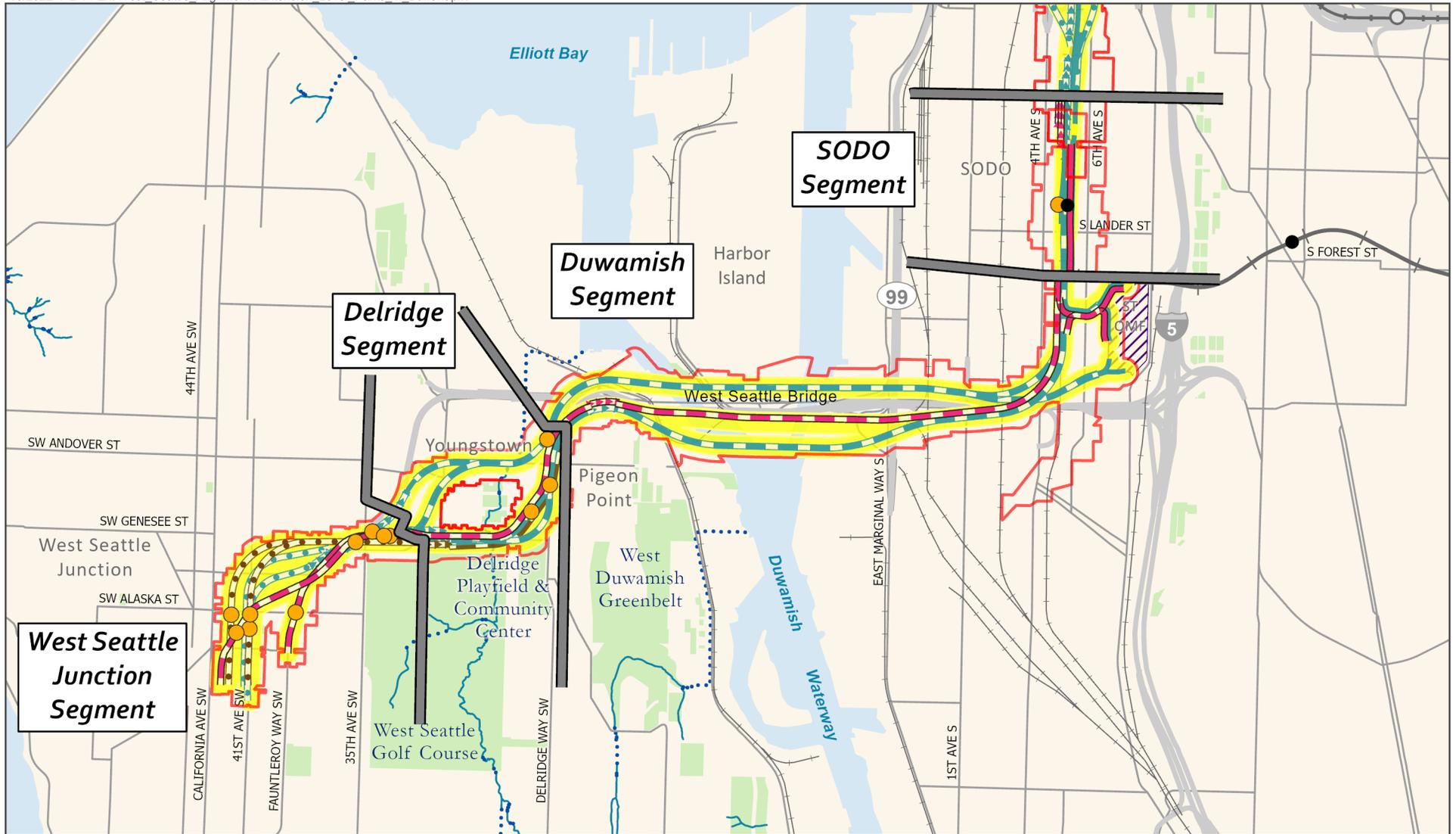
There are five trails in the West Seattle Link Extension study area that are used by both commuters and recreationists:

