2 ALTERNATIVES CONSIDERED

This chapter describes the alternatives defined and evaluated for the West Seattle Link Extension Project (the project). It explains how the alternatives were developed for the Final Environmental Impact Statement (EIS), and it summarizes the alternatives eliminated from further consideration. This chapter is organized into the following sections:

- 2.1 Build Alternatives
- 2.2 No Build Alternative
- 2.3 Operations and Maintenance
- 2.4 Minimum Operable Segment
- 2.5 Alternatives Development and Scoping
- 2.6 Refined Alternatives and Options for the Final EIS
- 2.7 Construction Approach
- 2.8 Environmental Practices and Commitments
- 2.9 Project Funding and Cost Comparison

The project purpose and need described in Chapter 1, Purpose and Need for West Seattle Link Extension, served as the basis for developing the project alternatives. Prior to the Draft EIS, Sound Transit conducted an Alternatives Development process to define and evaluate a wide range of alternatives. The Sound Transit Board of Directors (Board) then identified alternatives for study in the Draft EIS in May and October 2019 (refer to Section 2.5.3, Alternatives Carried Forward for Evaluation in the Draft EIS).

Definitions

Preferred Alternative: A statement of preference for alternatives based on currently available information. It is not a decision on the project to build.

Other Alternatives: Alternatives or options that are not identified by the Board as preferred.

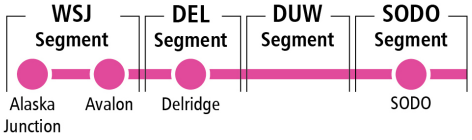
Design Option: An alternate location for a station area or an alternative route along a portion of an alternative.

In 2022, after publication of the Draft EIS and review of comments from Tribes, Tribal organizations, agencies, and individuals, the Board modified the Preferred Alternative and identified additional refinements and a cost-savings concept to study in the Final EIS (refer to Section 2.1.1, Sound Transit Board Direction on Modified EIS Alternatives).

The Final EIS evaluates multiple Build Alternatives in the project corridor, including different design options for alignments and stations. The Final EIS also evaluates a No Build Alternative. This allows an analysis of the potential impacts of not building the project and provides a basis for comparing the Build Alternatives to a future baseline condition.

The Board will not make a final decision on the project to be built until after completion of the Final EIS. At that time, the Board can select from any of the alternatives or design options in the EIS.

Cost estimates reflect increased project costs due to steeply rising real estate prices and other construction expenses, and costs resulting from more advanced design that provides a better understanding of project scope and mitigation. To ensure that funding remains available to complete all voter-approved projects, the Board conducted a “realignment” process in 2021 that established a schedule that is affordable, utilizing current financial projections and cost estimates to set the general order in which projects will advance. This “affordable” schedule established an approach to prioritize, fund, and manage program work over time (Resolution 2021-05). In addition, the Board adopted a “target” schedule as close to the Sound Transit 3 Plan schedules as possible for priority projects, reliant upon reductions in the affordability gap.



To reduce the affordability gap, Sound Transit will pursue expanded financial capacity (Motion M2020-37); develop and implement a cost-savings plan; identify cost savings for the Sound Transit budget outside of the capital program; identify opportunities to reduce cost and planning delays; and engage project stakeholders in discussions to address the trade-offs between project scope, schedule, and new financial resources to inform Board decision-making on project schedule.

Based on realignment, the West Seattle Link Extension would begin operations in 2032 under both the affordable and the target schedule. The affordable schedule could implement the West Seattle Minimum Operable Segment (M.O.S.), as described in Section 2.4, Minimum Operable Segment.

When the Sound Transit Board identified alternatives for study in the Draft EIS, early cost estimates indicated that alternatives with a tunnel in West Seattle could have required additional funding; that is, funding beyond what was assumed in the Sound Transit 3 financing plan. Additional funding for these alternatives would have needed to come from contributions from partner agencies outside of Sound Transit, such as the City of Seattle or others. The alternatives that were anticipated to require "third-party" funding were identified with an asterisk (*) throughout the Draft EIS. Since publication of the Draft EIS, more specific cost estimates were reviewed by Sound Transit. Due to the rising price of real estate, tunnel alternatives would not necessarily cost more than elevated alternatives. However, based on current cost estimates and revenue projections, the preferred alternatives for the West Seattle Link Extension are anticipated to exceed the assumptions in the realigned financial plan.

Sound Transit, City of Seattle, and King County acknowledge there may be shared responsibility to address the additional cost difference between the final project to be built and the realigned financial plan through either additional funding or cost-savings opportunities. As described in Motion 2023-52, the City of Seattle and King County provided letters to Sound Transit on March 23, 2023 indicating their intent to work with Sound Transit to further analyze costs and funding sources over the next year and develop a funding agreement in advance of the Board action to select a project to be built. As a result of these developments, the asterisk indicating third-party funding has been removed from alternative names in this Final EIS.

2.1 Build Alternatives

This section describes the Build Alternatives and design options for the West Seattle Link Extension.

The West Seattle Link Extension would start service in 2032, initially providing service between an Alaska Junction Station and a new SODO Station. In 2039, as part of the Ballard Link Extension, which will be constructed with a new downtown tunnel, the West Seattle Link Extension will be connected to the existing downtown tunnel north of the new SODO Station, with service continuing north to the University of Washington, Northgate, Lynnwood (2024), and Everett (2037 to 2041) (Figure 2-1). The Ballard Link Extension, previously evaluated within the West Seattle and Ballard Link Extensions Draft EIS, will undergo separate environmental review as described in Chapter 1. Riders on the West Seattle to Everett Link light rail line would have a direct connection through Downtown Seattle between Everett and West Seattle, and this line would become the 3 Line. From the 3 Line, riders could transfer at either the Westlake or SODO stations to the 1 Line between Ballard and Tacoma or transfer at International District/Chinatown Station to the 2 Line between Mariner and Redmond.

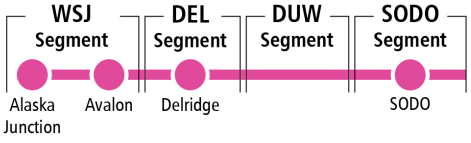
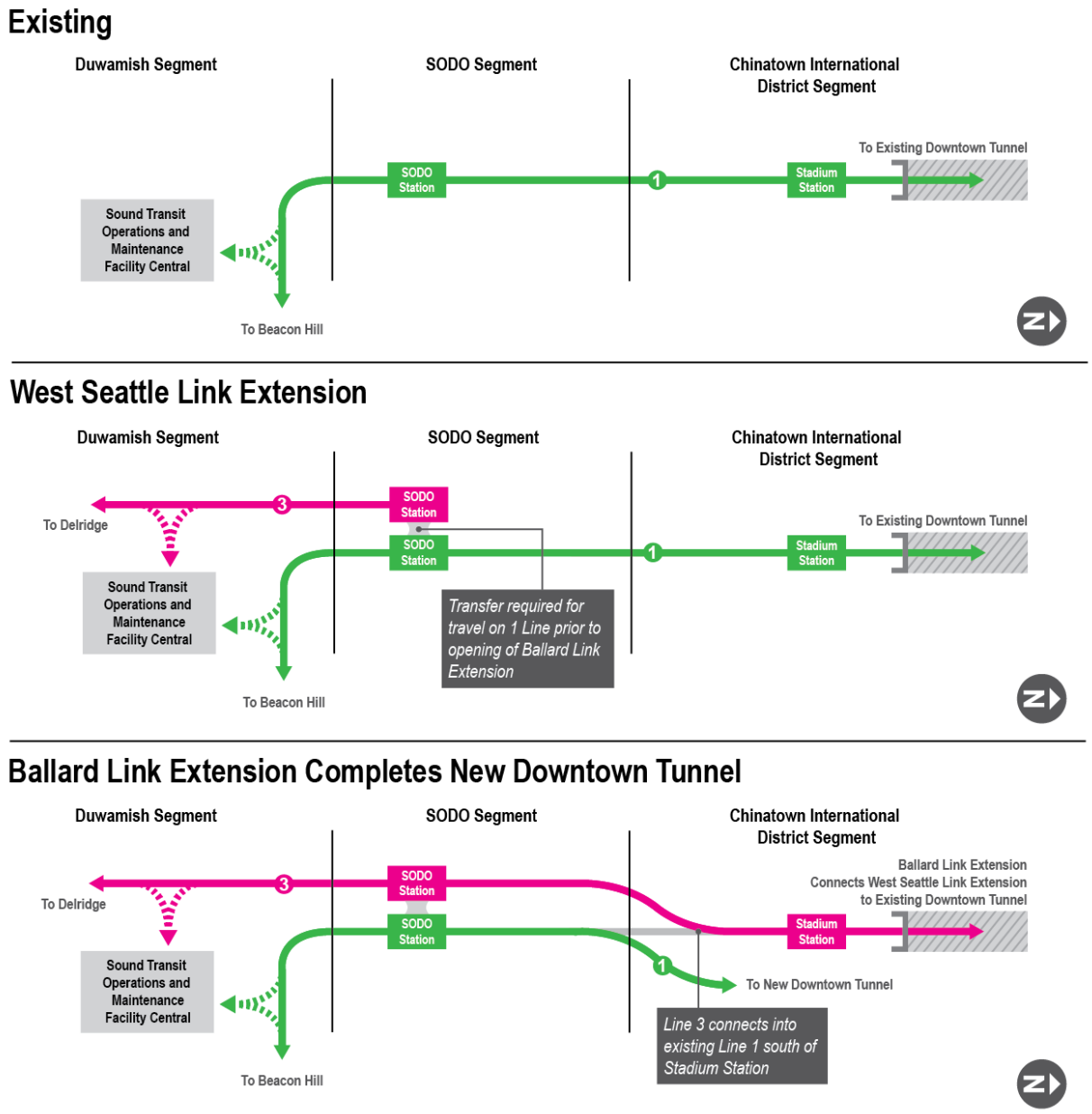
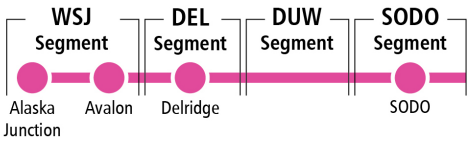


Figure 2-1. Connecting West Seattle Link Extension to Regional Light Rail





2.1.1 Sound Transit Board Direction on Modified EIS Alternatives

In 2022, after publication of the Draft EIS and review of Tribal, Tribal organization, agency, and public comments, including those that suggested new or modified alternatives, the Sound Transit Board confirmed or modified the Preferred Alternative to be studied in the Final EIS and directed staff to study refinements (Motion M2022-57). The refinements to be studied were intended to enhance station access, prioritize an integrated and well-designed transfer experience from buses to light rail, and address concerns over potential displacements of organizations serving low-income populations and communities of color. Specific direction from the Board included:

- In the West Seattle Junction Segment, explore option to shift a station entrance to 42nd Avenue Southwest at the Alaska Junction Station.
- In the Delridge Segment, explore opportunities to provide access north and south of Andover Street at the Delridge Station including a pedestrian bridge across Andover Street or shifting the alignment south towards Southwest Yancy Street west of the station.
- In the SODO Segment, explore opportunities to enhance access from the platform to South Lander Street at the SODO Station.

The Board directed staff to further study the following potential cost-savings concept:

- In the West Seattle Junction Segment, eliminate the Avalon Station.

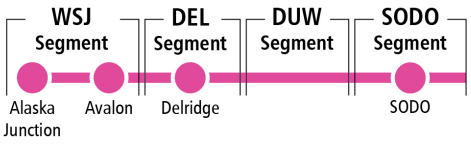
Based on this Board direction, alternatives and design options refining some of the alternatives evaluated in the Draft EIS were added for study in the Final EIS. In the West Seattle Junction Segment, Preferred Option WSJ-5b was added as a refinement to Draft EIS Alternative WSJ-5 (now Alternative WSJ-5a) to shift the Alaska Junction Station entrance closer to 42nd Avenue Southwest. In the Delridge Segment, Preferred Option DEL-6b was added as a refinement to Draft EIS Alternative DEL-6 (now Alternative DEL-6a) to provide better access opportunities and minimize displacements associated with a behavioral health facility. Preferred Option SODO-1c, was added as a refinement to Draft EIS Alternative SODO-1a to enhance access from South Lander Street. Alternatives DEL-7 and WSJ-6 were added to eliminate the Avalon Station for consideration as a cost-savings measure.

In Motion M2022-57, the Board identified a preference for Alternative SODO-1a with the staggered station configuration. Therefore, the staggered station configuration was incorporated into the SODO-1a Alternative.

2.1.2 Components of Build Alternatives

This section describes the general components common to the Build Alternatives and design options and describes the alignments and the stations associated with each alternative and option.

The light rail would operate on a fixed guideway in exclusive right-of-way, outside of traffic, to maintain reliable operations and provide the fast and frequent service needed to serve the project corridor. Trains would arrive as frequently as every 6 minutes and travel at speeds of up to 55 miles per hour (see Table 2-2 in Section 2.3, Operations and Maintenance, for the operating plan). The guideway right-of-way would generally be 30 to 40 feet wide, with two sets of tracks. This includes room for the poles that support the overhead catenary system, the contact wires needed to power the trains. Many sections would be wider approaching stations



that have platforms in the center, to allow emergency access and to accommodate walls or barriers to restrict unauthorized access. The guideway would be in or adjacent to existing transportation rights-of-way where possible when it is above ground. However, because light rail vehicles are limited to grades below 6 percent and cannot make sharp turns without reducing speeds, the proposed alignments deviate from transportation corridors in some locations. Emergency access points would also be at stations. In addition to the space required (described above), above-ground guideway would require driplines or branches no closer than 15 feet from the overhead catenary system. Depending on the profile type and site conditions, the width of this zone might vary. Sound Transit could allow low shrubs and groundcover within this zone.

2.1.2.1 Profiles

Light rail has four main profile types: elevated, at-grade, retained-cut, and tunnel.

2.1.2.1.1 Elevated

Sound Transit uses elevated structures to cross over geographic or physical barriers and in areas of varying topography. An elevated guideway must have a minimum clearance of at least 16.5 feet over roadways and 23.5 feet over railways, but topography and other considerations can result in higher profiles. An elevated guideway can travel within road rights-of-way or in off-street corridors.

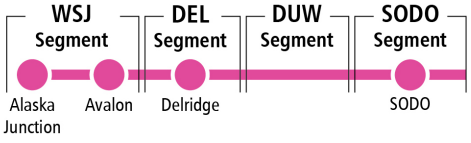
Pier supports holding up the guideway are typically about 10 feet by 10 feet square at the ground, although the underground support structure might be wider, depending on design and site conditions. Piers can be single guideway columns, side-by-side double guideway columns, or straddle bents. Typical types of elevated profiles are shown on Figure 2-2.

A straddle bent is a structure that spans a roadway or another structure either partially or completely. Where straddle bents span a roadway completely, guideway columns are on each side, so a conventional pier is not required in the middle of a roadway. Guideway columns include the pier, pile cap, and the drilled shaft.

Bridges are a specific type of elevated structure used where slopes are steep (more than 5 to 6 percent) and physical barriers must be crossed. Bridges are typically used to cross large waterways and highways. Bridge height depends on the surrounding topography and the required clearances underneath. A bridge over navigable waterways must have vertical and horizontal clearance sufficient to meet the navigational requirements of the waterway as determined by the United States Coast Guard. The type of bridge and support structure is determined by the required carrying load of the bridge, operational requirements, and environmental conditions such as geotechnical conditions, wind, and water flow. Depending on the type of bridge, piers might be required in the water to support the structure but would be outside navigation channels.

2.1.2.1.2 At-Grade

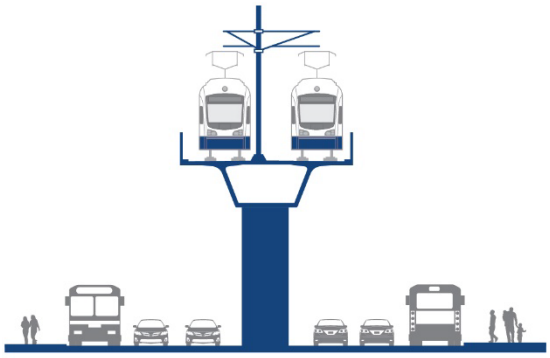
“At-grade” means that the rail track is at the same grade (ground level) as the surrounding terrain. At-grade light rail operates best in areas with less than 6 percent grade and in areas with adequate space within reserved street rights-of-way or off-street corridors. No new at-grade crossings of roadways are proposed. Transitions between at-grade and elevated profiles are typically compacted fill between retaining walls. An at-grade profile is shown on Figure 2-2.



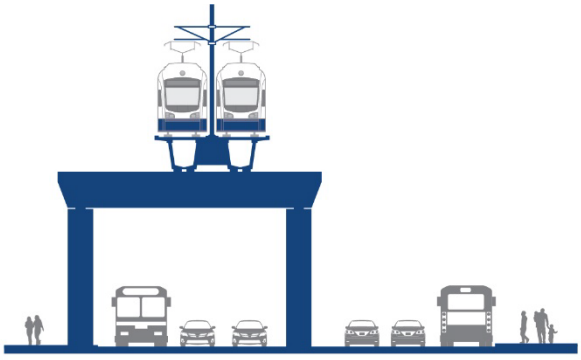
2.1.2.1.3 Retained-Cut

With a retained-cut profile, the trackway is cut into the ground with a retaining wall on one or both sides (Figure 2-2). Portions of the guideway would include retained-cut profiles due to topography.

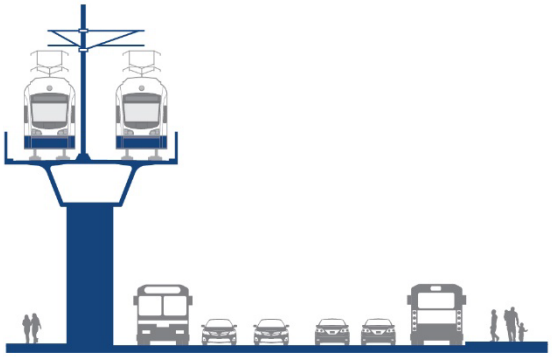
Figure 2-2. Typical Elevated, At-Grade, and Retained-Cut Guideway



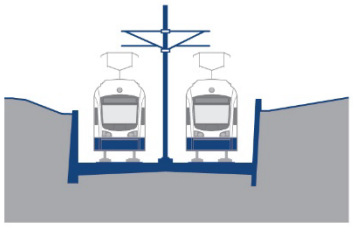
Elevated Guideway (Single Column) in Road Right-of-Way



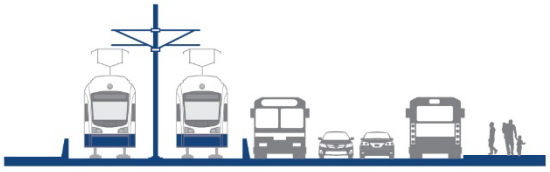
Elevated Guideway (Straddle Bent) over Road Right-of-Way



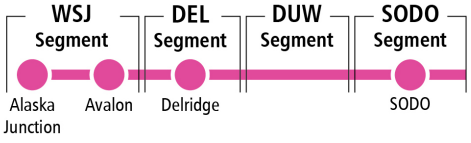
Elevated Guideway Adjacent to Road Right-of-Way



Retained-Cut Guideway



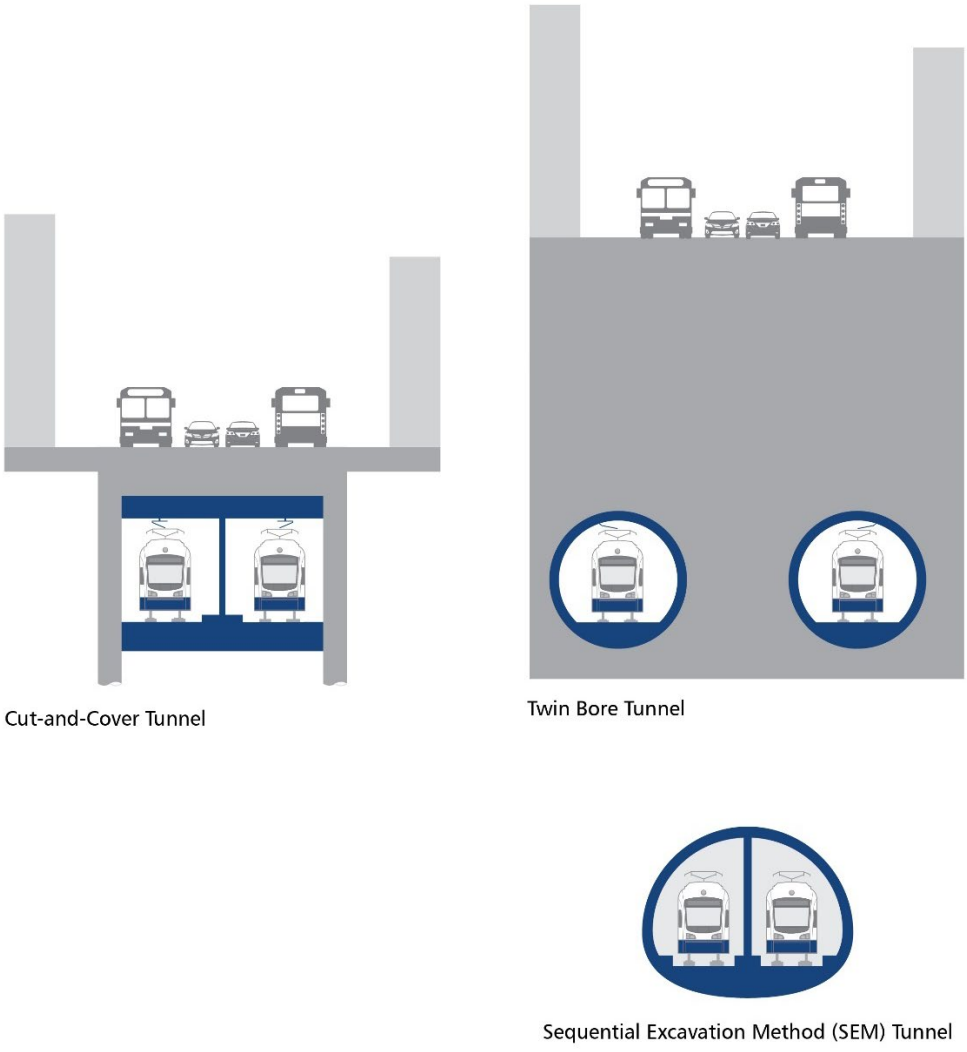
At-Grade Guideway

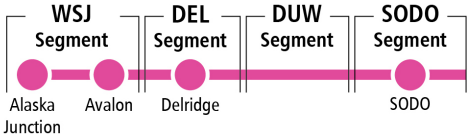


2.1.2.1.4 Tunnel

Sound Transit uses tunnels where existing topography contains steep slopes (more than 5 to 6 percent), physical barriers must be crossed, right-of-way is inadequate for at-grade or elevated profiles, and/or the density of development is high. The two most common tunnel construction methods are cut-and-cover and mined tunnels. Cut-and-cover construction is excavated from the surface, while mined tunnels are constructed with limited surface disturbance beyond entering and exiting the tunnel at portals and entrances for stations. Mined tunnels can be constructed with a tunnel boring machine or sequential excavation mining technique. Tunnels can be constructed as twin tunnels or one large tunnel. Cut-and-cover and mined tunnel cross sections are shown on Figure 2-3.

Figure 2-3. Typical Cut-and-Cover and Mined Tunnel Sections





2.1.2.2 Stations

The project includes three to four new light rail stations. The stations would be elevated, at-grade, in a retained cut, or in a tunnel, depending on the site conditions, guideway profile, and the engineering requirements of the guideway.