- SODO Trail
- West Seattle Bridge Trail
- Duwamish Trail
- Delridge Connector Trail
- Alki Trail

FTA has determined that these trails are part of the transportation system and function primarily for transportation based on the Seattle Department of Transportation's inclusion of these trails in its Bicycle Master Plan (City of Seattle 2014). These multi-use, paved trails are entirely or mostly within public right-of-way, and are part of the existing bicycle network, which is considered an extension of the City's transportation network by the City of Seattle. Therefore, these trails are not subject to Section 4(f) protection in accordance with Code of Federal Regulations Title 23 Section 774.13(f)(4). Potential impacts to these trails are discussed in Section 3.7, Non-motorized, in Chapter 3, Transportation Environment and Consequences.

The official with jurisdiction for each Section 4(f) park and recreational resource is the resource owner identified in Section 3.1 of Appendix H, Draft Section 4(f) Evaluation; the official with jurisdiction for Section 4(f) historic resources is the State Historic Preservation Officer. For individual properties that are eligible for Section 4(f) protection as both a park resource and a historic resource, Sound Transit will consult with the resource's official with jurisdiction as well as the State Historic Preservation Officer.





Source: City of Seattle, King County (2019, 2020, 2021).

Alternatives

- Preferred Alternative
- Preferred Alternative with Third-party Funding
- Other Alternatives

Alternative Profile

- Elevated
- Tunnel
- At-Grade
- Retained Cut

Station

- New
- Existing

Segment Line

 Sound Transit Operations and Maintenance Facility (ST OMF)

Existing Link Light Rail

East Link Light Rail (Under Construction)

Railroad

— Stream

⋯ Piped Stream

Park

 Area of Potential Effects

 Parks Study Area

FIGURE 4.2.18-1
West Seattle Link Extension
Section 4(f) Study Area
West Seattle Link Extension

West Seattle and Ballard Link Extensions



Table 4.2.18-1. Summary of Section 4(f) Resources in the West Seattle Link Extension Study Area

Segment	Number of Park/Recreation Resources	Number of Historic Resources
SODO	0	5
Duwamish	2	57
Delridge	4	12
West Seattle Junction	3	28
Linear resources spanning multiple segments	0	1

4.2.18.2 Section 4(f) Uses

If a Section 4(f) resource is not mentioned in this section, there is no use of that resource. The full Section 4(f) analysis can be found in Appendix H, Draft Section 4(f) Evaluation.

4.2.18.2.1 SODO Segment

There would be no Section 4(f) uses from any SODO Segment alternatives.

4.2.18.2.2 Duwamish Segment

Table 4.2.18-2 provides a summary of the preliminary Section 4(f) use determinations for the Duwamish Segment alternatives.

4.2.18.2.3 Delridge Segment

Table 4.2.18-3 provides a summary of the preliminary Section 4(f) uses for the Delridge Segment alternatives.

4.2.18.2.4 West Seattle Junction Segment

Table 4.2.18-4 provides a summary of the preliminary Section 4(f) use determinations for the West Seattle Junction Segment alternatives.

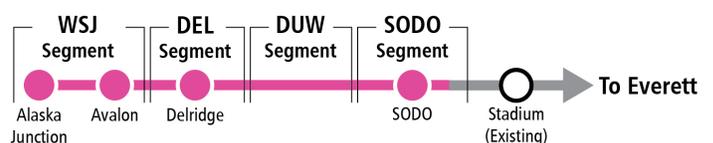
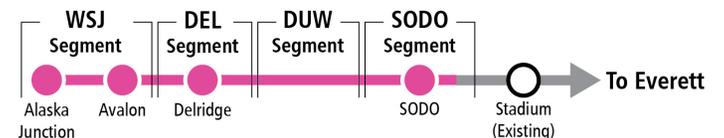


Table 4.2.18-2. Summary of Preliminary Section 4(f) Use Determinations by Alternative for the Duwamish Segment