Boarding Platforms

Boarding platforms would be about 380 feet long and would serve four-car trains. At stations with center platforms, the platform would be between the two tracks. While most project alternatives assume center platform stations, side platforms could be used in some locations based on final design. At side platform stations, the two tracks would have station platforms on either side. Escalators, elevators, and stairs would provide access to the elevated, retained-cut, or tunnel platforms.

Figure 2-4 shows the various station types. All stations would meet Americans with Disabilities Act, public access, fire code, and safety requirements. Sound Transit operates its own security force at its facilities. This includes Sound Transit-contracted transit security officers, station agents, and contracted law enforcement officers who function as transit police. Security personnel and/or station agents are stationed at some facilities throughout the day, and some roam and patrol transit facilities and respond to incidents in coordination with Sound Transit police and local law enforcement. Transit security officers and fare ambassadors provide security on board trains. Most station areas would accommodate a traction power substation and/or a signal bungalow (see Section 2.1.2.3, Other Facilities and Structures). They would also include ticket vending machines, closed-circuit television cameras, a public address system, emergency phones, and variable-message signage.

Link riders could access stations by bus transit, light rail at SODO Station, automobile drop-off/pick-up, bicycle, and walking. Sound Transit and King County Metro Transit (Metro) routes would provide service as described in the Transportation Technical Report in Appendix N.1. All stations would have paratransit stops and accessible stops for riders with disabilities. Each station would include bus stops on adjacent streets for riders to transfer to or from buses. Depending on the projected level of future bus service, some stations would have bus layover on adjacent streets or dedicated facilities for bus layover within the station area. Paratransit and bus facilities at stations were developed in coordination with Metro and will continue to evolve during the station planning process. Sound Transit could make, or partner with other local agencies, on road improvements (such as sidewalks, bike lanes, or widening) or road realignments at some stations.

Stations in this Final EIS are based on conceptual (10 percent) design. Stations are designed to have a Sound Transit system identity and a neighborhood identity to make it easy for all users to navigate and to be identifiable as a transit station. Sound Transit and the City of Seattle will continue to hold station planning meetings through final design to incorporate neighborhood identity in station design. Stations will also undergo City of Seattle design review.

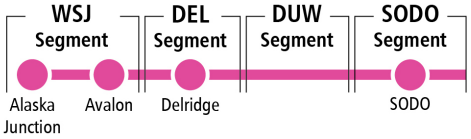
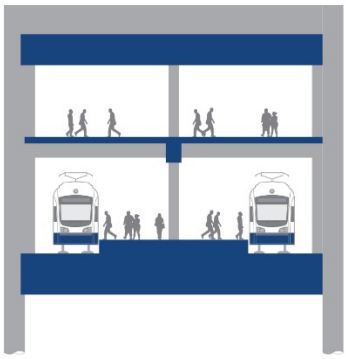
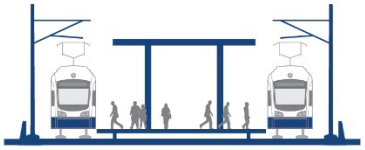


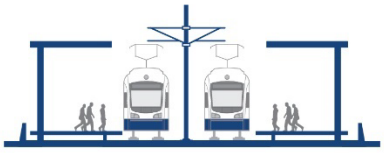
Figure 2-4. Typical Stations – Elevated, At-Grade, Retained-Cut, and Tunnel



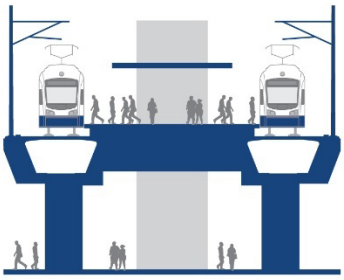
Cut-and-Cover Tunnel Center-Platform Station



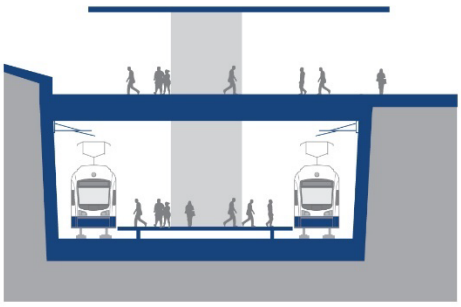
At-Grade Center-Platform Station



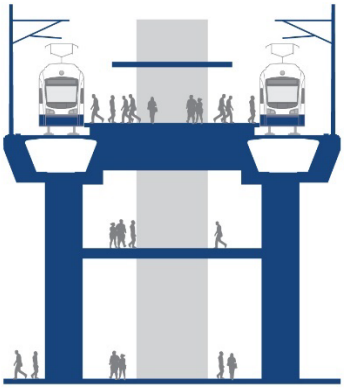
At-Grade Side-Platform Station



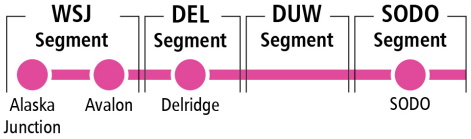
Elevated Center-Platform Station



Retained-Cut Center-Platform Station with Lid



Elevated Center-Platform Mezzanine Station



Private vehicle parking for riders would not be provided by Sound Transit at stations. Each station would have a dedicated bicycle storage area.

Where appropriate, Sound Transit would facilitate transit-oriented development (TOD) with the City of Seattle and potential development partners in accordance with Sound Transit's Equitable Transit Oriented Development Policy (Resolution R2018-10). TOD is discussed further in Section 4.2.6, Indirect Impacts of the Build Alternatives.

Equitable Transit-Oriented Development

Sound Transit's Equitable Transit Oriented Development Policy (Resolution R2018-10) directs Sound Transit to consider TOD potential in the planning, design, and delivery of its transit projects, including identifying agency and community TOD opportunities and strategies as well as opportunities for partnerships with public and private interests. TOD in station areas could include joint development of station facilities with residential and/or commercial structures by others, or redevelopment of property surplus to the project's need when construction is complete.

2.1.2.3 Other Facilities and Structures

The project would require other facilities and structures described in this section and shown in conceptual design drawings included in Appendix J, Conceptual Design Drawings. Specific locations of these facilities and structures could be modified during final design based on project needs.

2.1.2.3.1 Overhead Catenary System

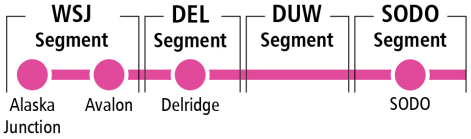
The overhead catenary system delivers the electricity that powers the light rail vehicles. It supplies two wires for each track, supported on 15- to 23-foot-high steel poles about 150 to 200 feet apart (Figure 2-5). Poles may be as close as 50 feet apart where the guideway curves. The poles are typically between the two tracks.

Figure 2-5. Typical Overhead Catenary System

2.1.2.3.2 Traction Power Substation

Traction power substations boost the power to the overhead catenary system. The traction power substations are metal buildings about 20 feet wide by 60 feet long, with an additional 10 to 20 feet of clearance required around each unit, screened by a wall or security fence (Figure 2-6). Traction power substations would typically be at light rail stations, but they are also needed along the guideway approximately every 1 to 1.25 miles. They would likely be placed in the footprint of the station or beneath the guideway; however, some traction power substations may be outside but a short distance from these areas.

Figure 2-6. Typical Traction Power Substation



2.1.2.3.3 Signal Bungalows

Signal bungalows contain signal system equipment and provide power to track switch machines and track circuits for train speed control and separation.

They can be a separate prefabricated structure or a room integrated within a station building. Standalone signal bungalows are about 32 feet long by 10 feet wide and include parking and security fencing (Figure 2-7).

Figure 2-7. Signal Bungalow

2.1.2.3.4 Special Trackwork

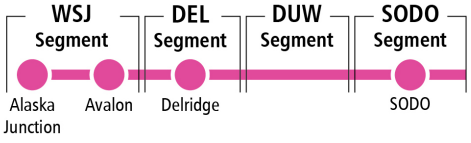
Special trackwork, including crossovers, pocket tracks, and tail tracks, is used along alignments to serve special purposes as described below.

Crossover tracks connect two parallel tracks and allow trains to change from one track to the other (Figure 2-8). The project would include crossovers in various locations to allow for maintenance that requires removing one track from service, to bypass a stalled train, to reverse direction, or to operate in the event of emergencies or blockages. Crossover tracks require special signaling control equipment under or adjacent to the guideway.

Figure 2-8. Crossover Tracks

Tail tracks extend past a terminus station for the temporary layover of one four-car train—typically 500 feet beyond the end of the station platform (Figure 2-9). The tail tracks may be longer if they include crossover tracks, which are required to allow trains to switch tracks at the terminus station. Crossover tracks may be either before or after the station platform. Tail tracks would be included at terminus stations, including the M.O.S.

Figure 2-9. Tail Tracks



2.1.2.3.5 Hi-Rail Access and Maintenance Roads

Hi-rail vehicles used for track inspection and maintenance (Figure 2-10) can operate on both rail tracks and conventional roads. Hi-rail vehicle access would be provided in various locations along the project corridor, generally where the guideway would be close to or at-grade to enable a connection from a maintenance access road onto the rail tracks. However, there are some instances where the length of elevated track would require a hi-rail access to the elevated guideway. In these cases, a hi-rail access road would start at-grade and transition to an elevated profile (on retained fill or guideway columns) to reach the height of the guideway. General maintenance roads (not specific to hi-rail access) would also be provided to allow for maintenance of other elements of the project (such as bridge structures and retaining walls). The maintenance roads would be accessed from public street right-of-way.

Figure 2-10. Hi-Rail Vehicle

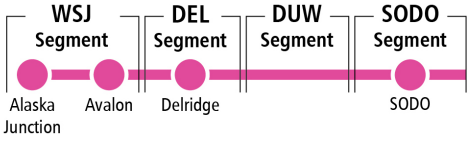
2.1.2.3.6 Tunnel Vents

Ventilation structures provide ventilation and climate control for alternatives and design options that are in a tunnel or are lidded (Figure 2-11). They include a set of ventilation shafts, typically at or close to stations. The surface building enclosing the shaft would include an exhaust and intake in the roof, a fan room, and space for electrical and communications equipment. These may be integrated with the structures for station access from the surface. Ventilation could also be provided at the tunnel portals by large fans housed in a building. Ventilation fans are typically designed for use during tunnel or underground station emergencies and are occasionally tested for operations and maintenance purposes.

Figure 2-11. Ventilation Structure

2.1.2.3.7 Stormwater Facilities

Stormwater facilities for the project would include flow-control and water quality treatment facilities, as necessary. Stormwater vaults consist of concrete boxes sited below ground level, with access covers or grates at the surface. Stormwater vaults would be provided in areas of roadway improvements, near the guideway, and at stations.



2.1.2.3.8 Designing for Climate Change Resilience

In order to design the project for resilience to increased localized flood risk and sea level rise due to climate change, Sound Transit developed a technical memorandum to support the agency's climate change planning and adaptation efforts, *Projected Changes in Key Drivers of Climate Change for the Puget Sound Region: an Updated Overview* (2022). Sound Transit is also assessing how flood risk and sea level rise may affect resilience of proposed designs and design standards for the project alternatives. By assessing climate-related changes and vulnerabilities in the project planning stages, Sound Transit can prepare for them and include adaptation measures to support resilient infrastructure and operations. Examples of potential adaptations include installing sensors to monitor track temperature, including air conditioning or shading around signal boxes, and raising ground level infrastructure in flood prone areas.

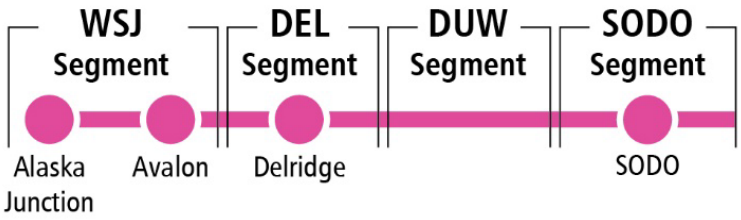
Numbering Project Alternatives and Design Options

Project alternatives are designated by segment. The West Seattle Link Extension has four segments and corresponding abbreviations: SODO (SODO), Duwamish (DUW), Delridge (DEL), and West Seattle Junction (WSJ). Each alternative is designated by segment, name, and number, which describe the location and nature of the alternative. Some alternatives have design options and use the letter "a" to identify the alternative and the letter "b" to identify the design option. For example, the At-Grade Alternative (SODO-1a) is the alternative, and the At-Grade South Station Option (SODO-1b) and Preferred At-Grade Lander Access Station Option (SODO-1c) are the design options for that alternative. The project includes design options for alignments and stations. An alignment option refers to a different profile or location of a portion of the alternative. Station options include alternative locations for stations, but the options for a station generally would have the same station characteristics and serve the same population. This chapter distinguishes between alternatives and design options, but other chapters of the Final EIS use the general term "alternatives" which includes alternatives and design options unless referring to a specific alternative or option.

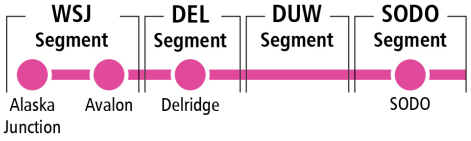
2.1.3 Build Alternatives and Design Options

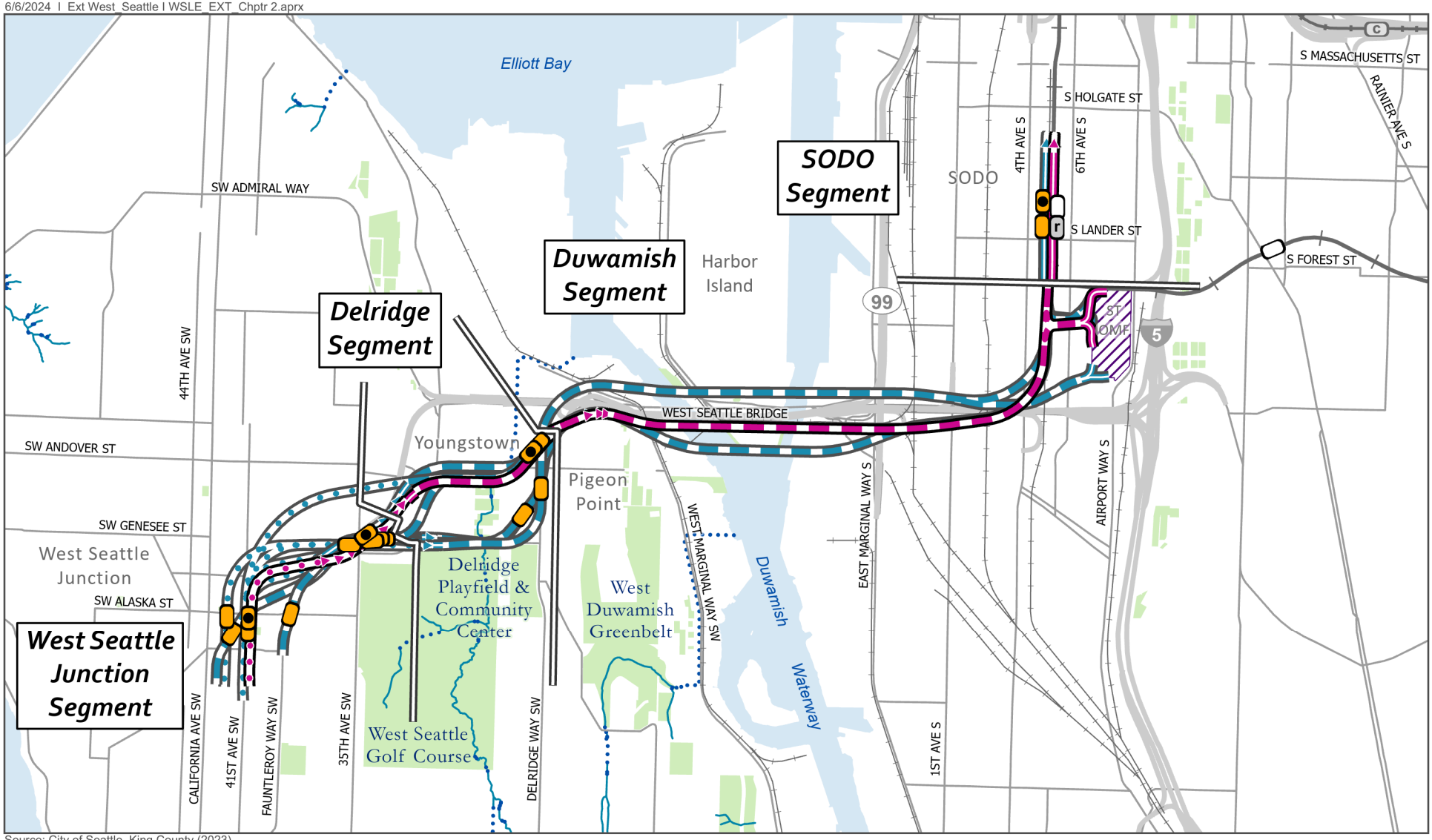
This section describes the Build Alternatives and design options for the project. The project is broken into smaller geographic areas called segments. The West Seattle Link Extension has four segments (SODO, Duwamish, Delridge, and West Seattle Junction) (Figures 2-12 and 2-13).

Figure 2-12. West Seattle Link Extension Segments and Stations



There are two categories of Build Alternatives and design options: preferred alternatives and other alternatives. The Build Alternatives are shown in the conceptual design drawings included in Appendix J; however, it is important to note that alternatives and options could be modified during final design based on project needs.





Source: City of Seattle, King County (2023).

Preferred Alternative
- Elevated
- Tunnel
- At-Grade
- Retained Cut

Other Alternatives
- Elevated
- Tunnel
- At-Grade
- Retained Cut

Station (● *Indicates Preferred Alternative*)
- New
- Relocated
- 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

0 0.5 1 Mile

N

FIGURE 2-12
Alternatives

West Seattle Link Extension

The West Seattle Link Extension would temporarily terminate at a new SODO Station and would include tail tracks north of SODO Station (south of South Holgate Street). In 2039, the Ballard Link Extension would permanently connect the West Seattle Link Extension tail tracks to the existing Central Link light rail line through the existing Downtown Seattle Transit Tunnel continuing north to Everett, which would open in 2037 (2037 to southwest Everett and 2041 to Everett full build under the realignment affordable schedule). The West Seattle Link Extension would begin south of South Holgate Street and north of a new SODO Station that would allow for transfers with the existing SODO Station on the existing light rail line. Before the Ballard Link Extension is constructed, to travel north or south of SODO on light rail, riders would need to disembark at the SODO Station and transfer to the existing Link line.

The West Seattle Link Extension would travel south from the SODO Station across South Lander Street either at-grade or on an elevated guideway and would continue south from south of South Lander Street toward South Spokane Street on an elevated guideway. In the vicinity of South Spokane Street, it would turn west on an elevated guideway either on the north or south side of the West Seattle Bridge, where it would cross the Duwamish Waterway (also known as the Duwamish River) on a light-rail-only, high-level fixed bridge structure. On the west side of the Duwamish Waterway, the guideway would be mostly elevated to the west side of the Delridge valley. In the West Seattle Junction area, the guideway could be elevated or below ground. Up to three stations would be constructed in West Seattle: Delridge, Avalon, and Alaska Junction. The Delridge Station would be elevated, and the Avalon and Alaska Junction stations could be elevated or below ground. There is one alternative in West Seattle that does not include the Avalon Station. This alternative was added for study at the direction of the Sound Transit Board as a potential cost-savings measure (Motion M2022-57).

The project corridor is shown on Figure 1-1 in Chapter 1. The following sections describe the preferred alternatives and the other alternatives for the extension by segment. The West Seattle Link Extension has a total of 16 alternatives (several of which have design options). Table 2-1 summarizes the alternatives and design options and the possible connections between the alternatives and options in each segment. Not all alternatives and options can connect to every alternative and option in adjacent segments due to variations in alignment and profile. In Table 2-1 and the figures in this section showing the alternatives and design options, the pink color is for preferred alternatives and options and the blue color for other alternatives and options. The alternatives and options are shown in the conceptual design drawings included in Appendix J.

2.1.3.1 SODO Segment

The SODO Segment includes the area between approximately South Massachusetts Street and South Forest Street in the SODO neighborhood. There is an existing SODO light rail station, and a new SODO station is the only station proposed in this segment. The new SODO Station would provide a transfer point to/from the 1 Line (future Ballard to Tacoma light rail line) via the existing SODO Station, and the two stations would therefore function as one SODO Station. One alternative and one design option include the relocation of the existing SODO Station as explained under the descriptions below. The SODO Segment alternatives and design options are shown on Figure 2-14. All SODO alternatives include relocation of 230-kilovolt power line from the SODO Busway to 6th Avenue South between South Massachusetts Street and the Duwamish Segment boundary at South Forest Street.

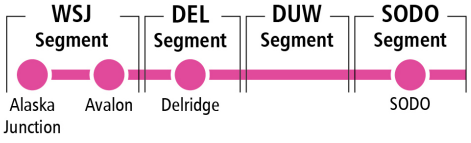
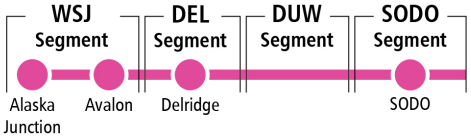


Table 2-1. Summary of West Seattle Link Extension Alternatives and Design Options Evaluated in the Final EIS

Segment	Alternative or Design Option	Abbreviation	Stations (and Station Profile)	Connections
SODO	**Preferred At-Grade Lander Access Station Option**	**SODO-1c**	**SODO (At-Grade)**	**All DUW Segment alternatives.**
	At-Grade Alternative	SODO-1a	SODO (At-Grade)	All DUW Segment alternatives.
	At-Grade South Station Option	SODO-1b	SODO (At-Grade)	All DUW Segment alternatives.
	Mixed Profile Alternative	SODO-2	SODO (Elevated)	All DUW Segment alternatives.
Duwamish (DUW)	**Preferred South Crossing Alternative**	**DUW-1a**	**None**	**All SODO Segment alternatives. All DEL Segment alternatives.**
	South Crossing South Edge Crossing Alignment Option	DUW-1b	None	All SODO Segment alternatives. All DEL Segment alternatives.
	North Crossing Alternative	DUW-2	None	All SODO Segment alternatives. All DEL Segment alternatives.
Delridge (DEL)	**Preferred Andover Street Station Lower Height South Alignment Option**	**DEL-6b**	**Delridge (Elevated)**	**All DUW Segment alternatives. Connects to WSJ-5a and WSJ-5b.**
	Dakota Street Station Alternative	DEL-1a	Delridge (Elevated)	All DUW Segment alternatives. Connects to WSJ-1, WSJ-2, and WSJ-4.
	Dakota Street Station North Alignment Option	DEL-1b	Delridge (Elevated)	All DUW Segment alternatives. Connects to WSJ-1, WSJ-2, and WSJ-4.
	Dakota Street Station Lower Height Alternative	DEL-2a	Delridge (Elevated)	All DUW Segment alternatives. Connects to WSJ-3a and WSJ-3b.
	Dakota Street Station Lower Height North Alignment Option	DEL-2b	Delridge (Elevated)	All DUW Segment alternatives. Connects to WSJ-3a and WSJ-3b.
	Delridge Way Station Alternative	DEL-3	Delridge (Elevated)	All DUW Segment alternatives. Connects to WSJ-1, WSJ-2, and WSJ-4.
	Delridge Way Station Lower Height Alternative	DEL-4	Delridge (Elevated)	All DUW Segment alternatives. Connects to WSJ-3a and WSJ-3b.
	Andover Street Station Alternative	DEL-5	Delridge (Elevated)	All DUW Segment alternatives. Connects to WSJ-1, WSJ-2, and WSJ-4.
	Andover Street Station Lower Height Alternative	DEL-6a	Delridge (Elevated)	All DUW Segment alternatives. Connects to WSJ-5a and WSJ-5b.
	Andover Street Station Lower Height No Avalon Station Tunnel Connection Alternative	DEL-7	Delridge (Elevated)	All DUW Segment alternatives. Connects to WSJ-6.



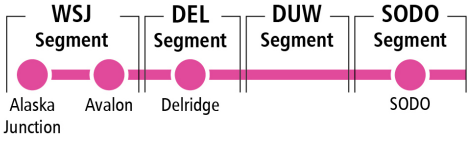
Segment	Alternative or Design Option	Abbreviation	Stations (and Station Profile)	Connections
West Seattle Junction (WSJ)	**Preferred Medium Tunnel 41st Avenue Station West Entrance Station Option**	**WSJ-5b**	**Avalon (Retained-Cut), Alaska Junction (Tunnel)**	**Connects to DEL-6a, DEL-6b.**
	Elevated 41st/42nd Avenue Station Alternative	WSJ-1	Avalon (Elevated), Alaska Junction (Elevated)	Connects to DEL-1a, DEL-1b, DEL-3, and DEL-5.
	Elevated Fauntleroy Way Station Alternative	WSJ-2	Avalon (Elevated), Alaska Junction (Elevated)	Connects to DEL-1a, DEL-1b, DEL-3, and DEL-5.
	Tunnel 41st Avenue Station Alternative	WSJ-3a	Avalon (Tunnel), Alaska Junction (Tunnel)	Connects to DEL-2a, DEL-2b, and DEL-4.
	Tunnel 42nd Avenue Station Option	WSJ-3b	Avalon (Tunnel), Alaska Junction (Tunnel)	Connects to DEL-2a, DEL-2b, and DEL-4.
	Short Tunnel 41st Avenue Station Alternative	WSJ-4	Avalon (Elevated), Alaska Junction (Tunnel)	Connects to DEL-1a, DEL-1b, DEL-3, and DEL-5.
	Medium Tunnel 41st Avenue Station Alternative	WSJ-5a	Avalon (Retained-Cut), Alaska Junction (Tunnel)	Connects to DEL-6a, DEL-6b.
	No Avalon Station Tunnel Alternative	WSJ-6	Alaska Junction (Tunnel)	Connects to DEL-7.

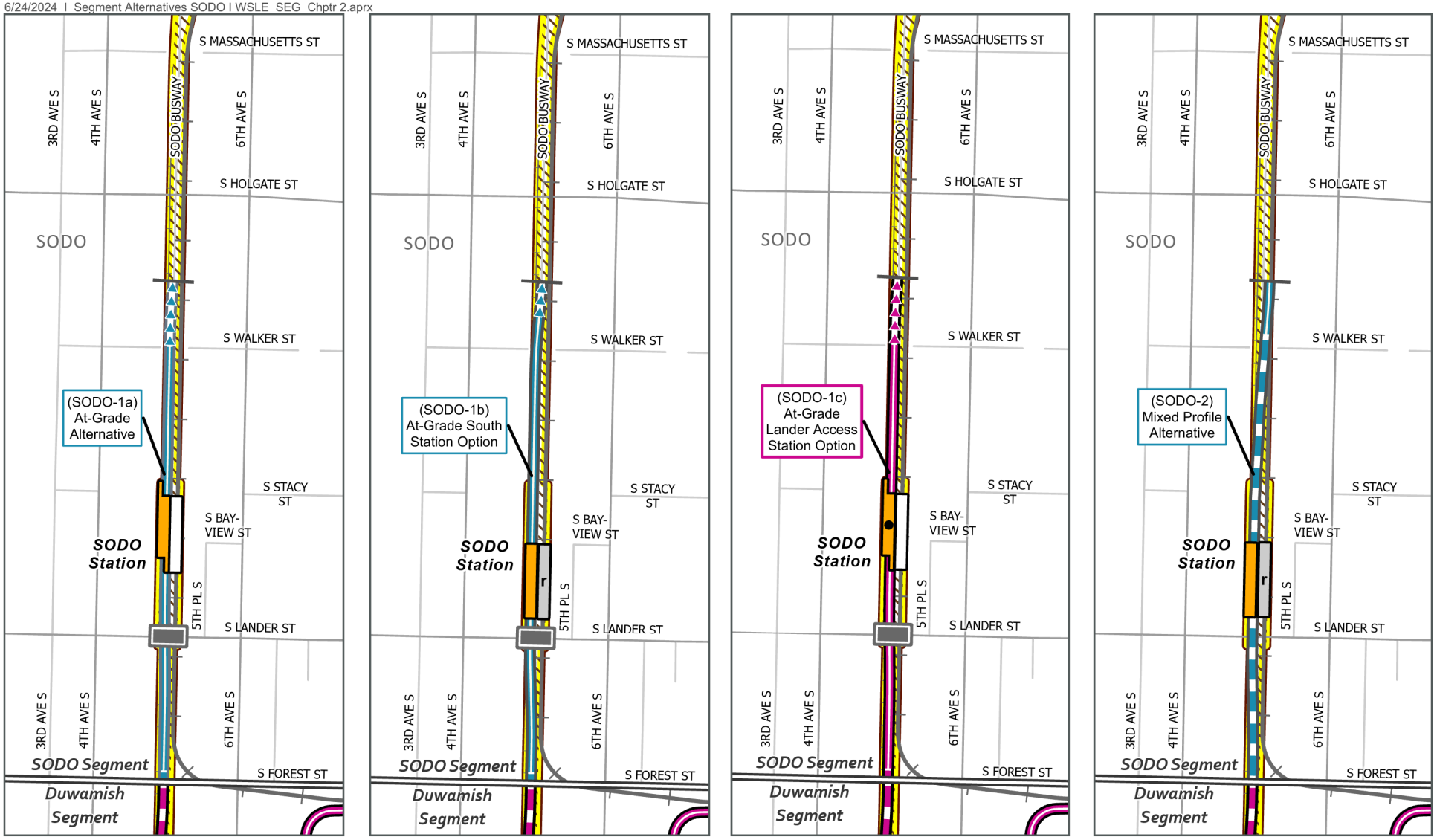
2.1.3.1.1 Preferred Alternative

At-Grade Lander Access Station Option (SODO-1c)

Preferred Option SODO-1c is a refinement of the Draft EIS Preferred Alternative SODO-1a staggered configuration. It reflects Sound Transit Board direction in Motion M2022-57 identifying the Preferred Alternative to explore opportunities to enhance access from the station platform to South Lander Street. Preferred Option SODO-1c would be similar to Alternative SODO-1a except for the station access. Heading south, Preferred Option SODO-1c would begin north of the existing SODO Station and travel at-grade west of and parallel to the existing Link light rail line in the SODO Busway. Preferred Option SODO-1c would continue south at-grade under South Lander Street, which would be reconstructed as an overpass of the light rail tracks. The light rail tracks would then transition to an elevated guideway; buses would be displaced from the SODO Busway. The height of the guideway would range between a retained-cut and approximately 20 feet high and would mostly be at-grade. The plan and profile for this alternative is shown on Figure 2-15.

The new SODO Station on the West Seattle Link Extension would be at-grade, immediately west of the existing SODO Station, north of South Lander Street. The top of the station structure would be approximately 40 feet high. Station platforms would be side platforms, one of which would be shared between the future northbound connection of the West Seattle Link Extension into the existing downtown tunnel and the existing southbound platform on the existing light rail line to SeaTac, continuing to Federal Way (2026) and Tacoma (2035). Preferred Option SODO-1c has a staggered station configuration that was developed in order to avoid property owned by the United States Postal Service at 4th Avenue South and South Lander Street. This property is the location of the Carrier Annex and Distribution Center/Terminal Post Office (Carrier Annex/Terminal Post Office).





Source: City of Seattle, King County (2023).

Preferred Alternative
- Elevated
- At-Grade
- Retained Cut

Other Alternatives
- Elevated
- At-Grade
- Retained Cut

Station (● *Indicates Preferred Alternative*)
- New
- Existing
- r Relocated

- Segment Line
- Existing Link Light Rail
- Railroad
- SODO Busway
- Proposed Overpass

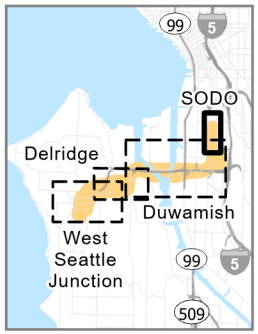


FIGURE 2-14
SODO
Segment Alternatives
SODO Segment

West Seattle Link Extension

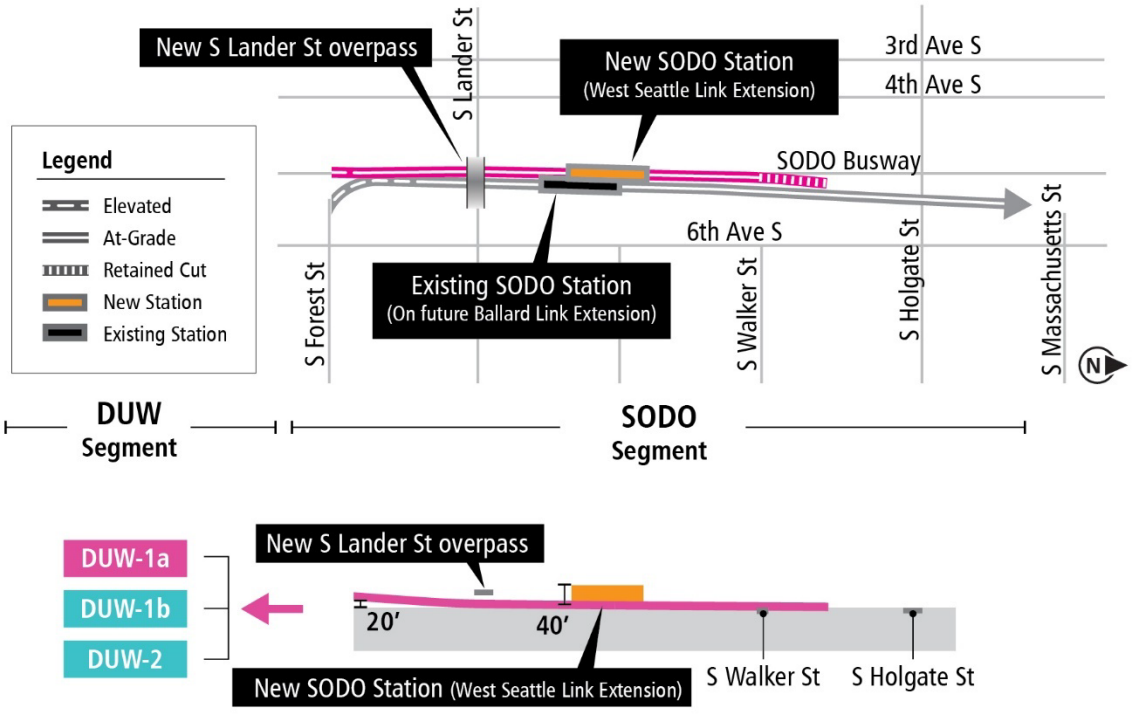
0 500 1,000 Feet
N

The station design features a narrowed center platform and staggered side platforms, with the southbound platform shifted slightly north so that it is not on the Carrier Annex/Terminal Post Office property. The existing driveway at the Carrier Annex/Terminal Post Office facility's southern access point would be connected under the new South Lander Street overpass to 4th Avenue South, which then maintains access to South Lander Street.

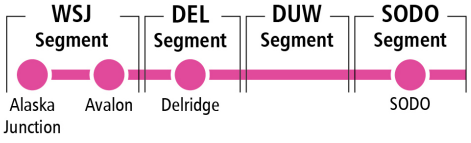
The existing at-grade pedestrian crossing of the light rail tracks at SODO Station would be closed, and a new pedestrian grade-separated crossing of both existing and new tracks would be used to access both stations. The station would not include the South Stacy Street cul-de-sac access to the west that is included in Alternative SODO-1a, and instead would include an access point at South Lander Street. Access to 4th Avenue South would occur via South Lander Street. A new bus turnaround would be created from 6th Avenue South, east of the station. The SODO Trail would be relocated east of the station area, adjacent to the existing light rail line.

Consistent with Board direction to design reliable transit transfers and enhance station accessibility and reliability of vertical conveyances, Sound Transit has identified the potential to refine this station design further to improve passenger experience. This potential refinement may enable eliminating the staggered station configuration without displacing the United States Postal Service Carrier Annex/Terminal Post Office, while improving passenger experience and station access. Sound Transit will continue to explore this refinement in coordination with the City of Seattle, United States Postal Service, and Federal Transit Administration (FTA).

Figure 2-15. Plan and Profile for Preferred At-Grade Lander Access Station Option (SODO-1c)



Diagrams are not to scale and all measurements are approximate for illustration purposes only.



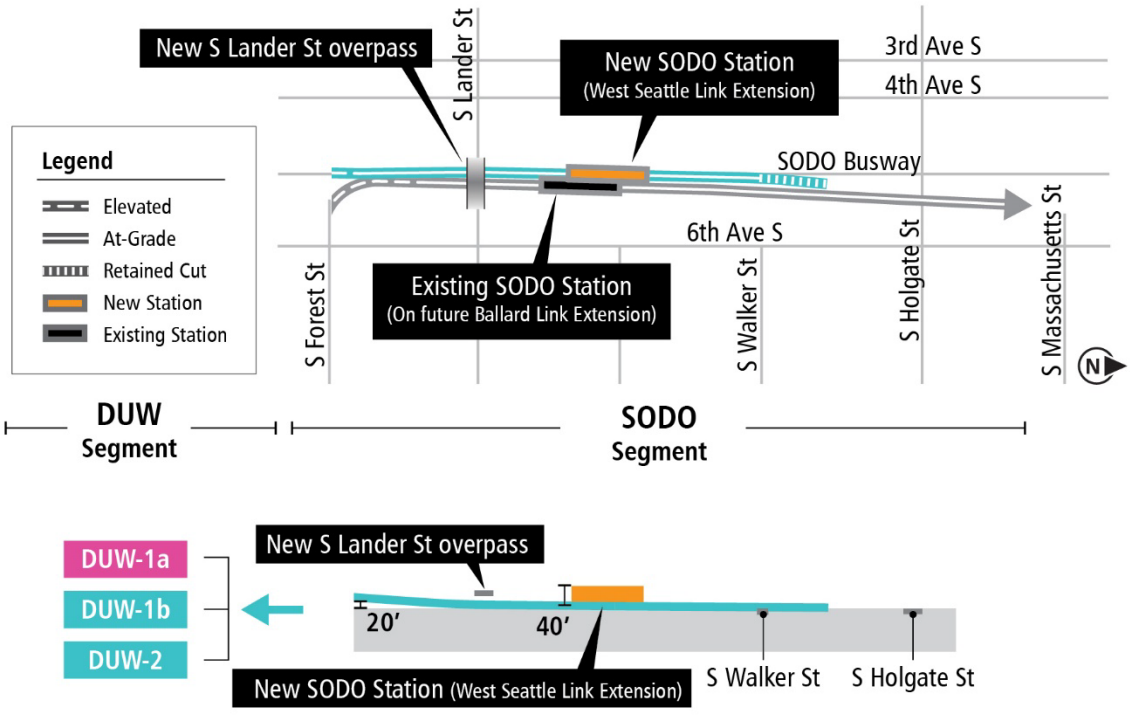
2.1.3.1.2 Other Build Alternatives and Design Options

At-Grade Alternative (SODO-1a)

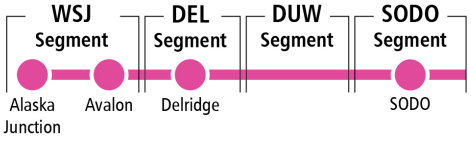
Alternative SODO-1a is a refinement to the Alternative SODO-1a in the Draft EIS. It includes the staggered station configuration described in the Draft EIS as the base alternative. Heading south, Alternative SODO-1a would begin north of the existing SODO Station and travel at-grade west of and parallel to the existing Link light rail line in the SODO Busway. The height of the guideway would range between a retained-cut and approximately 20 feet high and would mostly be at-grade. The plan and profile for this alternative is shown on Figure 2-16.

The new SODO Station on the West Seattle Link Extension would be at-grade, immediately west of the existing SODO Station, north of South Lander Street. The top of the station structure would be approximately 40 feet high. Station platforms would be side platforms, one of which would be shared between the future northbound connection of the West Seattle Link Extension into the existing downtown tunnel and existing southbound platform on the existing light rail line to SeaTac, continuing to Federal Way (2026) and Tacoma (2035). Alternative SODO-1a has a staggered station configuration that was developed in order to avoid property owned by the United States Postal Service at 4th Avenue South and South Lander Street. This property is the location of the Carrier Annex and Distribution Center/Terminal Post Office (Carrier Annex/Terminal Post Office). The station design features a narrowed center platform and staggered side platforms, with the southbound platform shifted slightly north so that it is not on the Carrier Annex/Terminal Post Office property. The existing driveway at the Carrier Annex/Terminal Post Office facility's southern access point would be connected under the new South Lander Street overpass to 4th Avenue South, which then maintains access to South Lander Street.

Figure 2-16. Plan and Profile for At-Grade Alternative (SODO-1a)



Diagrams are not to scale and all measurements are approximate for illustration purposes only.



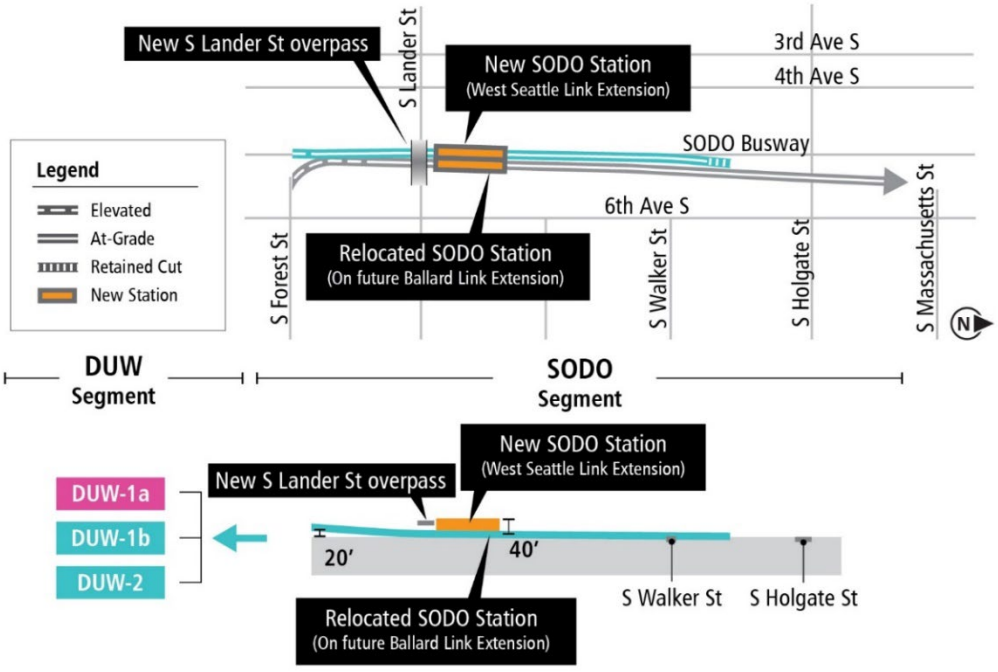
The existing at-grade pedestrian crossing of the light rail tracks at SODO Station would be closed, and a new grade-separated pedestrian crossing of both existing and new tracks would be used to access both stations. South Stacy Street would be extended from 4th Avenue South to a cul-de-sac on the west side of the station. A new bus turnaround would be created from 6th Avenue South, east of the station. The SODO Trail would be relocated east of the station area, adjacent to the existing light rail line.

This alternative would continue south at-grade under South Lander Street, which would be reconstructed as an overpass of the light rail tracks. The overpass would remove the need for traffic to stop for light rail trains, the frequency of which would increase with the combination of both the existing and new light rail lines. The light rail would transition to an elevated guideway within the SODO Busway south of South Lander Street. Buses would be displaced from the SODO Busway.

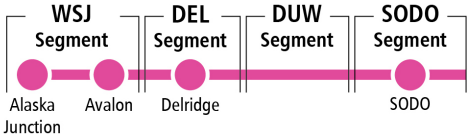
At-Grade South Station Option (SODO-1b)

Option SODO-1b would be similar to Alternative SODO-1a except for the SODO Station. The plan and profile for this option is shown on Figure 2-17. A new at-grade station on the West Seattle Link Extension would be west of and approximately 200 feet south of the existing SODO Station, just north of South Lander Street. The top of the station structure would be approximately 40 feet high. The existing SODO Station would be relocated 200 feet south of its current location to be next to the new SODO Station. Pedestrian access would be from a new South Lander Street overcrossing. Station platforms would be side platforms, one of which would be shared between the future northbound connection of the West Seattle Link Extension into the existing downtown tunnel and the existing southbound platform on the existing light rail line to SeaTac, continuing to Federal Way (2026) and Tacoma (2035). A new bus turnaround would be created off 4th Avenue South, west of the station. As with Alternative SODO-1a, buses would be displaced from the SODO Busway.

Figure 2-17. Plan and Profile for At-Grade South Station Option (SODO-1b)



Diagrams are not to scale and all measurements are approximate for illustration purposes only.

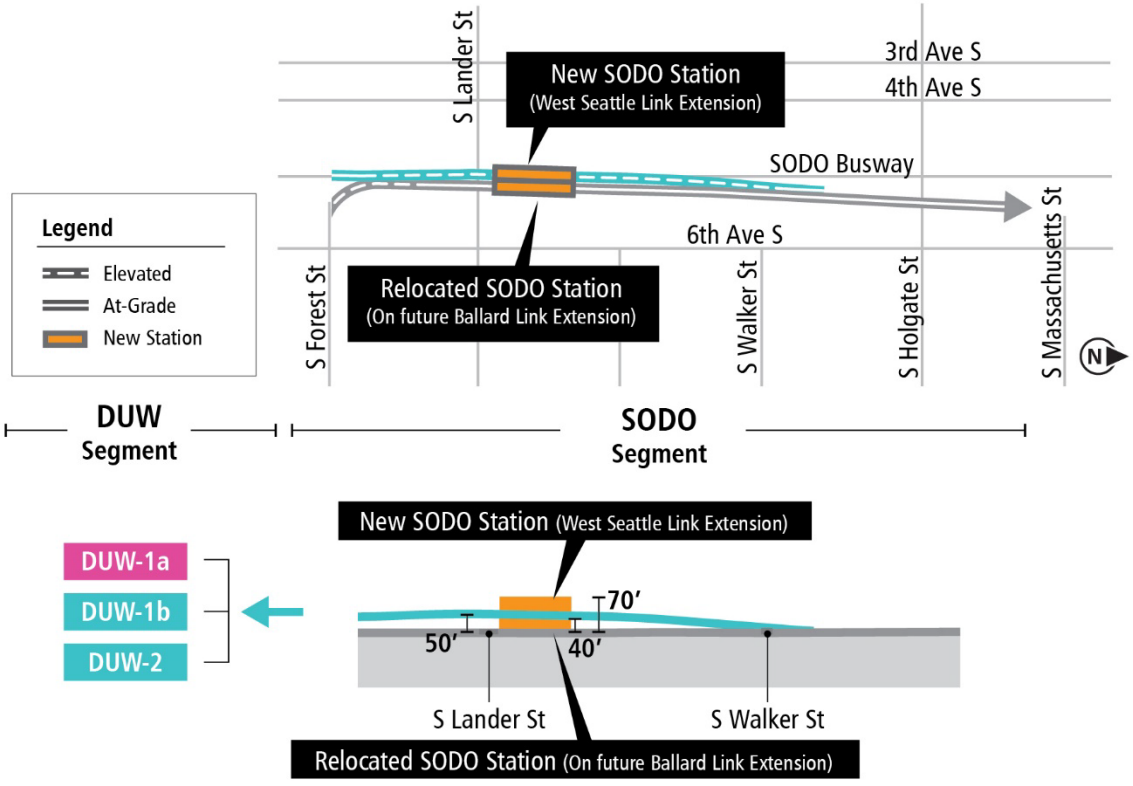


Mixed Profile Alternative (SODO-2)

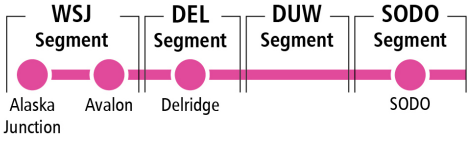
Alternative SODO-2 for the West Seattle Link Extension would range between ground level and approximately 50 feet high. It would begin at-grade north of the existing SODO Station, west of and parallel to the existing Link light rail line in the existing SODO Busway. At South Walker Street, the alignment would transition to an elevated profile and would continue south over South Lander Street. The plan and profile for this alternative is shown on Figure 2-18. The SODO Busway would be relocated to the west of the new rail line and new station and would be operational for buses after construction.