Resource	Preferred South Crossing Alternative (DUW-1a)	South Crossing South Edge Crossing Alignment Option (DUW-1b)	North Crossing Alternative (DUW-2)
West Duwamish Greenbelt	<i>de minimis</i>	<i>de minimis</i>	No use
Viking Auto Sprinkler Company	No use	No use	Use
Ehrlich-Harrison Co. Industrial Buildings	No use	No use	<i>de minimis</i>
Pacific Forge Company/Bethlehem Steel Nut and Bolt Factory Historic District	Use	Use	No use
Fire Station 14	No use	No use	<i>de minimis</i>
Pacific Hoist and Warehouse Company	No use	No use	<i>de minimis</i>
Langendorf United Bakeries	<i>de minimis</i>	<i>de minimis</i>	<i>de minimis</i>
Langendorf United Bakeries Repair Garage	<i>de minimis</i>	<i>de minimis</i>	<i>de minimis</i>
A.M. Castle and Company	No use	Use	No use
Alaskan Copper Co. Employment Office	Use	Use	Use
Auto Repair Garage	Use	Use	No use
Department of Highway District No. 1 Headquarters/Maintenance Facility – Office/Administrative Building	No use	No use	Use
Department of Highway District No. 1 Headquarters/Maintenance Facility – Maintenance Building	No use	No use	Use
Department of Highway District No. 1 Headquarters/Maintenance Facility – Storage Building	No use	No use	Use
Department of Highway District No. 1 Headquarters/Maintenance Facility – Car/Paint Building	No use	No use	Use
Department of Highway District No. 1 Headquarters/Maintenance Facility – Maintenance/Garage Building	No use	No use	Use
Spokane Street Manufacturing Historic District	Use	Use	No use
Truck Storage Battery Charging Building	Use	Use	No use
Acme Tool Works	Use	Use	No use
Cold Storage Plant/Rainier Market Center	No use	Use	No use

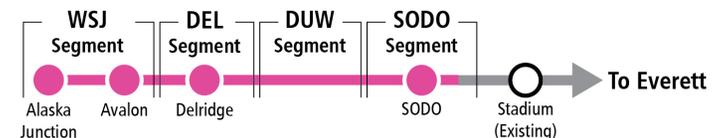


Resource	Preferred South Crossing Alternative (DUW-1a)	South Crossing South Edge Crossing Alignment Option (DUW-1b)	North Crossing Alternative (DUW-2)
Transportation Equipment Rentals Office Building	No use	No use	Use
Transportation Equipment Rentals Maintenance Warehouse	No use	No use	Use
Fire Station 36	Use ^a	Use ^a	No use

^a Use would potentially occur only when connecting to Alternative DEL-3 or Alternative DEL-4* in the Delridge Segment.

Table 4.2.18-3. Summary of Preliminary Section 4(f) Use Determinations by Alternative for the Delridge Segment

Resource	Preferred Dakota Street Station Alternative (DEL-1a)	Dakota Street Station North Alignment Option (DEL-1b)	Preferred Dakota Street Station Lower Height Alternative (DEL-2a)*	Dakota Street Station Lower Height North Alignment Option (DEL-2b)*	Delridge Way Station Alternative (DEL-3)	Delridge Way Station Lower Height Alternative (DEL-4)*	Andover Street Station Alternative (DEL-5)	Andover Street Station Lower Height Alternative (DEL-6)*
Delridge Playfield	No use	No use	No use	No use	<i>de minimis</i>	No use: Temporary Occupancy	No use	No use
Longfellow Creek Natural Area	No use: Temporary Occupancy	<i>de minimis</i>	No use	<i>de minimis</i>	No use	No use	No use	No use
Longfellow Creek Legacy Trail	No use: Temporary Occupancy	<i>de minimis</i>	No use	<i>de minimis</i>	No use	No use	No use	No use
West Seattle Golf Course (park)	No use: Temporary Occupancy	No use: Temporary Occupancy	Use	No use: Temporary Occupancy	No use: Temporary Occupancy	Use	No use	No use
West Seattle Golf Course (historic property)	No use	No use	Use	No use	No use	Use	No use	No use
Bethlehem Pacific Coast Steel Company Office Building	Use	Use	Use	Use	Use	Use	No use	No use