A new SODO Station on the West Seattle Link Extension would be in an elevated profile north of South Lander Street. The top of the station structure would be approximately 70 feet high. Because this alternative would be elevated over South Lander Street, the street would remain as it is today, with a gated at-grade crossing of the existing light rail line. The existing SODO Station would be relocated as described for Option SODO-1b and would be at-grade adjacent to the new elevated station. Pedestrian access would be on the north side of South Lander Street and from 4th Avenue South and 6th Avenue South. A new pedestrian grade-separated crossing of both existing and new tracks would be used to access both the new and relocated station. The SODO Trail would be relocated east of the station area, adjacent to the existing light rail line.

Figure 2-18. Plan and Profile for Mixed Profile Alternative (SODO-2)



Diagrams are not to scale and all measurements are approximate for illustration purposes only.



2.1.3.2 Duwamish Segment

The Duwamish Segment includes the area between South Forest Street in the SODO neighborhood and the intersection of Southwest Charlestown Street and Delridge Way Southwest in the North Delridge neighborhood. This segment does not include a station but does include a connection to the existing Operations and Maintenance Facility Central. The Duwamish Segment alternatives and design option are shown on Figure 2-19. All Duwamish Segment alternatives include relocation of a 230-kilovolt power line starting at the Duwamish Segment northern boundary at South Forest Street. The power line would be relocated from the SODO Busway to 6th Avenue South and Diagonal Avenue South or across the Department of Highways District No. 1 property to connect to 5th Avenue South. Either relocation route would lead to the Seattle City Light electrical substation south of South Spokane Street.

2.1.3.2.1 Preferred Alternative

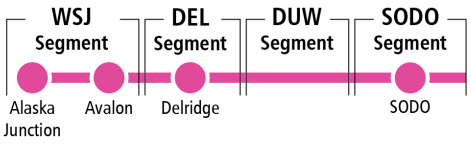
South Crossing Alternative (DUW-1a)

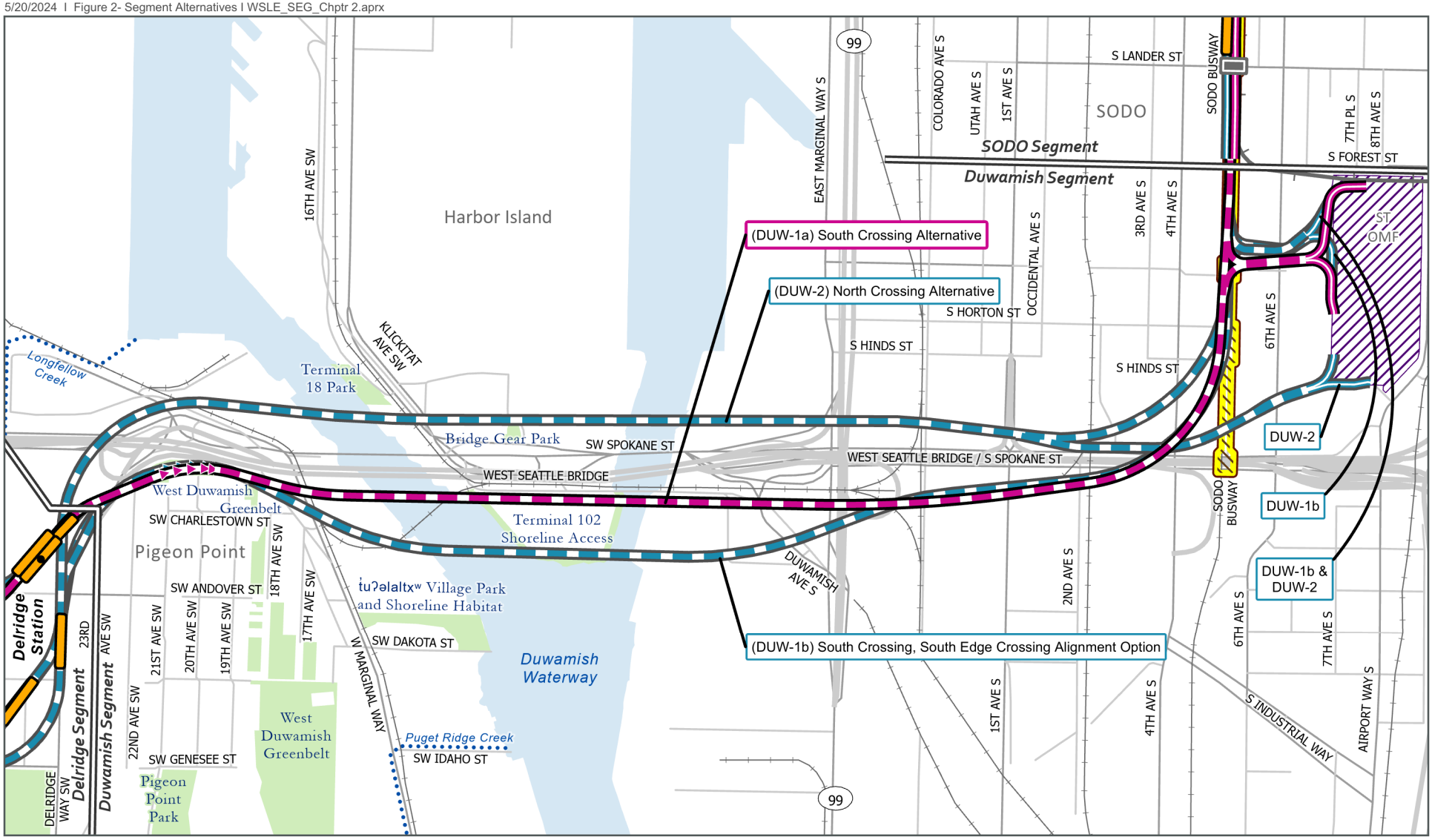
Preferred Alternative DUW-1a would continue south from South Forest Street along the west side of the existing light rail line on an elevated guideway, past the Operations and Maintenance Facility Central before heading southwest to cross over to the south side of the Spokane Street Bridge and the West Seattle Bridge.

The alternative would continue west and to the south side of the West Seattle Bridge. It crosses State Route 99, and would gradually increase in height as it travels west, since light rail cannot travel on grades as steep as automobiles can. The alternative would cross over the East Waterway, Harbor Island, and the West Waterway on a fixed, light-rail-only bridge. The height of the guideway in this segment would range between a retained-cut and approximately 170 feet high. It would be at its highest when crossing the West Waterway, where it would be at approximately the same height as the West Seattle Bridge. The bridge over the West Waterway would have a clearance of approximately 140 feet over the navigation channel.

West of the Duwamish Waterway crossing, the alternative would cross the northern edge of Pigeon Point in a combination of elevated guideway and retained-cut and fill before turning southwest on an elevated guideway that crosses Delridge Way Southwest. The plan and profile for this alternative is shown on Figure 2-20.

A connection to the Operations and Maintenance Facility Central would be provided from tracks between South Forest Street and South Spokane Street. The northbound and southbound access tracks would be parallel to each other and would span over the BNSF Railway tracks and 6th Avenue South, then transition to at-grade to enter the operations and maintenance facility.





Source: City of Seattle, King County (2023).

Preferred Alternative
- Elevated
- At-Grade
- Retained Cut

Other Alternatives
- Elevated
- At-Grade
- Retained Cut

Station (● *Indicates Preferred Alternative*)
- New

- Segment Line
- Existing Link Light Rail
- Railroad
- SODO Busway
- Proposed Overpass
- Sound Transit Operations and Maintenance Facility (ST OMF)
- Piped Stream
- Park

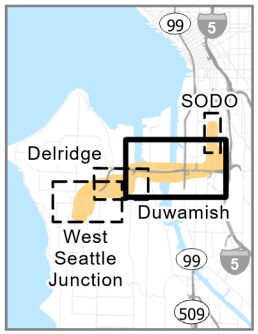


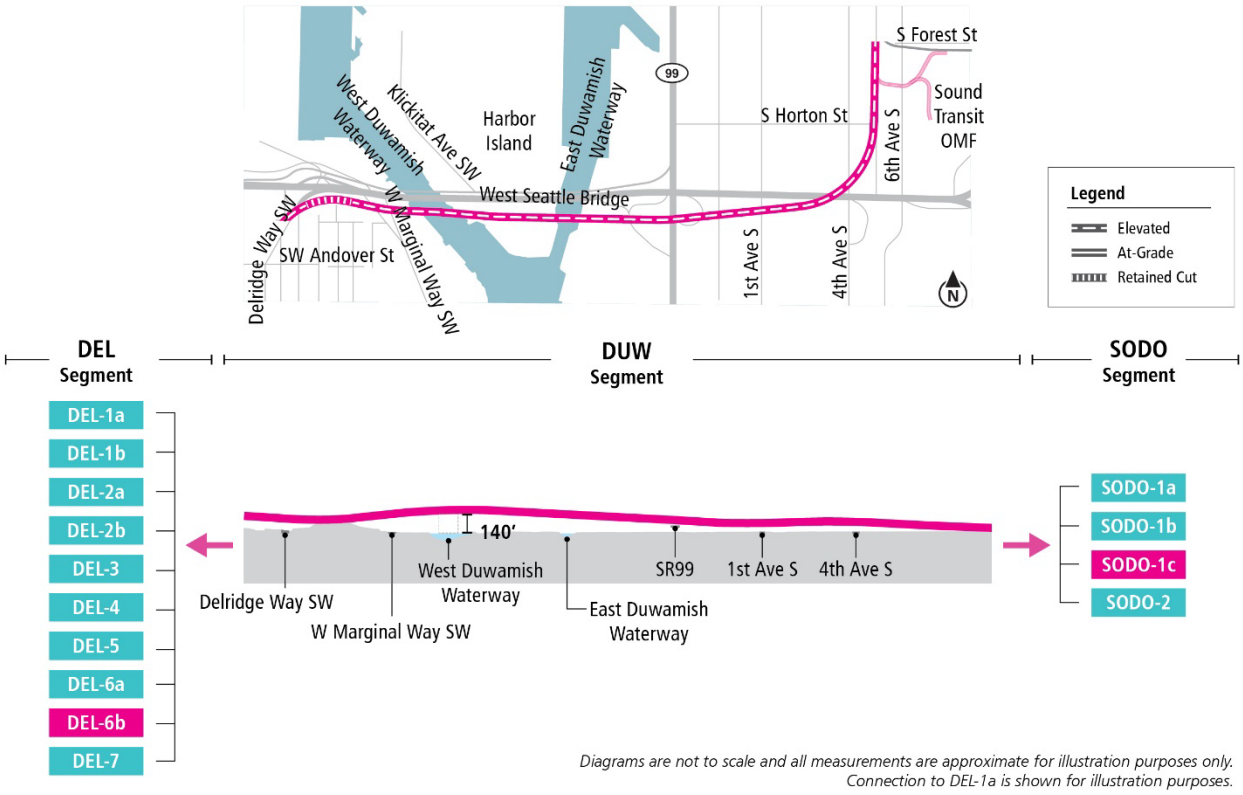
FIGURE 2-19
Duwamish Segment Alternatives
Duwamish Segment

West Seattle Link Extension

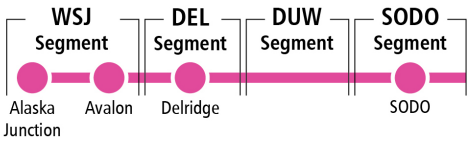
0 500 1,000 Feet

N

Figure 2-20. Plan and Profile for Preferred South Crossing Alternative (DUW-1a)



Diagrams are not to scale and all measurements are approximate for illustration purposes only. Connection to DEL-1a is shown for illustration purposes.

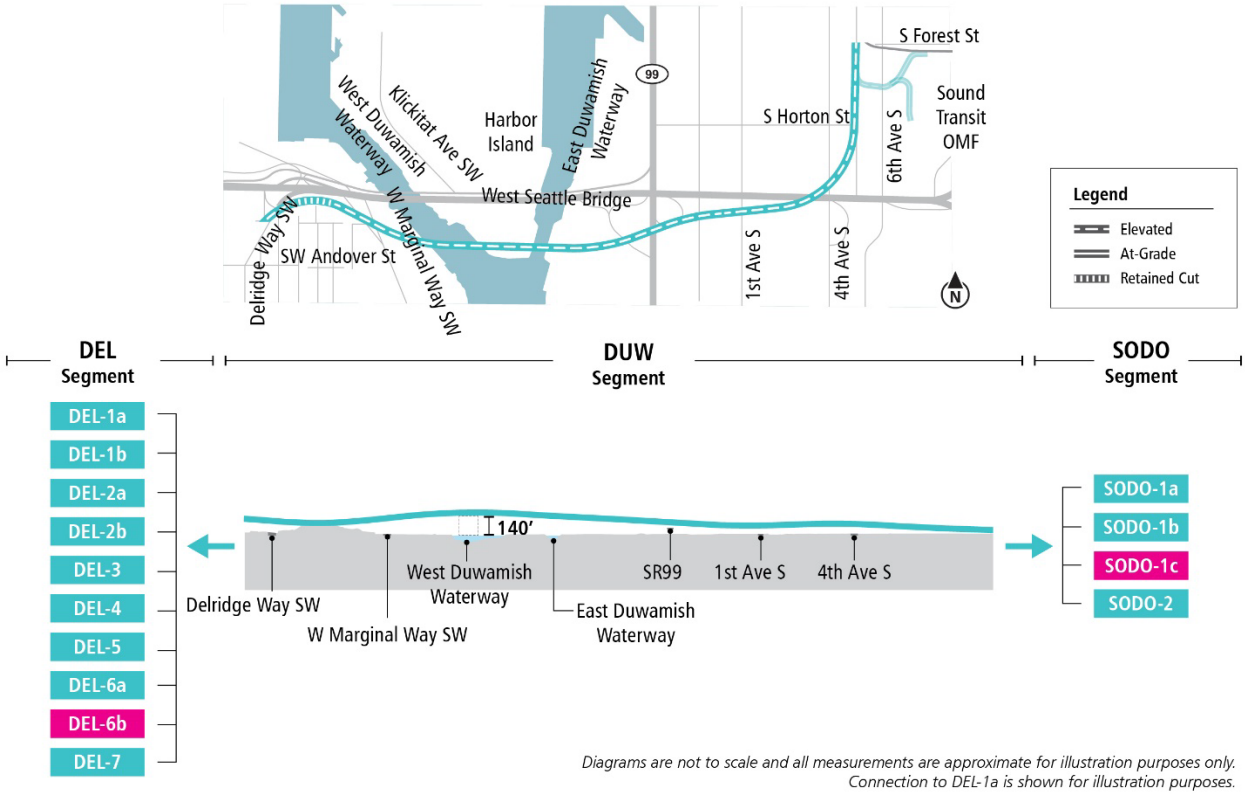


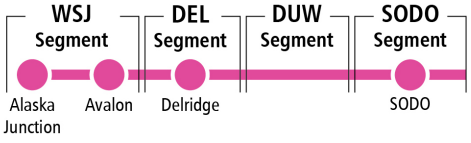
2.1.3.2.2 Other Build Alternatives and Design Options

South Crossing South Edge Crossing Alignment Option (DUW-1b)

Option DUW-1b would be similar to Alternative DUW-1a except it would cross the East and West Waterways on the south edge of Harbor Island. The height of this option would be the same as Alternative DUW-1a. The plan and profile for this option is shown on Figure 2-21.

Figure 2-21. Plan and Profile for South Edge Crossing Alignment Option (DUW-1b)



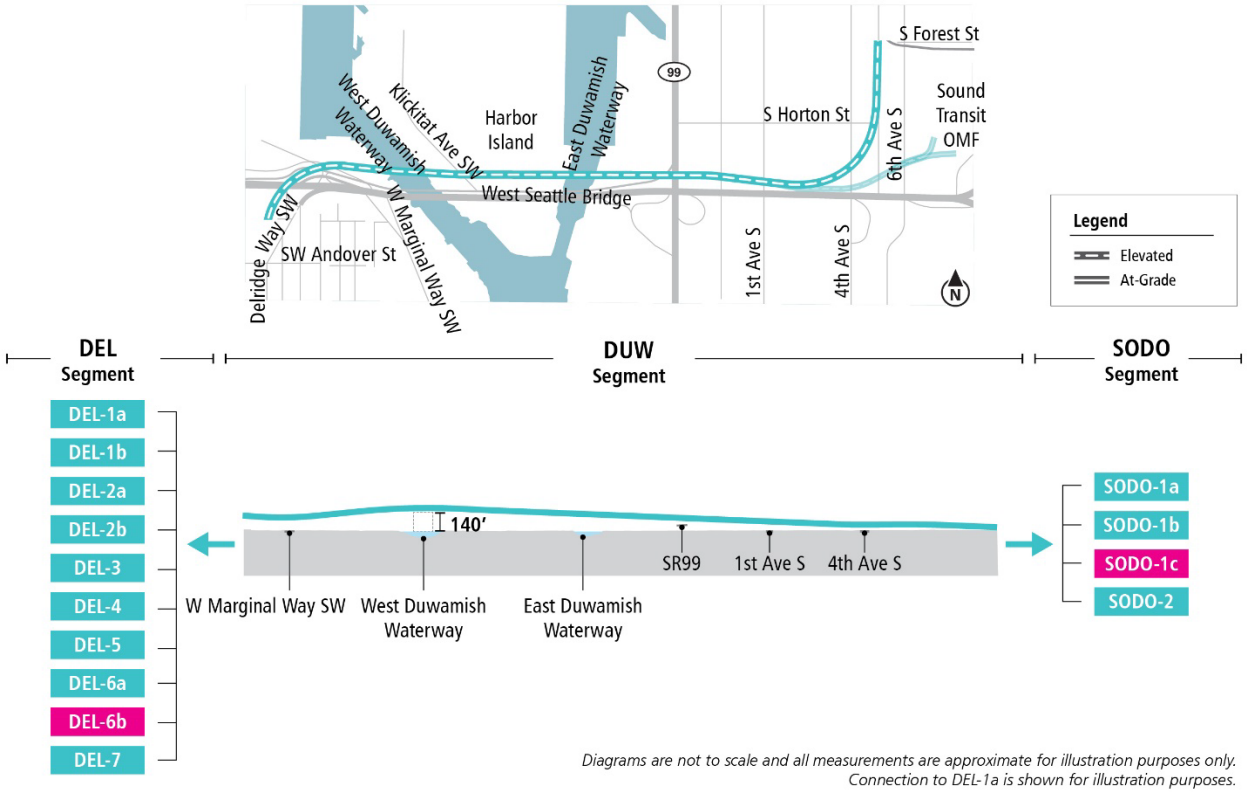


North Crossing Alternative (DUW-2)

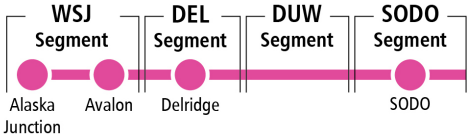
Alternative DUW-2 would continue south from South Forest Street along the west side of the existing light rail line on an elevated guideway, before heading west on a new fixed, light-rail-only bridge north of the existing West Seattle Bridge. The height of the guideway would range between approximately 30 feet and 170 feet high. It would be at its highest when crossing the West Waterway. The bridge over the West Waterway would have a clearance of approximately 140 feet over the navigation channel.

Where it crosses State Route 99, the alignment would gradually increase in height as it travels west. At the West Waterway, the bridge would be about the same height as the West Seattle Bridge. After crossing the West Waterway, the alternative would cross over the West Seattle Bridge to run south on the west side of Delridge Way Southwest. The plan and profile for this alternative is shown on Figure 2-22.

Figure 2-22. Plan and Profile for North Crossing Alternative (DUW-2)



A connection to the Operations and Maintenance Facility Central would be provided from north and south access tracks between South Forest Street and South Spokane Street. Unlike the south crossing alternative and option, the access tracks would not be parallel to each other because of the curve of the main alignment and the distance to the operations and maintenance facility. The northern access tracks south of South Forest Street would span 6th Avenue South and then transition to at-grade to enter the operations and maintenance facility. The southern access tracks would be elevated north of South Spokane Street and continue east from about 1st Avenue South to 6th Avenue South, and then transition to at-grade to enter the operations and maintenance facility.



2.1.3.3 Delridge Segment

The Delridge Segment includes the area between Southwest Charlestown Street and a boundary line between 31st Avenue Southwest and Fauntleroy Way Southwest (Figure 2-23). This segment includes one station, the Delridge Station. Some alternatives in this segment only connect to tunnel alternatives in the adjacent West Seattle Junction Segment. The Delridge Segment alternatives and design options are shown on Figure 2-23.

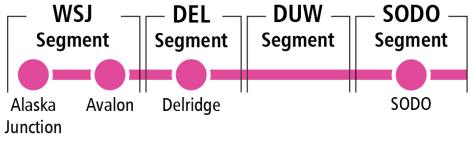
2.1.3.3.1 Preferred Alternative

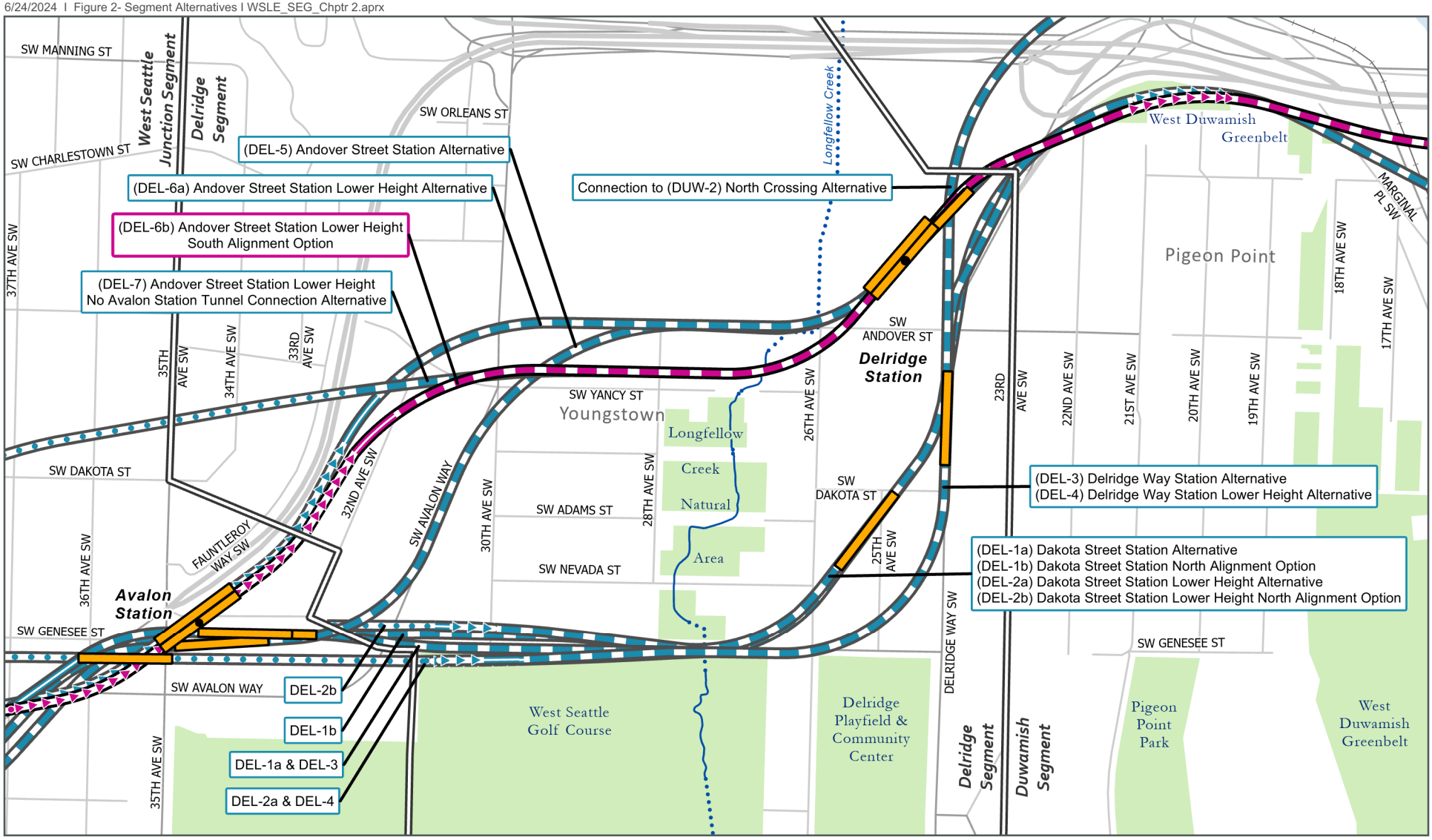
Andover Street Station Lower Height South Alignment Option (DEL-6b)

Preferred Option DEL-6b is a refinement of Alternative DEL-6 (now known as Alternative DEL-6a) developed in response to public and agency comments and Sound Transit Board direction in Motion 2022-57 to study refinement options to enhance station access, prioritize an integrated and well-designed transfer experience from buses to light rail, and address concerns over potential displacements of organizations serving low-income populations and communities of color.

Preferred Option DEL-6b would be on an elevated guideway on the west side of Delridge Way Southwest, south of Southwest Andover Street. The height of the guideway would range between approximately 40 feet and 80 feet high. The alignment would travel west along the north side of Southwest Yancy Street on an elevated guideway then cross Southwest Avalon Way in the vicinity of Southwest Yancy Street. Preferred Option DEL-6b would cross 32nd Avenue Southwest at-grade, resulting in the closure of a portion of 32nd Avenue Southwest and the construction of cul-de-sacs on the street to the north and south. Preferred Option DEL-6b would be similar to Alternative DEL-6a as it continues south along the east side of the West Seattle Bridge connection to Fauntleroy Way Southwest. The plan and profile for this option is shown on Figure 2-24.

The station would be elevated, north of southwest Andover Street and west of Delridge Way Southwest, in a northeast-southwest orientation. The top of the station structure would be approximately 70 feet high. This design option includes roadway improvements at the intersection of Delridge Way Southwest and 23rd Avenue Southwest to allow vehicle access and pedestrian crossings into the station area and Nucor Steel. Southwest Charlestown Street would be reconfigured west of Delridge Way Southwest and north of Southwest Andover Street to provide a dedicated circulation pathway for buses separate from freight and general purpose passenger vehicles.





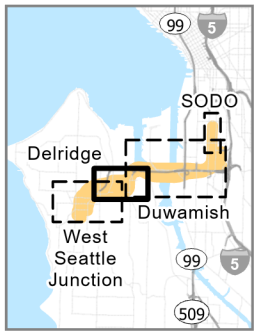
Source: City of Seattle, King County (2023).

Preferred Alternative
- Elevated
- Tunnel
- At-Grade
- Retained Cut

Other Alternatives
- Elevated
- Tunnel
- At-Grade
- Retained Cut

Station (● *Indicates Preferred Alternative*)
- New

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

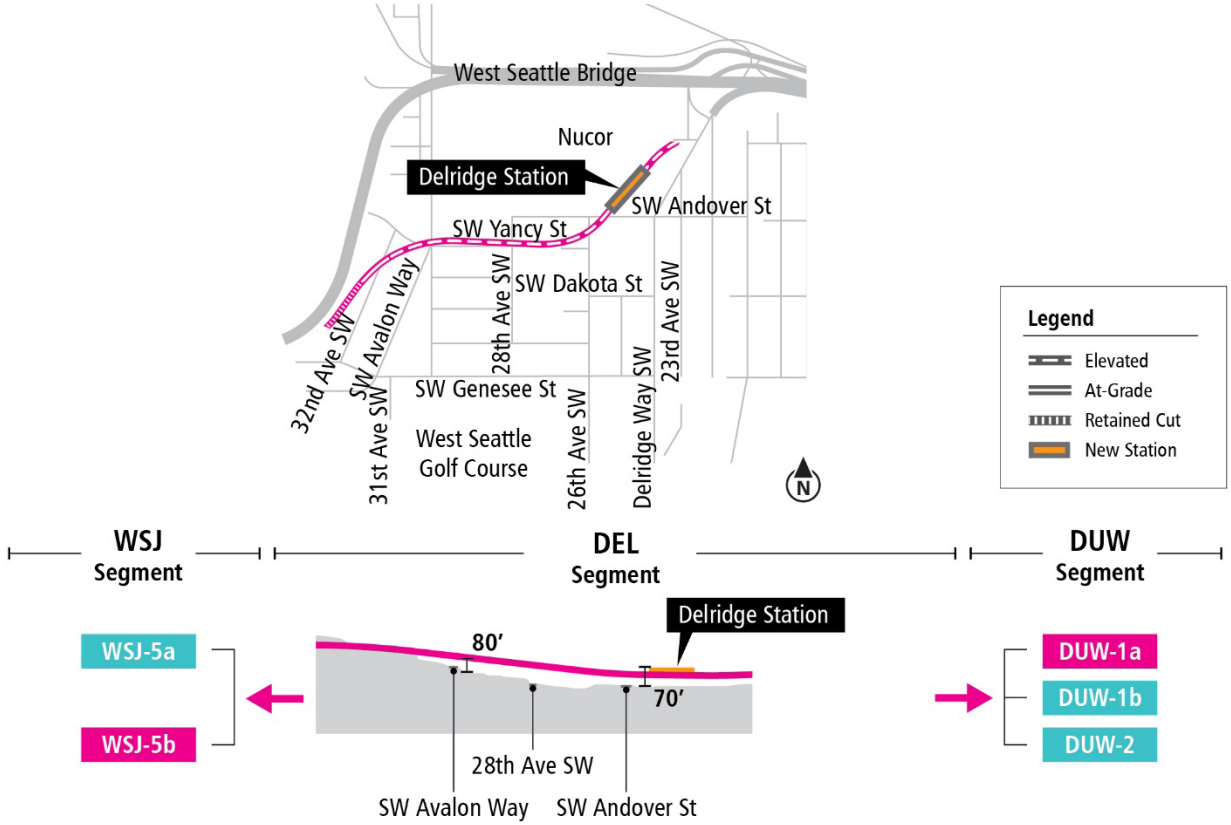


0 500 1,000 Feet N

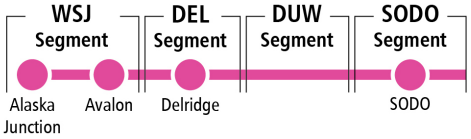
FIGURE 2-23
Delridge Segment Alternatives
Delridge Segment

West Seattle Link Extension

Figure 2-24. Plan and Profile for Preferred Andover Street Station Lower Height South Alignment Option (DEL-6b)



Diagrams are not to scale and all measurements are approximate for illustration purposes only.



2.1.3.3.2 Other Build Alternatives and Design Options

Dakota Street Station Alternative (DEL-1a)

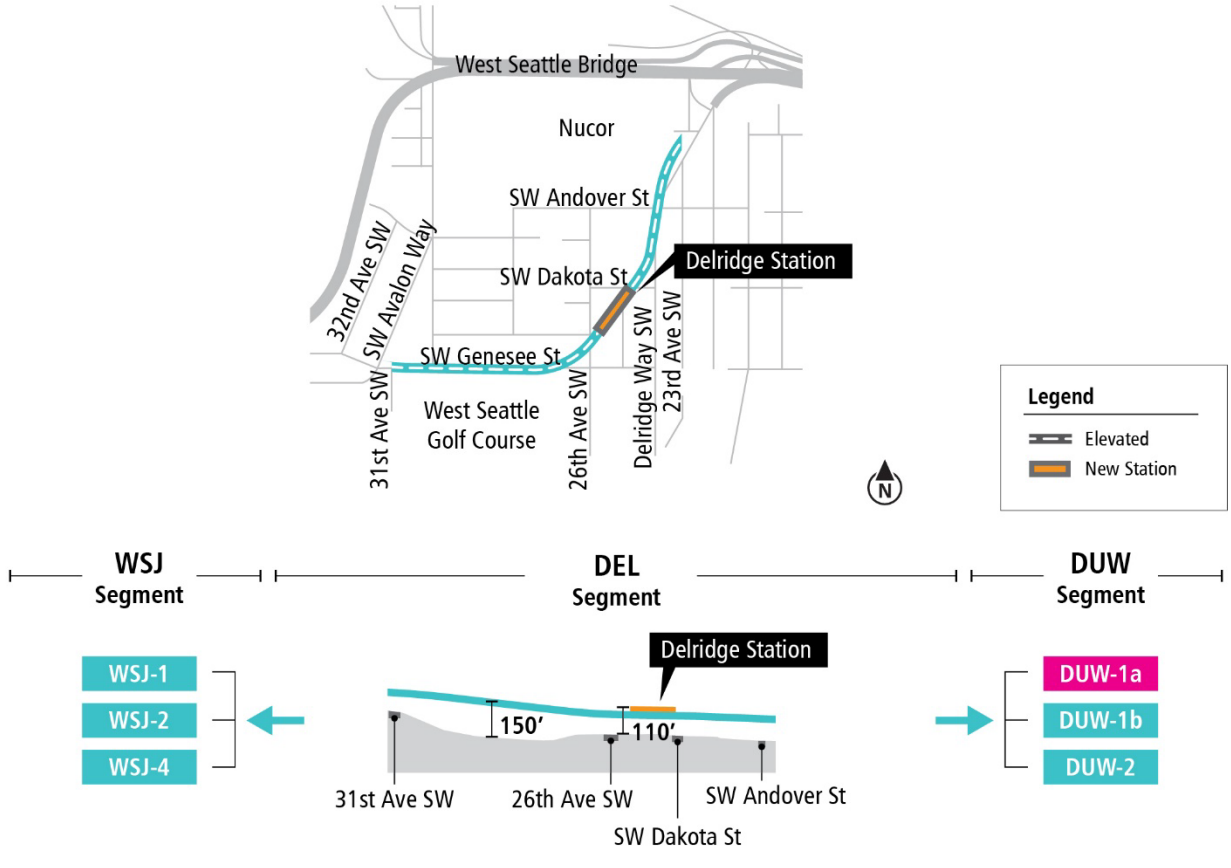
Alternative DEL-1a would follow Delridge Way Southwest south on an elevated guideway to an elevated station. The guideway would be on the west side of Delridge Way Southwest except for in the vicinity of Southwest Andover Street, where it would be over Delridge Way Southwest.

The height of the guideway would range between approximately 70 feet and 150 feet high. The highest portion would be where the alignment climbs from the station in the Delridge valley up to the West Seattle Junction.

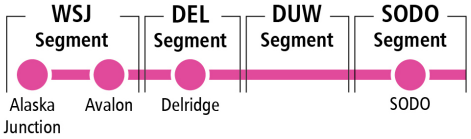
The station would be elevated between Delridge Way Southwest and 26th Avenue Southwest, south of Southwest Dakota Street, and oriented southwest-northeast. The top of the station structure would be approximately 110 feet high.

South of the station, the alternative would curve west and cross to the south side of the Southwest Genesee Street right-of-way, north of the West Seattle Golf Course. The guideway would continue west along the south edge of Southwest Genesee Street and connect to an elevated guideway in the West Seattle Junction Segment. The plan and profile for this alternative is shown on Figure 2-25.

Figure 2-25. Plan and Profile for Dakota Street Station Alternative (DEL-1a)



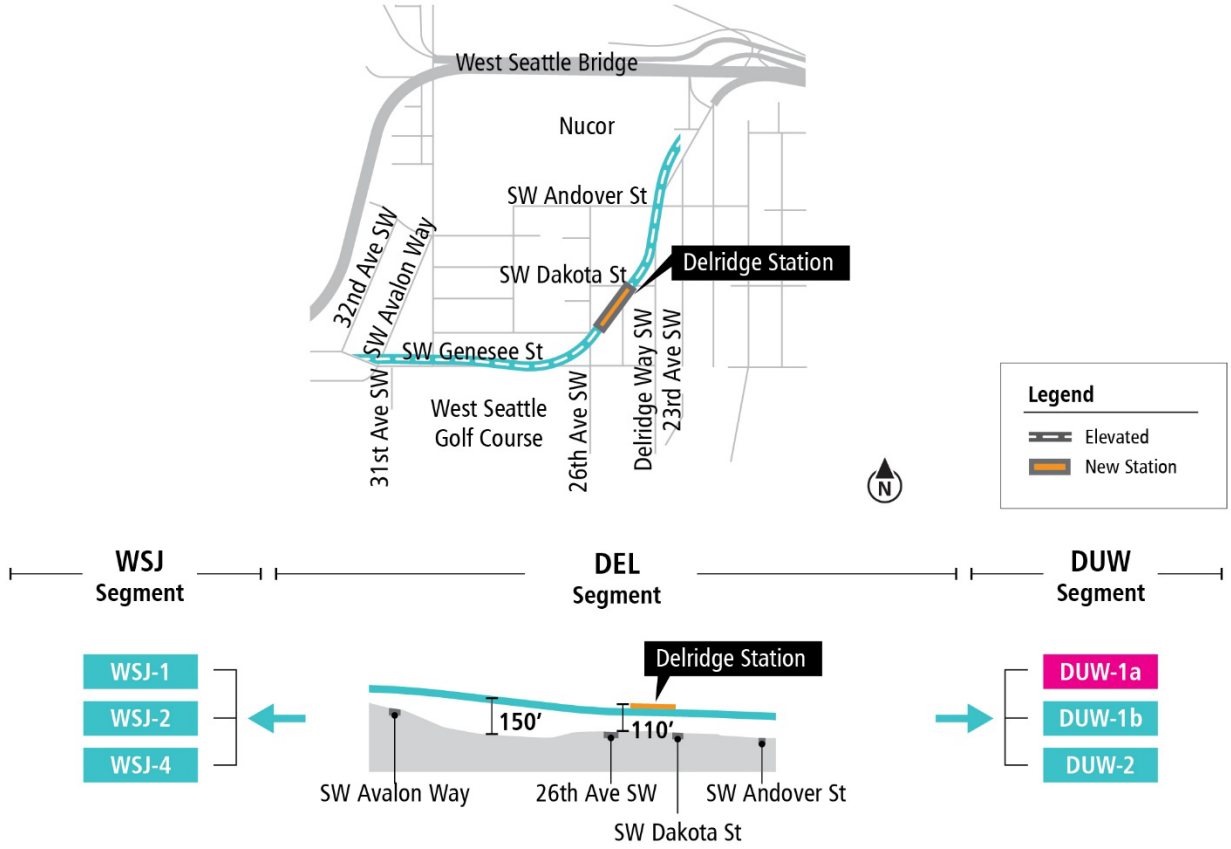
Diagrams are not to scale and all measurements are approximate for illustration purposes only.



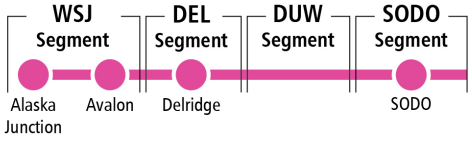
Dakota Street Station North Alignment Option (DEL-1b)

Option DEL-1b would be similar to Alternative DEL-1a except it would be within the Southwest Genesee Street right-of-way between the West Seattle Golf Course and the Longfellow Creek Natural Area, then shift to the north side of Southwest Genesee Street west of 28th Avenue Southwest. The plan and profile for this option is shown on Figure 2-26. The height of the guideway would range between approximately 60 feet and 150 feet high. The highest portion would be where the alignment climbs from the station in the Delridge valley up to the West Seattle Junction. The top of the station structure would be approximately 110 feet high.

Figure 2-26. Plan and Profile for Dakota Street Station North Alignment Option (DEL-1b)



Diagrams are not to scale and all measurements are approximate for illustration purposes only.

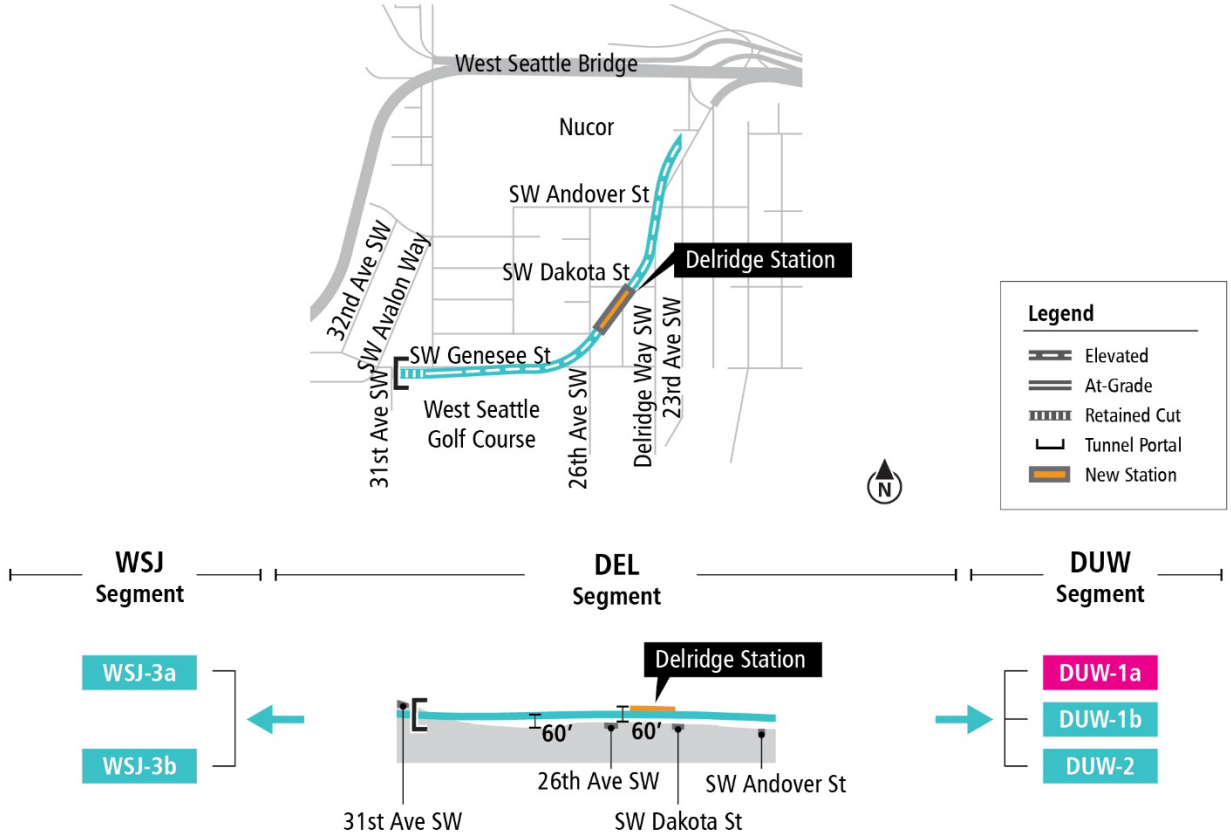


Dakota Street Station Lower Height Alternative (DEL-2a)

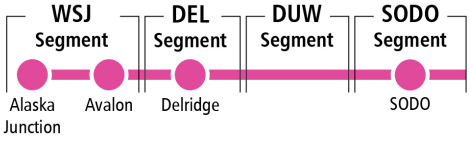
Alternative DEL-2a would follow the same alignment as Alternative DEL-1a to the station but would be at a lower elevation to connect to tunnel alternatives in the West Seattle Junction Segment. The height of the guideway would range between a tunnel and approximately 60 feet high. The top of the station structure would be approximately 60 feet high.

To accommodate the station, 25th Avenue Southwest would be permanently closed between Southwest Dakota Street and Southwest Genesee Street. From the station, the alternative would continue south to cross Southwest Genesee Street and would run along the northern edge of the West Seattle Golf Course. A tunnel portal for connecting to tunnel alternatives in the West Seattle Junction Segment would be in the northwest corner of the West Seattle Golf Course, south of Southwest Genesee Street and east of 31st Avenue Southwest. The plan and profile for this alternative is shown on Figure 2-27.

Figure 2-27. Plan and Profile for Dakota Street Station Lower Height Alternative (DEL-2a)



Diagrams are not to scale and all measurements are approximate for illustration purposes only.

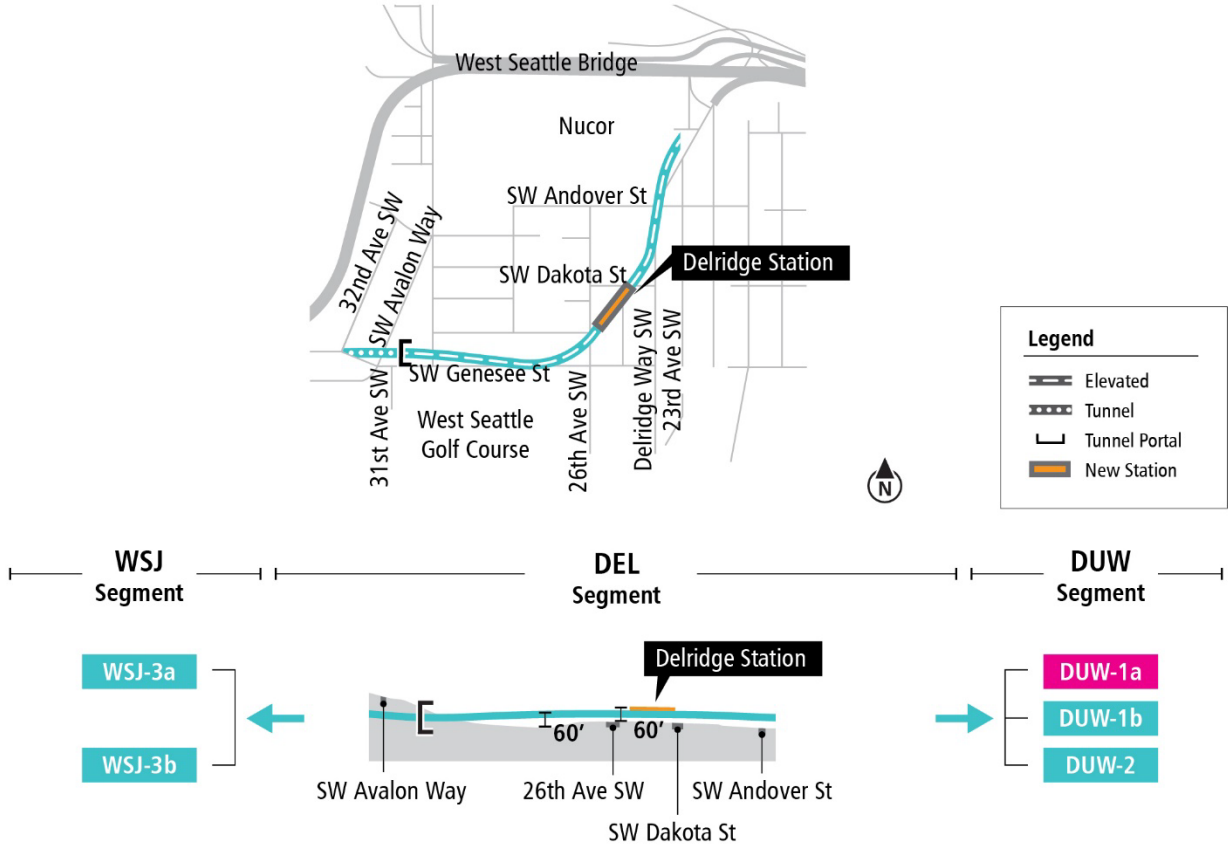


Dakota Street Station Lower Height North Alignment Option (DEL-2b)

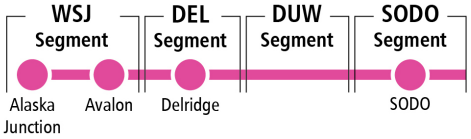
Option DEL-2b would be similar to Alternative DEL-2a, except it would shift to the north side of Southwest Genesee Street west of 28th Avenue Southwest. The plan and profile for this option is shown on Figure 2-28. The height of the guideway would range between a tunnel and approximately 60 feet high. The top of the station structure would be approximately 60 feet high.