Resource	Preferred Dakota Street Station Alternative (DEL-1a)	Dakota Street Station North Alignment Option (DEL-1b)	Preferred Dakota Street Station Lower Height Alternative (DEL-2a)*	Dakota Street Station Lower Height North Alignment Option (DEL-2b)*	Delridge Way Station Alternative (DEL-3)	Delridge Way Station Lower Height Alternative (DEL-4)*	Andover Street Station Alternative (DEL-5)	Andover Street Station Lower Height Alternative (DEL-6)*
Residence, 4030 Delridge Way Southwest	Use	Use	Use	Use	Use	Use	No use	No use
Seattle Steel Company/Bethlehem Pacific Coast Steel Corporation	No use	No use	No use	No use	No use	No use	<i>de minimis</i>	<i>de minimis</i>
Mrachke & Son	Use	Use	Use	Use	Use	Use	No use	No use
Single-family Craftsman Residence, 4108 25th Avenue Southwest	Use	Use	Use	Use	No use	No use	No use	No use
Single-family Craftsman Residence, 4139 25th Avenue Southwest	Use	Use	Use	Use	No use	No use	No use	No use
Contemporary Ranch House, 4150 32nd Avenue Southwest	No use	Use	No use	No use	No use	No use	Use	No use
Kirlow Four-Plex, 3074 Southwest Avalon Way	No use	No use	No use	No use	No use	No use	Use	No use

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

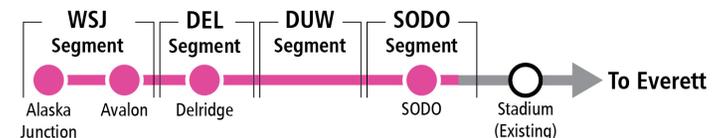


Table 4.2.18-4. Summary of Preliminary Section 4(f) Use Determinations by Alternative for the West Seattle Junction Segment

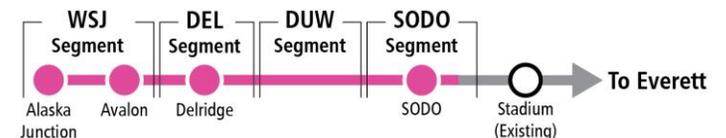
Resource	Preferred Elevated 41st/42nd Avenue Station Alternative (WSJ-1)	Preferred Elevated Fauntleroy Way Station Alternative (WSJ-2)	Preferred Tunnel 41st Avenue Station Alternative (WSJ-3a)*	Preferred Tunnel 42nd Avenue Station Option (WSJ-3b)*	Short Tunnel 41st Avenue Station Alternative (WSJ-4)*	Medium Tunnel 41st Avenue Station Alternative (WSJ-5)*
Junction Plaza Park	No use	No use	No use	Use	No use	No use
Limcrest Apartments	No use	No use	Use ^a	Use ^a	No use	No use
Single-family Residence, 4406 37th Avenue Southwest	No use	Use	Use	Use	Use	Use
Carlsen & Winqvist Auto	Use	No use	No use	No use	No use	No use
West Seattle Brake Service	<i>de minimis</i>	No use	No use	No use	No use	No use
Contemporary Ranch House, 3221 Southwest Genesee Street	Use	Use	No use	No use	Use	No use
Golden Tee Apartments (3201 Avalon Way Southwest)	Use ^b	Use ^b	Use ^c	Use ^c	Use ^b	No use
Golden Tee Apartments (3211 Avalon Way Southwest)	No use	No use	No use	No use	No use	No use
Chinook Apartments	No use	Use	No use	No use	Use	No use
Residence, 5011 41st Avenue Southwest	No use	No use	No use	No use	Use	No use
Residence, 4426 38th Avenue Southwest	No use	No use	No use	No use	Use	No use
Jim's Shell Service	Use	Use	No use	No use	Use	No use

* As described in the introduction to Chapter 2, Alternatives Considered, at the time the Sound Transit Board identified alternatives for study in the Draft Environmental Impact Statement some alternatives were anticipated to require third-party funding based on early cost estimates. The asterisk identifies these alternatives and the alternatives that would only connect to these alternatives in adjacent segments.