To accommodate the station, 25th Avenue Southwest would be permanently closed between Southwest Dakota Street and Southwest Genesee Street. Access to Southwest Genesee Street from 30th Avenue Southwest would be permanently closed with a turnaround at the south end of the road. The tunnel portal to enter a tunnel in the West Seattle Junction Segment would be north of Southwest Genesee Street, between Southwest Avalon Way and 30th Avenue Southwest.

Figure 2-28. Plan and Profile for Dakota Street Station Lower Height North Alignment Option (DEL-2b)



Diagrams are not to scale and all measurements are approximate for illustration purposes only.

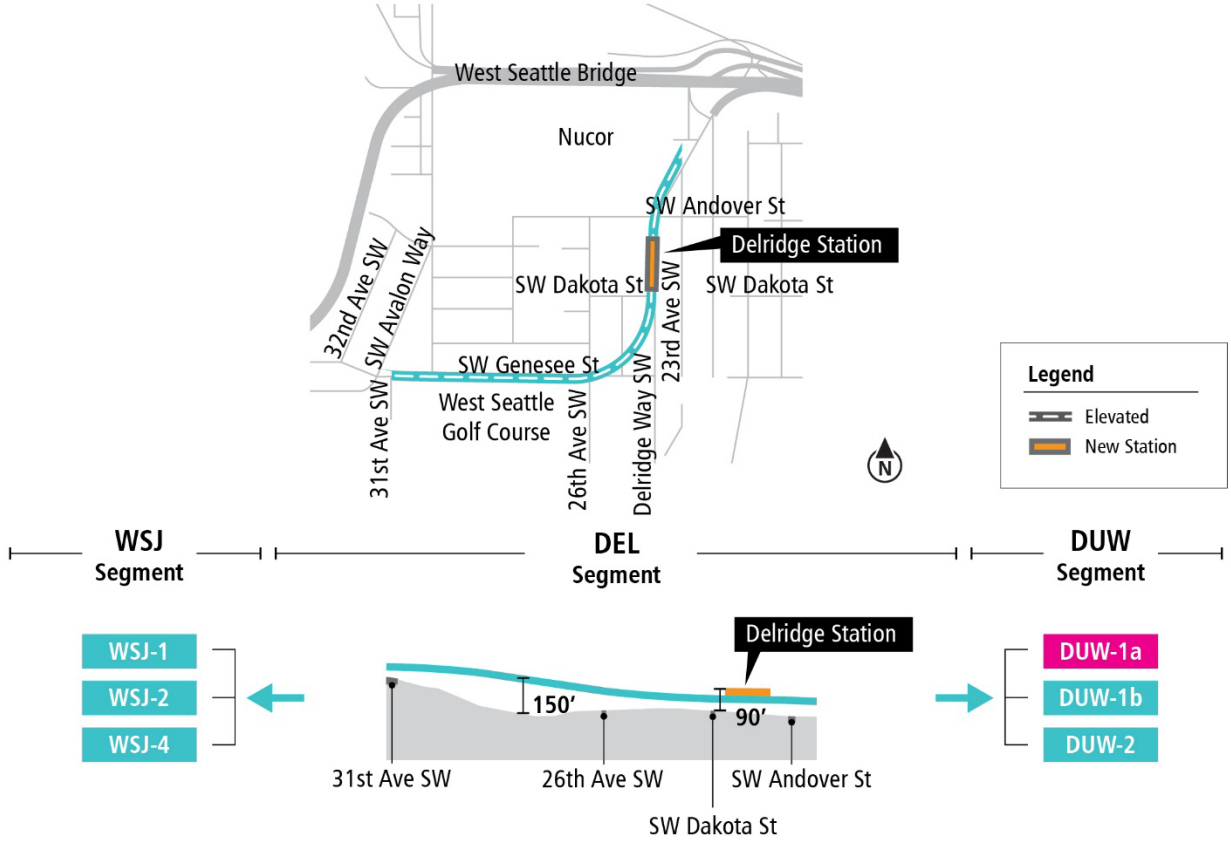


Delridge Way Station Alternative (DEL-3)

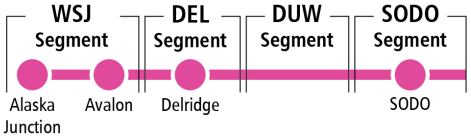
Alternative DEL-3 would follow Delridge Way Southwest south on an elevated guideway to the Delridge Station. The station would be in the middle of Delridge Way Southwest, north of Southwest Dakota Street, and the top of the station structure would be approximately 90 feet high. Station access would be from adjacent streets, including both sides of Delridge Way Southwest.

South of the station, the alternative would curve west and cross to the south side of the Southwest Genesee Street right-of-way, north of the West Seattle Golf Course. The guideway would continue west along the south edge of Southwest Genesee Street and connect to an elevated guideway in the West Seattle Junction Segment. The plan and profile for this alternative is shown on Figure 2-29. The height of the guideway would range between approximately 50 feet and 150 feet high. The highest portion would be where the alignment climbs from the station in the Delridge valley up to the West Seattle Junction.

Figure 2-29. Plan and Profile for Delridge Way Station Alternative (DEL-3)



Diagrams are not to scale and all measurements are approximate for illustration purposes only.

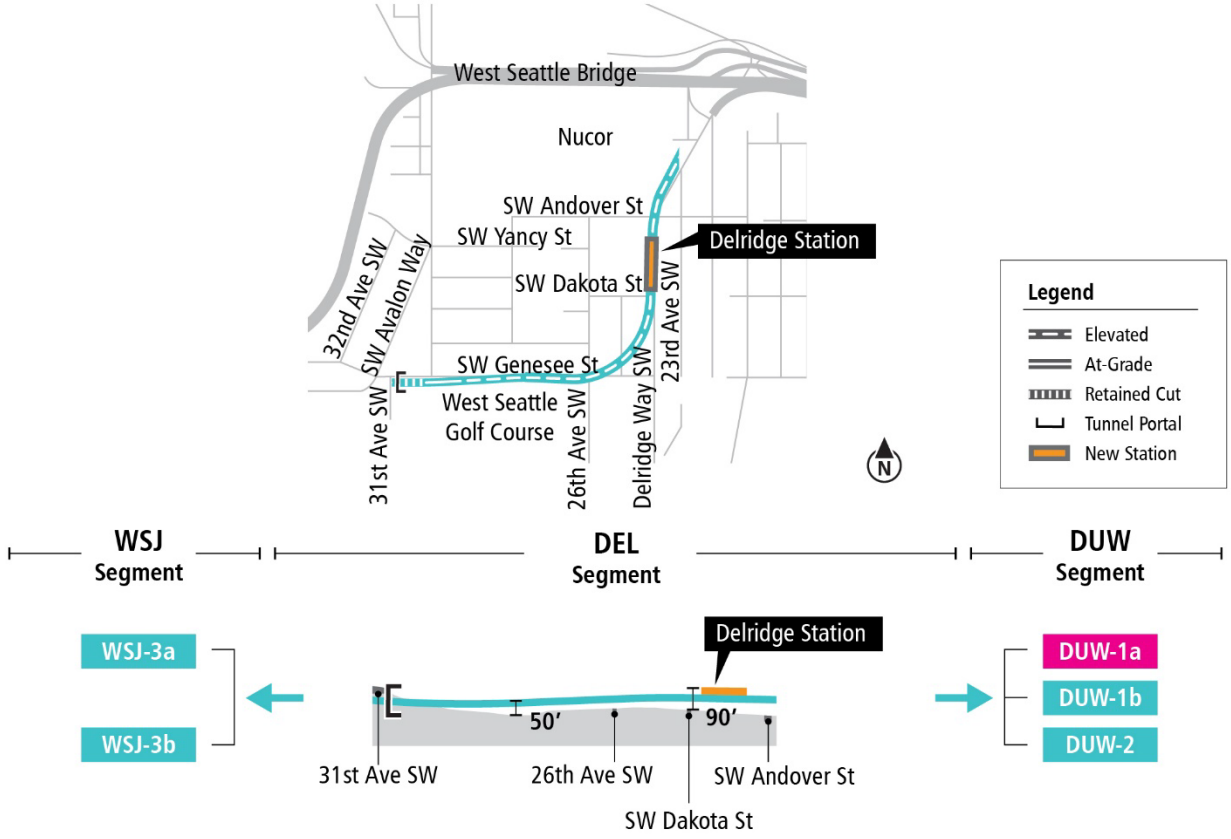


Delridge Way Station Lower Height Alternative (DEL-4)

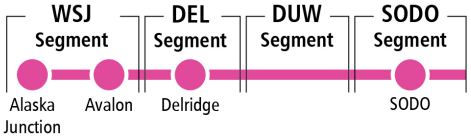
Alternative DEL-4 would follow the same alignment as Alternative DEL-3 to the station but would be at a lower elevation to connect to tunnel alternatives in the West Seattle Junction Segment. The height of the guideway would range between a tunnel and approximately 60 feet high. The top of the station would be approximately 90 feet high. Station access would be the same as Alternative DEL-3.

From the station, the alternative would continue south on the west side of Delridge Way Southwest and then turn west at Southwest Genesee Street, crossing Southwest Genesee Street to run along the northern edge of the West Seattle Golf Course. A tunnel portal for connecting to tunnel alternatives in the West Seattle Junction Segment would be in the northwest corner of the West Seattle Golf Course, south of Southwest Genesee Street and east of 31st Avenue Southwest. The plan and profile for this alternative is shown on Figure 2-30.

Figure 2-30. Plan and Profile for Delridge Way Station Lower Height Alternative (DEL-4)



Diagrams are not to scale and all measurements are approximate for illustration purposes only.

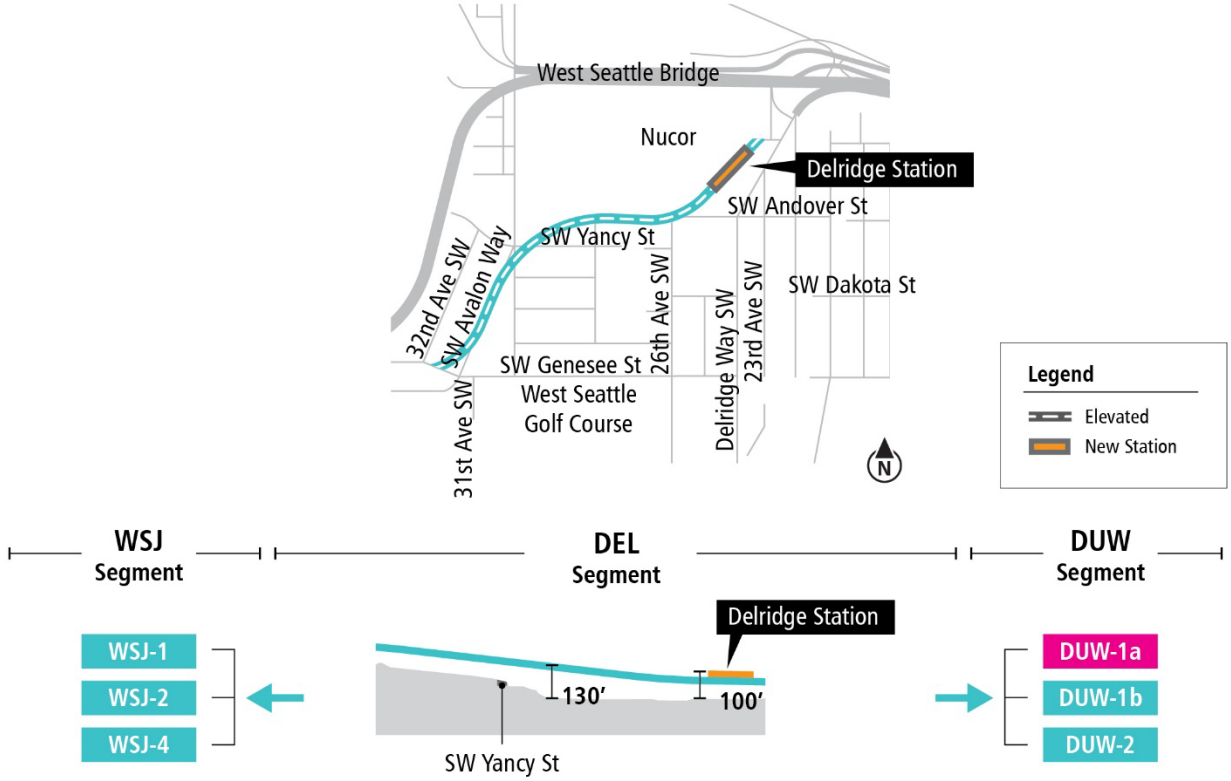


Andover Street Station Alternative (DEL-5)

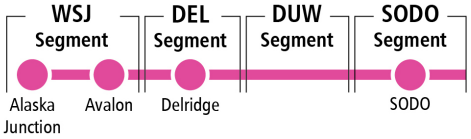
Alternative DEL-5 would be on an elevated guideway on the west side of Delridge Way Southwest, north of Southwest Andover Street. The height of the guideway would range between approximately 50 feet and 130 feet high. The alignment would travel west along Southwest Andover Street on an elevated guideway then south along Southwest Avalon Way in the vicinity of Southwest Yancy Street. The guideway would continue south along Southwest Avalon Way and turn west on the north side of Southwest Genesee Street. The highest portion of the guideway would be where the alignment climbs from the station in the Delridge valley up to the West Seattle Junction.

The station would be elevated, north of Southwest Andover Street and west of Delridge Way Southwest, in a northeast-southwest orientation. The plan and profile for this alternative is shown on Figure 2-31. The top of the station structure would be approximately 100 feet high.

Figure 2-31. Plan and Profile for Andover Street Station Alternative (DEL-5)



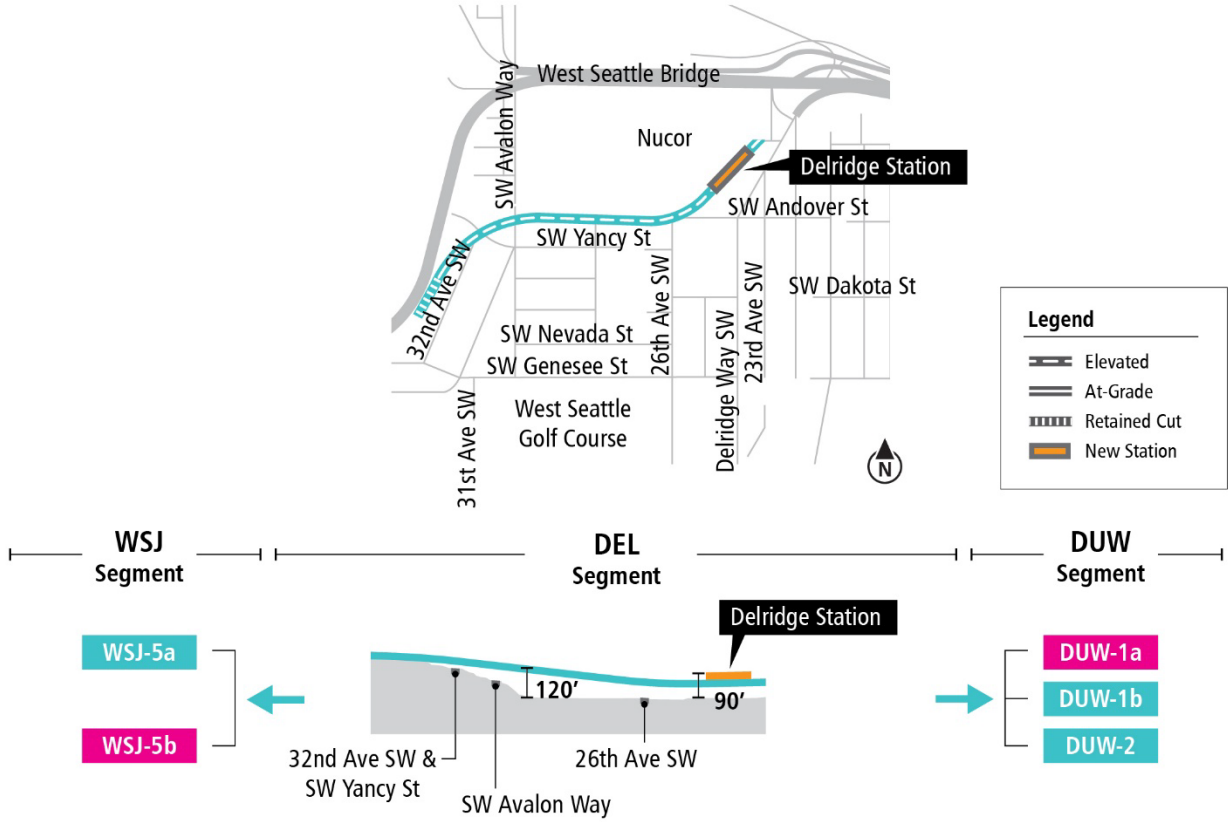
Diagrams are not to scale and all measurements are approximate for illustration purposes only.



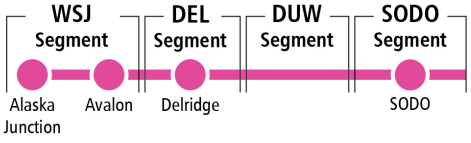
Andover Street Station Lower Height Alternative (DEL-6a)

Alternative DEL-6a (previously Alternative DEL-6 in the Draft EIS) would be similar to Alternative DEL-5 up to and including the station. The top of the station structure would be approximately 90 feet high. The height of the guideway would range between a retained-cut and approximately 120 feet high. The elevated guideway would cross over Southwest Avalon Way and then turn south in the vicinity of 32nd Avenue Southwest to travel south along the east side of the West Seattle Bridge connection to Fauntleroy Way Southwest, transitioning from elevated into a retained cut. The alignment would turn west in the vicinity of Southwest Genesee Street in a retained cut, passing below Southwest Genesee Street. The plan and profile for this alternative is shown on Figure 2-32.

Figure 2-32. Plan and Profile for Andover Street Station Lower Height Alternative (DEL-6a)



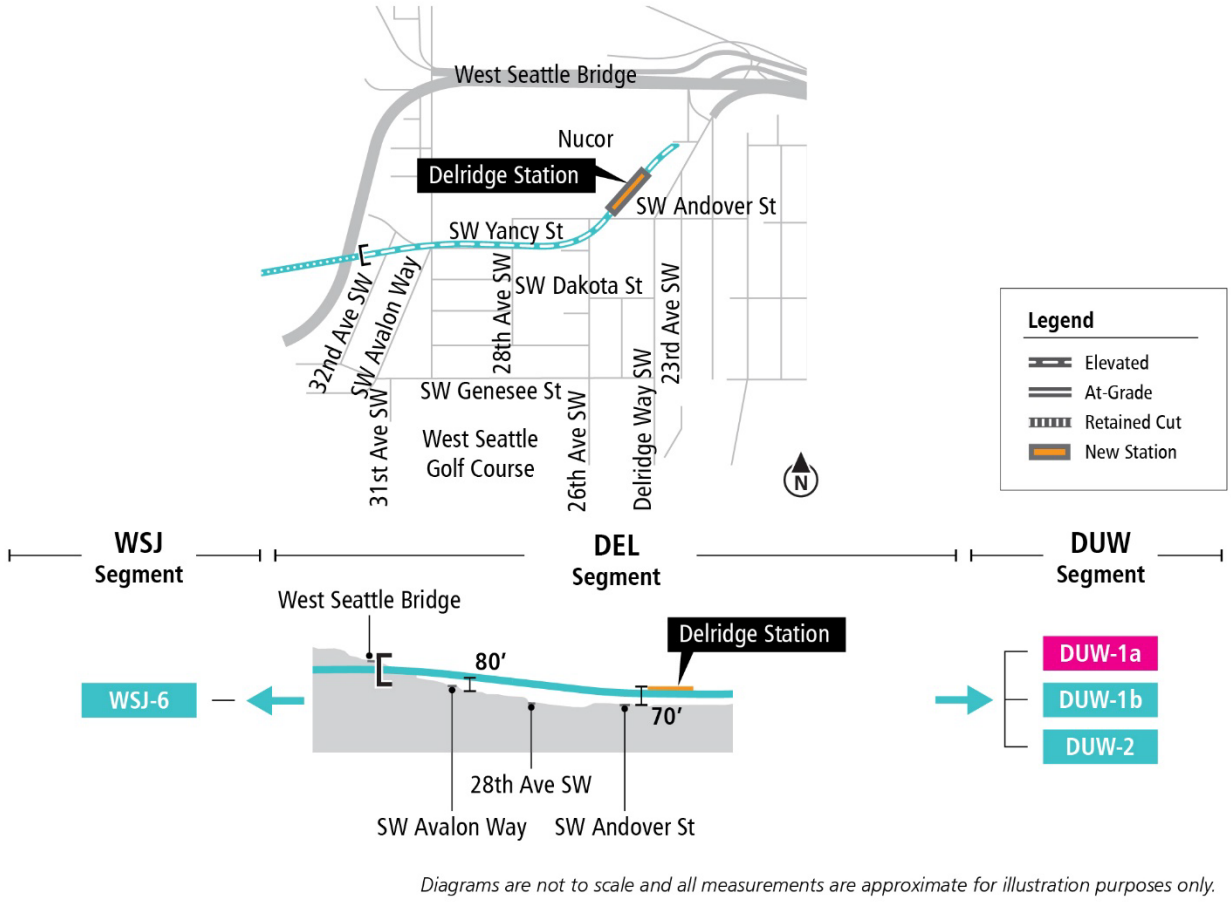
Diagrams are not to scale and all measurements are approximate for illustration purposes only.



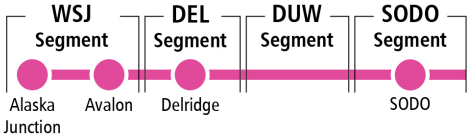
Andover Street Station Lower Height No Avalon Station Tunnel Connection (DEL-7)

Alternative DEL-7 is included at the direction of the Sound Transit Board (Motion 2022-57) to study elimination of the Avalon Station as a potential cost-savings measure. This refinement would be similar to Preferred Option DEL-6b up to and including Delridge Station and reflects a more direct alignment between the Delridge Station and the Alaska Junction Station with the elimination of an Avalon Station in the West Seattle Junction Segment. The top of the station structure would be approximately 70 feet high. The height of the guideway would range between approximately 30 feet and 80 feet. South of the station, the elevated guideway would continue west along Southwest Yancy Street and cross to the south side of Southwest Andover Street in an elevated guideway. A tunnel portal leading to Alternative WSJ-6 in the West Seattle Junction Segment would be in the vicinity of 32nd Avenue Southwest, east of the West Seattle Bridge. 32nd Avenue Southwest would no longer connect to Southwest Andover Street, but would end in a cul-de-sac south of the tunnel portal. The tunnel would continue west under the West Seattle Bridge towards 35th Avenue Southwest. The plan and profile for this alternative is shown on Figure 2-33.

Figure 2-33. Plan and Profile for Andover Street Station Lower Height No Avalon Station Tunnel Connection (DEL-7)



Diagrams are not to scale and all measurements are approximate for illustration purposes only.



2.1.3.4 West Seattle Junction Segment

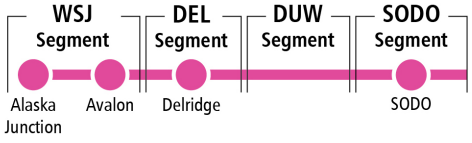
The West Seattle Junction Segment includes the area generally west of 31st Avenue Southwest, between Southwest Charleston Street and Southwest Hudson Street. Most alternatives and design options would have two stations: Avalon and Alaska Junction. One alternative would have only the Alaska Junction Station. The West Seattle Junction Segment alternatives and design options are shown on Figure 2-34.

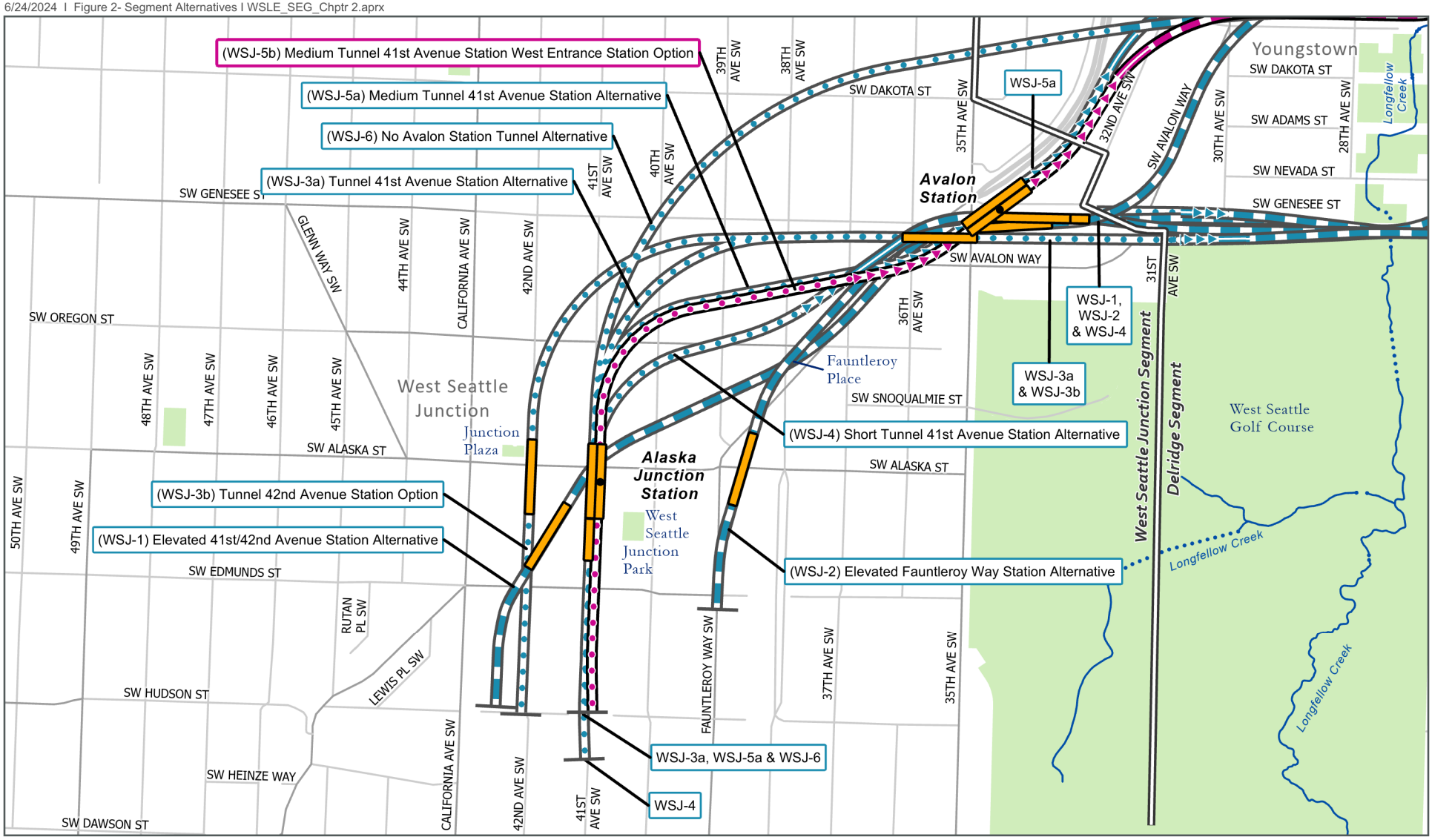
2.1.3.4.1 Preferred Alternative

Medium Tunnel 41st Avenue Station West Entrance Station Option (WSJ-5b)

Preferred Option WSJ-5b is a refinement of Alternative WSJ-5 analyzed in the Draft EIS, and it was refined based on the Sound Transit Board's direction to explore an option to shift a station entrance to 42nd Avenue Southwest at the Alaska Junction Station to improve access to the Alaska Junction. Preferred Option WSJ-5b begins in a retained cut south of Southwest Yancy Street and follows the east side of the West Seattle Bridge connection to Fauntleroy Way Southwest. Southwest Genesee Street would be permanently closed approaching 35th Avenue Southwest. This alignment enters a tunnel at Southwest Genesee Street and 37th Avenue Southwest. The alignment then curves to the southwest between 37th Avenue Southwest and 41st Avenue Southwest. It terminates at Southwest Hudson Street, with tail tracks in a north-south orientation under 41st Avenue Southwest. The plan and profile for this alternative is shown on Figure 2-35. Stations would be located as follows:

- **Avalon Station:** The Avalon Station would be in a lidded retained cut south of Southwest Genesee Street, beneath 35th Avenue Southwest with the top of the station structure approximately 30 feet above the existing ground surface. Station entrances would be on either side of 35th Avenue Southwest.
- **Alaska Junction Station:** The Alaska Junction Station would be in a tunnel beneath 41st Avenue Southwest and Southwest Alaska Street. Station entrances would be on either side of Southwest Alaska Street. Preferred Option WSJ-5b is a station option to Alternative WSJ-5a and would be the same as Alternative WSJ-5a, except the entrance south of Southwest Alaska Street would be on the west side of 41st Avenue Southwest, closer to the Alaska Junction. The entrance north of Southwest Alaska Street would not change.





Source: City of Seattle, King County (2023).

Preferred Alternative
- Elevated
- Tunnel
- At-Grade
- Retained Cut

Other Alternatives
- Elevated
- Tunnel
- At-Grade
- Retained Cut

Station (● *Indicates Preferred Alternative*)
- New

- Segment Line
- Stream
- Piped Stream
- Park

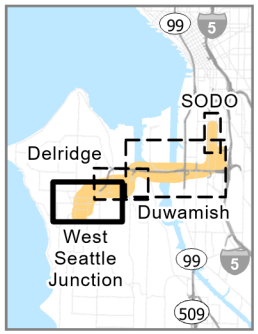
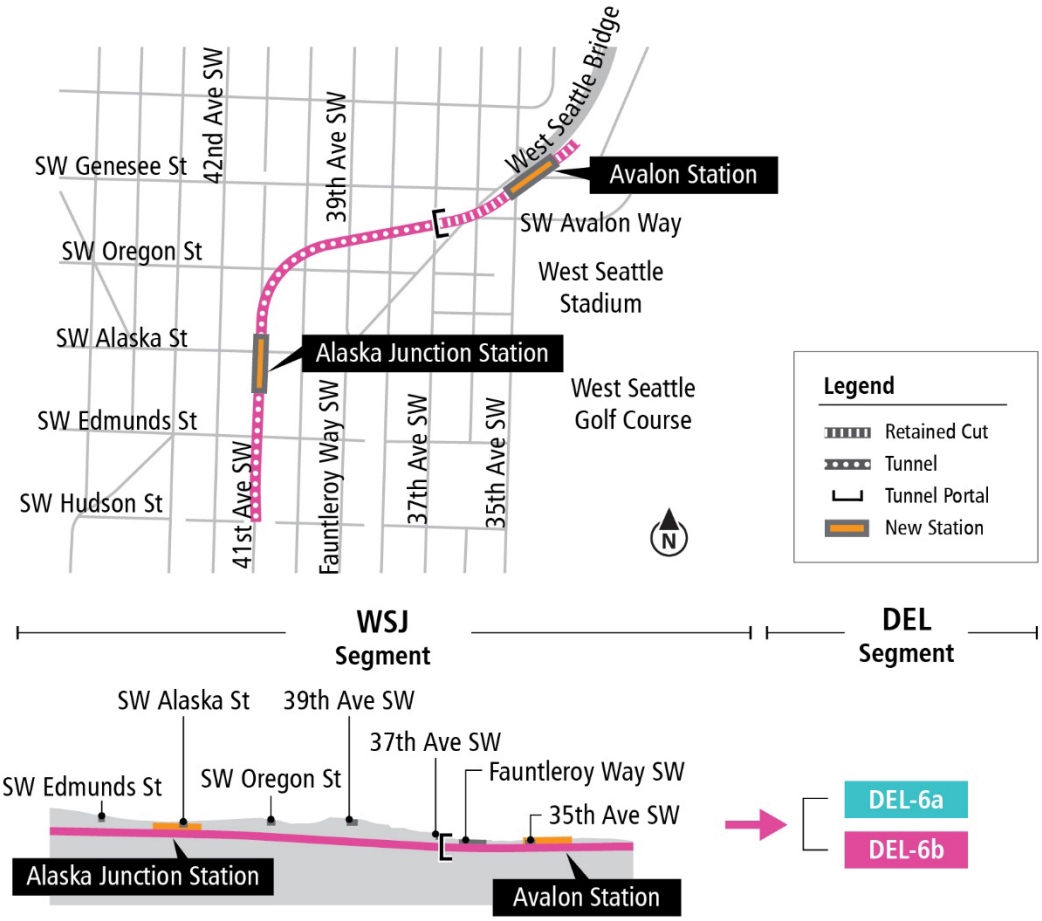


FIGURE 2-34
West Seattle Junction Segment Alternatives
West Seattle Junction Segment

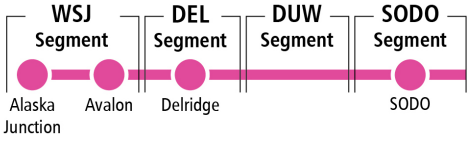
West Seattle Link Extension

0 500 1,000 Feet
N

Figure 2-35. Plan and Profile for Preferred Medium Tunnel 41st Avenue Station West Entrance Station Option (WSJ-5b)



Diagrams are not to scale and all measurements are approximate for illustration purposes only.



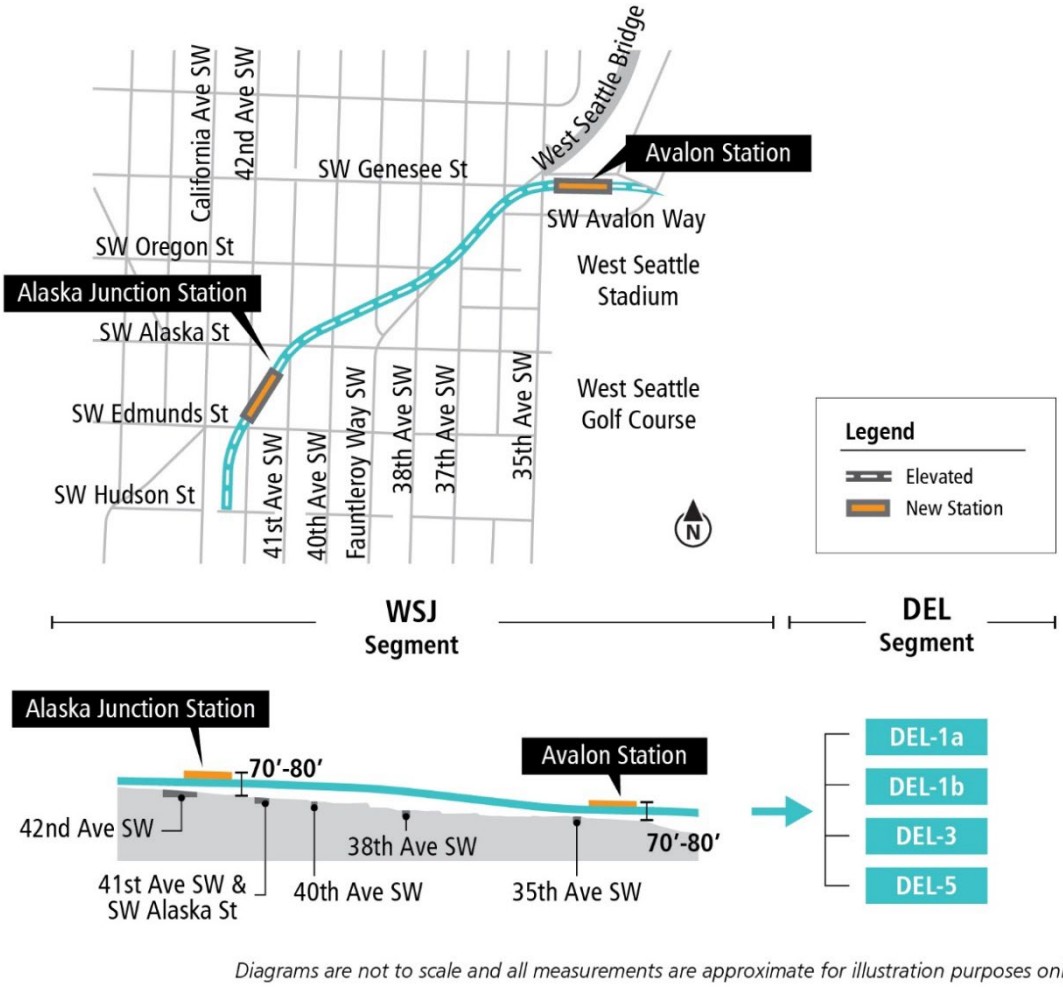
2.1.3.4.2 Other Build Alternatives

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

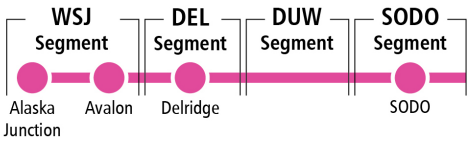
Alternative WSJ-1 would be elevated along the south side of Southwest Genesee Street between 31st Avenue Southwest and Fauntleroy Way Southwest. The height of the guideway would range between approximately 30 feet and 80 feet high. The alternative would cross to the west side of Fauntleroy Way Southwest. The guideway would turn south near 41st Avenue Southwest and Southwest Alaska Street, continuing to Southwest Hudson Street. The guideway would end on the west side of 42nd Avenue Southwest and include tail tracks south of the Alaska Junction Station. The top of the station structures would depend on which alternative it connects with in the Delridge Segment but would be approximately 70 to 80 feet high. The plan and profile for this alternative is shown on Figure 2-36. Stations would be located as follows:

- **Avalon Station:** The Avalon Station would be elevated along the south side of Southwest Genesee Street, east of 35th Avenue Southwest.
- **Alaska Junction:** The Alaska Junction Station would be elevated between 41st Avenue Southwest and 42nd Avenue Southwest, south of Southwest Alaska Street.

Figure 2-36. Plan and Profile for Elevated 41st/42nd Avenue Station Alternative (WSJ-1)



Diagrams are not to scale and all measurements are approximate for illustration purposes only.

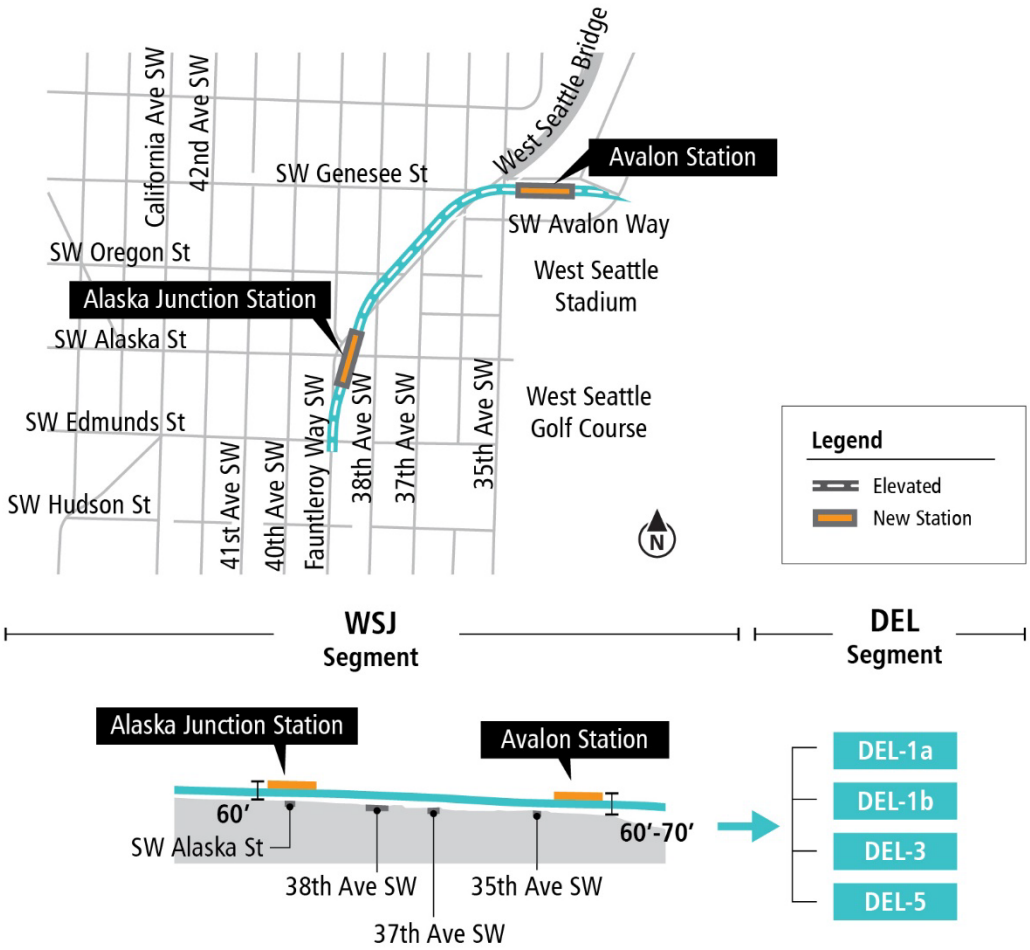


Elevated Fauntleroy Way Station Alternative (WSJ-2)

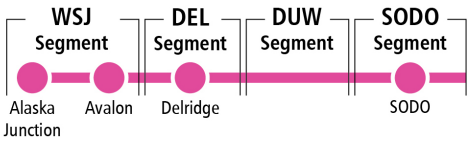
Alternative WSJ-2 would be elevated along the south side of Southwest Genesee Street between 31st Avenue Southwest and Fauntleroy Way Southwest. The height of the guideway would range between approximately 30 feet and 70 feet high. The alignment would head southwest on Fauntleroy Way Southwest and continue along the west side of Fauntleroy Way Southwest. The guideway would cross to the east side of Fauntleroy Way Southwest south of Southwest Oregon Street. Elevated tail tracks would begin south of the Alaska Junction Station, ending in the Fauntleroy Way Southwest right-of-waypast Southwest Edmunds Street. The plan and profile for this alternative is shown on Figure 2-37. Stations would be located as follows:

- **Avalon Station:** The Avalon Station would be elevated along the south side of Southwest Genesee Street and east of 35th Avenue Southwest. The top of the station structure would depend on which alternative it connects with in the Delridge Segment, but it would be approximately 60 to 70 feet high.
- **Alaska Junction Station:** The Alaska Junction Station would be elevated southeast of Fauntleroy Way Southwest straddling Southwest Alaska Street. The top of the station structure would be approximately 60 feet high.

Figure 2-37. Plan and Profile for Elevated Fauntleroy Way Station Alternative (WSJ-2)



Diagrams are not to scale and all measurements are approximate for illustration purposes only.

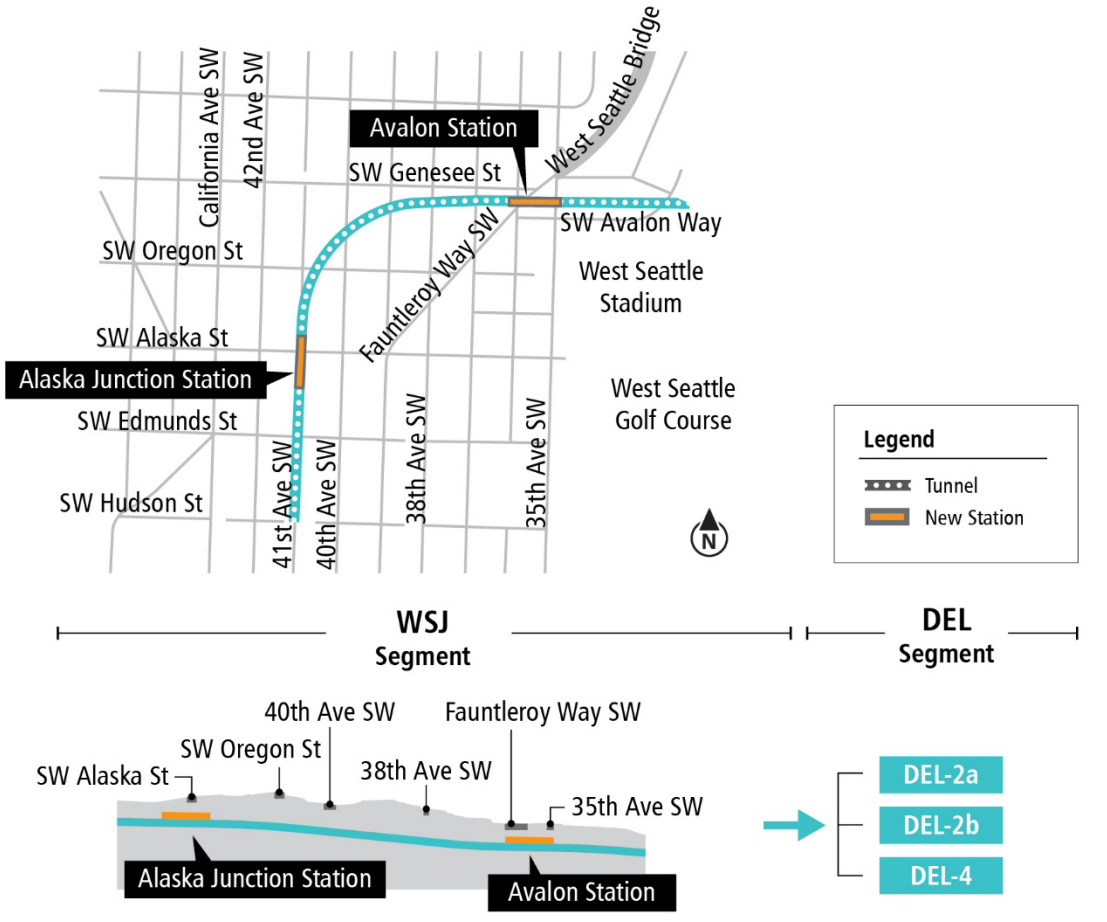


Tunnel 41st Avenue Station Alternative (WSJ-3a)

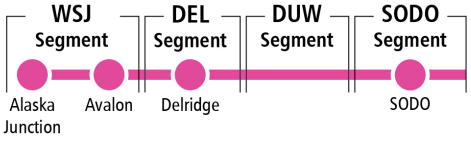
Alternative WSJ-3a would be in a tunnel under Southwest Genesee Street heading west from 31st Avenue Southwest then curve to the southwest between 37th Avenue Southwest and 41st Avenue Southwest. The tunnel would end in the vicinity of Southwest Hudson Street, with tail tracks in a north-south orientation under 41st Avenue Southwest. The guideway would be entirely in a tunnel. The plan and profile for this alternative is shown on Figure 2-38. Stations would be located as follows:

- **Avalon Station:** The Avalon Station would be beneath Fauntleroy Way Southwest. Station entrances would be on the west side of Fauntleroy Way Southwest and on the east side of 35th Avenue Southwest.
- **Alaska Junction Station:** The Alaska Junction Station would be beneath 41st Avenue Southwest and Southwest Alaska Street. Station entrances would be on either side of Southwest Alaska Street along the east side of 41st Avenue Southwest.