^a Use would only occur when connecting to Option DEL-2b* only. No use would occur with other connectors.

^b Use would only occur when connecting to Preferred Alternative DEL-1a or Alternative DEL-3 in the Delridge Segment. No use would occur with other connectors.

^c Use would only occur when connecting to Preferred Alternative DEL-2a*. No use would occur with other connectors.



4.2.18.3 Avoidance Alternatives

The *Section 4(f) Policy Paper* (United States Department of Transportation 2012) states that, along with the No Build Alternative, potential alternatives to avoid the individual use of a Section 4(f) resource must be considered and may include one or more of the following avoidance categories: location alternatives, alternative actions, alignment shifts, and design changes.

All alternatives in the Duwamish and West Seattle Junction segments would result in the use of at least one Section 4(f) resource, and there is no full-length project avoidance alternative for the West Seattle Link Extension. The Draft Section 4(f) Evaluation in Appendix H includes a discussion of feasible and prudent avoidance alternatives for all the West Seattle Link Extension Build Alternatives that would result in the individual use of a Section 4(f) resource in each segment. Based on the analysis of potential Section 4(f) resource avoidance alternatives, there are no prudent and feasible avoidance alternatives for the West Seattle Link Extension.

The Build Alternatives represent Sound Transit's best attempt to avoid and/or minimize Section 4(f) resources in the densely developed project corridor. The Build Alternatives balance the purpose and need of the project against potential impacts, while providing a range of alternatives for the public to consider and from which FTA and Sound Transit can choose. As design for the WSBLE Project progresses, Sound Transit continues to look for opportunities to reduce project impacts, including impacts on Section 4(f) resources.

Types of Avoidance Alternatives

Location Alternatives: A location alternative refers to rerouting the entire project along a different alignment.

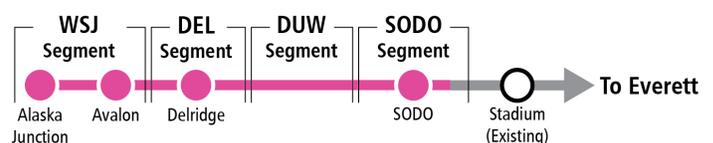
Alternative Actions: An alternative action could be a different mode of transportation, such as rail transit or bus service, or some other action that does not involve construction such as the implementation of transportation management systems or similar measures.

Alignment Shifts: An alignment shift is rerouting a portion of the project to a different alignment to avoid a specific resource. An example of an alignment shift alternative would be redesigning a proposed freeway exit ramp so that it loops around a Section 4(f) resource (such as a park) on a revised alignment footprint rather than intersecting with the park itself as a way of attempting to avoid a Section 4(f) use of the park.

Design Changes: A design change is a modification of the proposed design in a manner that would avoid impacts, such as reducing the planned median width, building a retaining wall, or incorporating design exceptions. To differentiate from the alignment shift alternative while using the previous freeway exit ramp example, a design change alternative would stay in the same proposed exit ramp footprint but would fly over the park (via an elevated structure) as a way of attempting to avoid a Section 4(f) use of the park.

4.2.18.4 Measures to Minimize Harm

Under Section 4(f), after determining there is no feasible and prudent avoidance alternative to the use of land from a Section 4(f) resource that does not meet the temporary occupancy or *de minimis* exceptions, the action must include all possible planning to minimize harm to the property resulting from such use. The Draft Section 4(f) Evaluation in Appendix H includes a detailed discussion of measures to minimize harm. In addition to the mitigation measures for resource impacts identified in Section 4.2.16.6 of the Historic and Archaeological Resources section and Section 4.2.17.6 of the Parks and Recreational Resources section, methods of minimization and avoidance include adjustments to the horizontal alignment, vertical profile, and placement of stations and support facilities. These design adjustments are included in the Build Alternatives that are being evaluated. Typical mitigation measures for visual effects and noise and vibration impacts that could apply to both parks and historic resources are described in



Sections 3.5.1 and 3.5.2 of Appendix H. Section 3.5.3, Parks and Recreation Measures to Minimize Harm, describes measures to minimize harm specific to parks, and Section 3.5.4, Historic Resources Measures to Minimize Harm, describes measures specific to historic resources.

4.2.18.4.1 Parks and Recreation Facilities Measures to Minimize Harm

According to City of Seattle Ordinance 118477, any City park land permanently acquired by the project must be replaced with land of equivalent or better size, value, location, and usefulness. Sound Transit would coordinate with Seattle Parks and Recreation to find suitable replacement property for acquired park land and displaced parks. Appendix H, Draft Section 4(f) Evaluation, summarizes the resource-specific measures to minimize harm to Section 4(f) park resources. Mitigation for all park and recreational resources is described in Section 4.2.17.6, Mitigation Measures, of the Parks and Recreational Resources section.

4.2.18.4.2 Historic Resources Measures to Minimize Harm

Sound Transit has made design changes during the design process for the project alternatives and will continue to do so throughout project design to minimize impacts on historic properties. Measures to minimize or mitigate harm to Section 4(f) historic resources, beyond the design measures already included in the project, are not known at this time as Sound Transit and FTA continue to consult with the State Historic Preservation Officer, Tribes, and other consulting parties. These measures will be coordinated with the Washington State Department of Archaeology and Historic Preservation, local jurisdictions, and interested parties. They will also be memorialized in the Section 106 memorandum of agreement or programmatic agreement for this project, consistent with Section 106 of the National Historic Preservation Act.

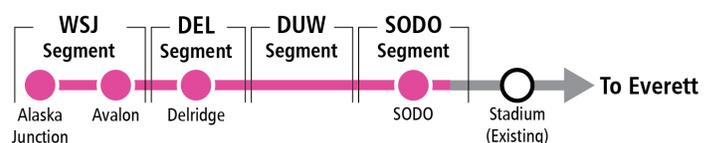
The specific mitigation measures for each affected historic resource will be developed in consultation with the State Historic Preservation Officer, Tribes, and other consulting parties under Section 106. Typical mitigation measures for impacts to historic resources are found in Section 4.2.16.6, Mitigation, of the Historic and Archaeological Resources section.

Designated Seattle landmarks and districts that would be directly modified would be subject to review and issuance of a certificate of approval from the Landmarks Board and/or District Review Boards.

4.2.18.5 Least Harm Analysis

When there is no feasible and prudent avoidance alternative, FTA may approve only the alternative(s) that cause the least overall harm based on an assessment of the seven factors listed in Code of Federal Regulations Title 23 Section 774.3(c)(1):

- 1) The ability of the alternative to mitigate adverse impacts to each Section 4(f) property (including any measures that result in benefits to the property).
- 2) The relative severity of the remaining harm, after mitigation, to the protected activities, attributes, or features that qualify each Section 4(f) property for protection.
- 3) The relative significance of each Section 4(f) property.
- 4) The views of the official(s) with jurisdiction over each Section 4(f) property.
- 5) The degree to which each alternative meets the purpose and need for the project.



- 6) After reasonable mitigation, the magnitude of any adverse impacts to resources not protected by Section 4(f).
- 7) Substantial differences in costs among the alternatives.

Following public review of and comment on the WSBLE Draft Environmental Impact Statement and the potential impacts of proposed alternatives (which includes Appendix H, Draft Section 4(f) Evaluation), continued consultation with officials having jurisdiction on the proposed *de minimis* findings after public comment is received, and consultation regarding adverse effects on historic resources with the State Historic Preservation Office and consulting parties, Sound Transit will prepare a Least Harm Analysis to be included in the Final Section 4(f) Evaluation, which will be prepared in conjunction with the Final Environmental Impact Statement for this project.