Figure 2-38. Plan and Profile for Tunnel 41st Avenue Station Alternative (WSJ-3a)



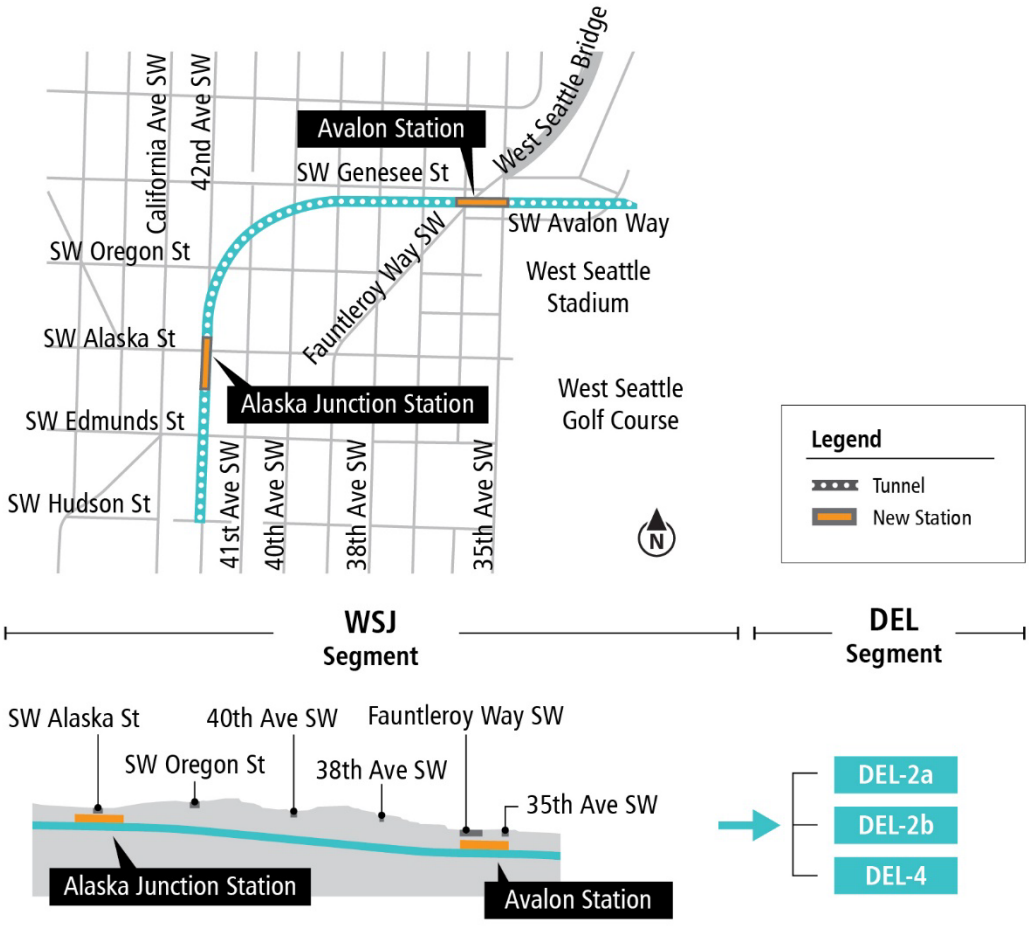
Diagrams are not to scale and all measurements are approximate for illustration purposes only.



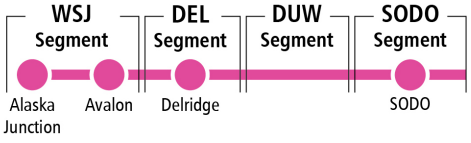
Tunnel 42nd Avenue Station Option (WSJ-3b)

Option WSJ-3b would be the same as Alternative WSJ-3a, except the tunnel would extend to 42nd Avenue Southwest instead of 41st Avenue Southwest. The tunnel would end in the vicinity of Southwest Hudson Street, with tail tracks in a north-south orientation under 42nd Avenue Southwest. The Avalon Station would be the same as described for the Tunnel 41st Avenue Alternative. The Alaska Junction Station would be in a tunnel beneath 42nd Avenue Southwest and Southwest Alaska Street. Station entrances would be on either side of Southwest Alaska Street, with one on the east side and one on the west side of 42nd Avenue Southwest. The plan and profile for this option is shown on Figure 2-39.

Figure 2-39. Plan and Profile for Tunnel 42nd Avenue Station Option (WSJ-3b)



Diagrams are not to scale and all measurements are approximate for illustration purposes only.

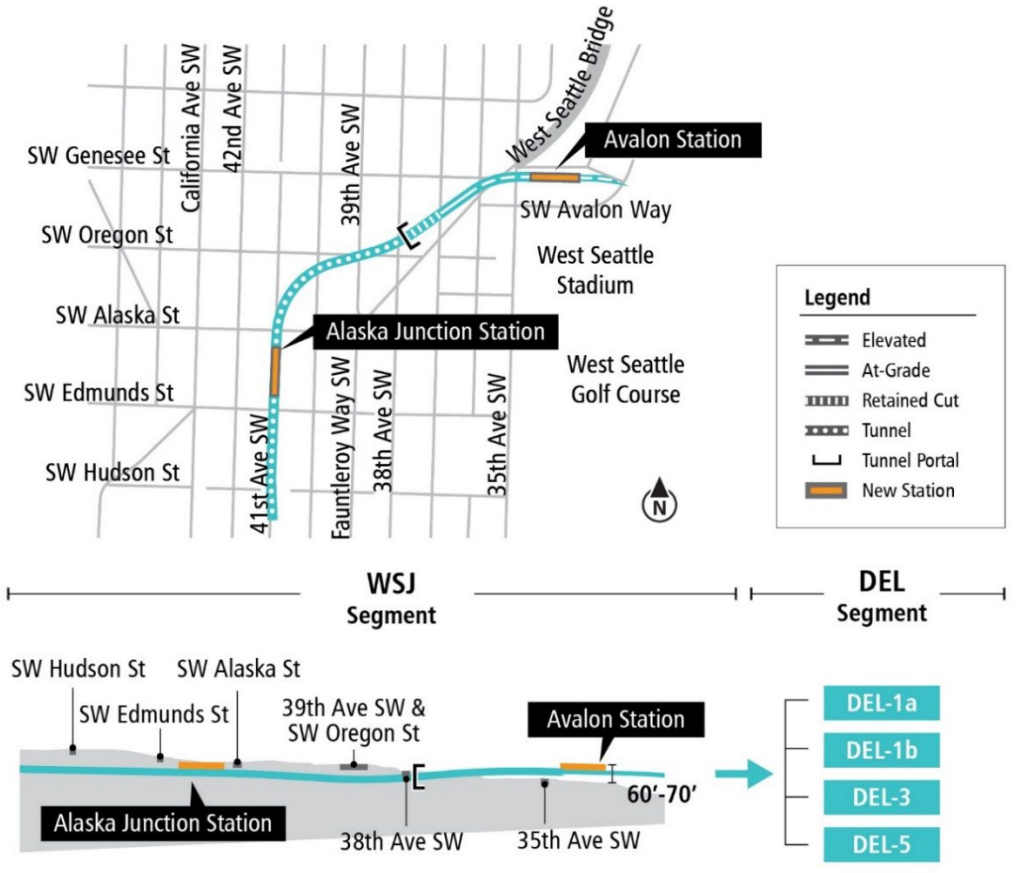


Short Tunnel 41st Avenue Station Alternative (WSJ-4)

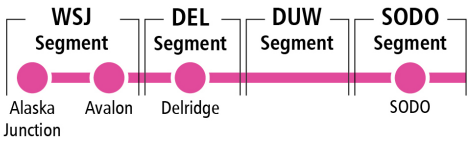
Alternative WSJ-4 would be on elevated guideway along the south side of Southwest Genesee Street from 31st Avenue Southwest to the west side of Fauntleroy Way Southwest. It would continue along the west side of Fauntleroy Way Southwest on elevated guideway before transitioning to at-grade near 37th Avenue Southwest. 37th Avenue Southwest and 38th Avenue Southwest would be modified to end in a turnaround between Southwest Genesee Street and Fauntleroy Way Southwest. The guideway would turn west near Southwest Oregon Street and transition into a tunnel with a portal in the vicinity of Southwest Oregon Street and 38th Avenue Southwest. The tunnel would turn south and end south of Southwest Hudson Street, with tail tracks in a north-south orientation along and under 41st Avenue Southwest. The height of the guideway would range between a tunnel and approximately 40 feet high. The plan and profile for this option is shown on Figure 2-40. Stations would be located as follows:

- **Avalon Station:** The Avalon Station would be elevated along the south side of Southwest Genesee Street and east of 35th Avenue Southwest. The top of the station structure would be approximately 60 to 70 feet high.
- **Alaska Junction Station:** The Alaska Junction Station would be in a tunnel beneath 41st Avenue Southwest and south of Southwest Alaska Street. Station entrances would be on Southwest Alaska Street and Southwest Edmunds Street.

Figure 2-40. Plan and Profile for Short Tunnel 41st Avenue Station Alternative (WSJ-4)



Diagrams are not to scale and all measurements are approximate for illustration purposes only.

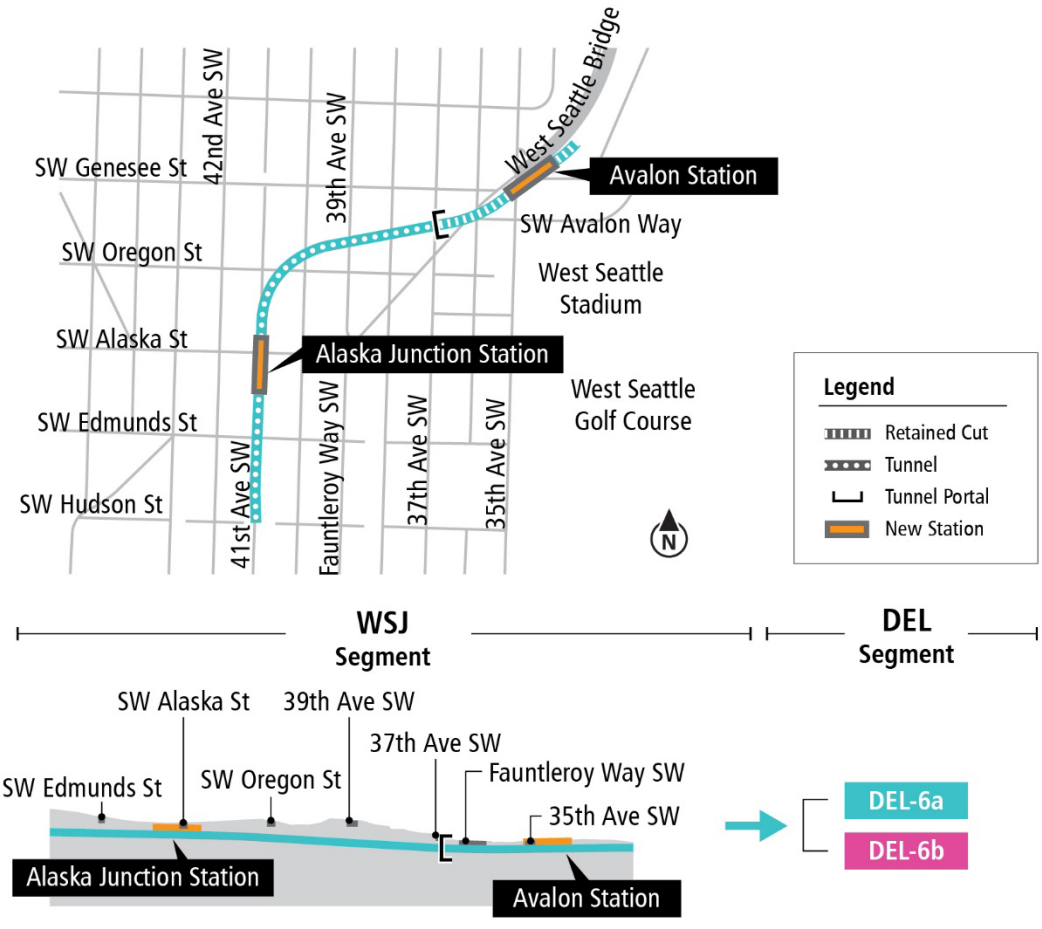


Medium Tunnel 41st Avenue Station Alternative (WSJ-5a)

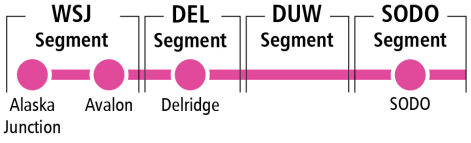
Alternative WSJ-5a (previously WSJ-5 in the Draft EIS) begins in a retained cut south of Southwest Yancy Street and follows the east side of the West Seattle Bridge connection to Fauntleroy Way Southwest. Southwest Genesee Street would be permanently closed approaching 35th Avenue Southwest. This alignment enters a tunnel at Southwest Genesee Street and 37th Avenue Southwest. The alignment then curves southwest west of 37th Avenue Southwest to 41st Avenue Southwest. It terminates at Southwest Hudson Street, with tail tracks in a north-south orientation under 41st Avenue Southwest. The plan and profile for this alternative is shown on Figure 2-41. Stations would be located as follows:

- **Avalon Station:** The Avalon Station would be in a lidded retained cut south of Southwest Genesee Street, beneath 35th Avenue Southwest with the top of the station structure approximately 30 feet above the existing ground surface. Station entrances would be on either side of 35th Avenue Southwest.
- **Alaska Junction Station:** The Alaska Junction Station would be in a tunnel beneath 41st Avenue Southwest and Southwest Alaska Street. Station entrances would be on either side of Southwest Alaska Street along the east side of 41st Avenue Southwest.

Figure 2-41. Plan and Profile for Medium Tunnel 41st Avenue Station Alternative (WSJ-5a)



Diagrams are not to scale and all measurements are approximate for illustration purposes only.

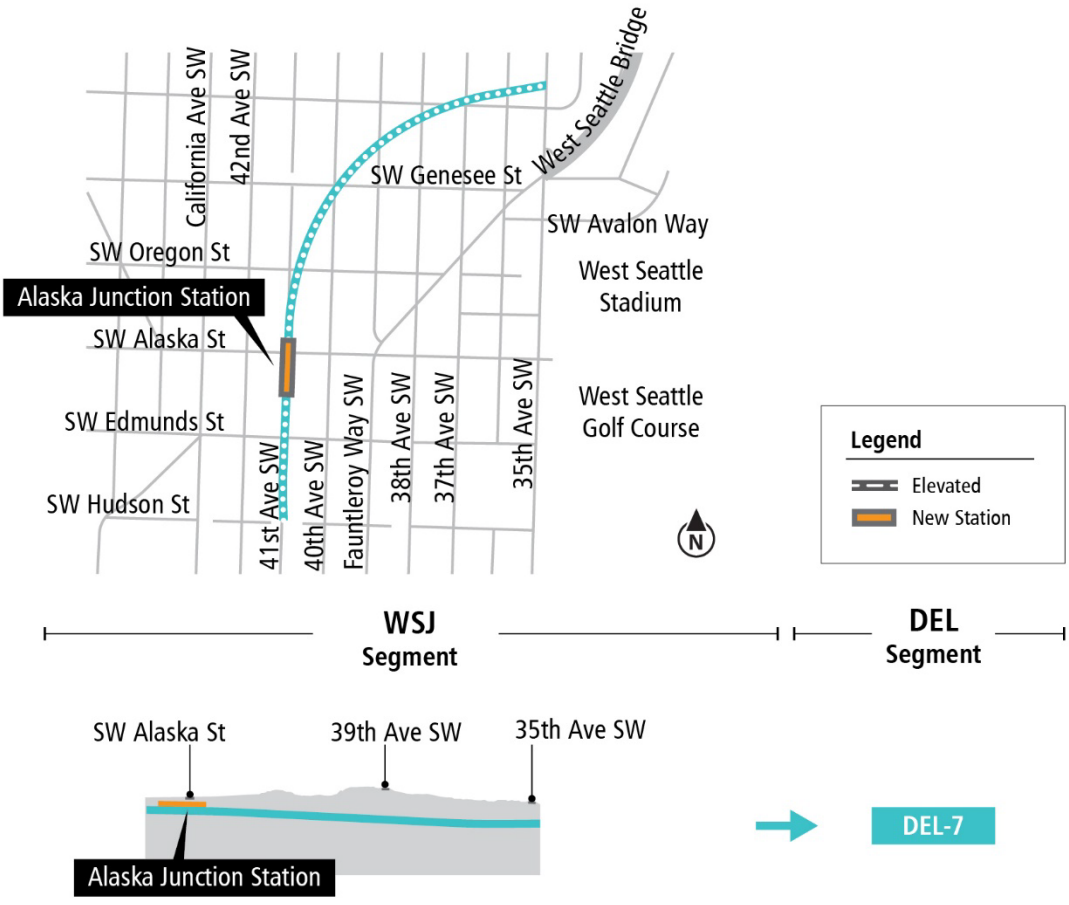


No Avalon Station Tunnel (WSJ-6)

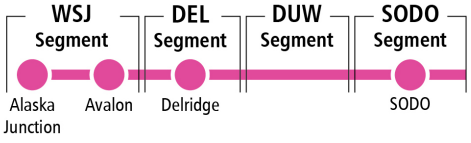
Alternative WSJ-6 is included at the direction of the Sound Transit Board (Motion 2022-57) to study elimination of the Avalon Station as a cost-savings measure. Alternative WSJ-6 would continue in a tunnel from where it would connect to Alternative DEL-7 in the Delridge Segment, at 35th Avenue Southwest between Southwest Andover Street and Southwest Dakota Street. The tunnel would curve southwest to 41st Avenue Southwest. It would terminate at Southwest Hudson Street, with tail tracks in a north-south orientation under 41st Avenue Southwest. The guideway would be entirely in a tunnel. The plan and profile for this alternative is shown on Figure 2-42. This alternative does not include an Avalon Station. The station would be located as follows:

- **Alaska Junction Station:** The Alaska Junction Station would be same as the station described for WSJ-5a.

Figure 2-42. Plan and Profile for No Avalon Station Tunnel Alternative (WSJ-6)



Diagrams are not to scale and all measurements are approximate for illustration purposes only.



2.2 No Build Alternative

No Build Alternative

The No Build Alternative includes the transportation system and environment as they would exist without the proposed project.

The No Build Alternative includes the transportation system and environment as they would exist in 2042 without the proposed project, and it provides a baseline condition for comparing impacts of the Build Alternatives and design options. The year 2042 is used as the analysis year because it aligns with full buildout of the light rail capital projects included in the Sound Transit 3 Plan under the realignment target schedule. Under the affordable schedule, only the south Kirkland to Issaquah light rail line (the 4 Line) would not be complete by 2042. The No Build Alternative includes projects, funding packages, and proposals in the central Puget Sound region that are planned to occur with or without the West Seattle Link Extension. No Build Alternative improvements include transit, roadway, and other transportation actions by state, regional, and local agencies that are currently funded or committed, and those that are likely to be implemented based on approved and committed funding.

The No Build Alternative for the West Seattle Link Extension assumes the following major rail improvements by Sound Transit:

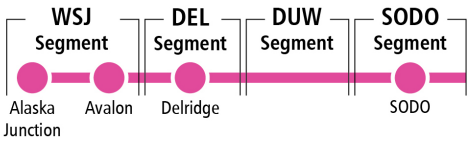
- Ballard Link Extension from SODO to Ballard with a new downtown tunnel (northern extension of the 1 Line)
- Extension of the existing Central Link light rail spine north to Everett and south to Tacoma Dome (southern extension of the 1 Line)
- Extension the 2 Line to downtown Redmond
- New Link light rail line from south Kirkland to Issaquah (the 4 Line)
- Infill Link stations at Northeast 130th Street, South Graham Street, and South Boeing Access Road in Seattle
- Sounder South Line capacity enhancements and extension to Tillicum and DuPont

The No Build Alternative includes regional highway improvements listed in the State Transportation Improvement Plan and Puget Sound Regional Council Regional Capacity Projects List, local improvements in the City of Seattle Capital Improvement Program (City of Seattle 2018), and bus service enhancements based on the Metro Connects long-range plan (Metro 2021) and Sound Transit's Long-Range Plan (Sound Transit 2014a), with frequency upgrades and restructures along and near the project corridor. The No Build Alternative also includes redevelopment projects at Terminal 5 by the Northwest Seaport Alliance. Appendix N.1 describes the major projects assumed in the No Build Alternative by jurisdiction.

2.3 Operations and Maintenance

2.3.1 Vehicles and Operation

The West Seattle Link Extension would typically operate 20 hours a day Monday through Saturday and 18 hours a day on Sundays and holidays. Preliminary operating plans have two trains deployed between approximately 4:30 a.m. and 5 a.m., to be staged for the beginning of morning service. Similarly, two trains may operate between approximately 1 a.m. and 1:30 a.m. as they return to the operations and maintenance facility or terminus stations at the close of



service each day. Light rail trains would operate with up to four cars, although fewer cars could be used during off-peak periods.

Train frequencies are established based on ridership demand and other service standards and would be finalized in an updated Rail Fleet Management Plan. Table 2-2 shows the preliminary proposed operating plan, or service schedule, for weekdays. Weekend and holiday service would have the same train frequencies as the early/late frequencies shown in the table.

Table 2-2. Weekday Service Schedule

Service Period	Time Period	Service Level	Train Frequency (minutes)
Early morning	5 a.m. to 6 a.m.	Early	10
Morning peak	6 a.m. to 8:30 a.m.	Peak	6
Midday	8:30 a.m. to 3 p.m.	Base	10
Afternoon peak	3 p.m. to 6:30 p.m.	Peak	6
Evening	6:30 p.m. to 10 p.m.	Base	10
Evening late night	10 p.m. to 1 a.m.	Late	15

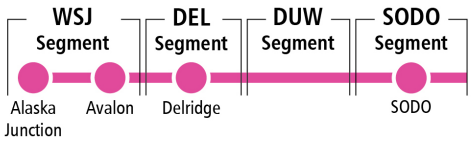
Additional light rail vehicles would be required to operate the West Seattle Link Extension. Conventional low-floor light rail vehicles would be used to provide level boarding for all passengers and would be easily accessible by people with disabilities. A typical light rail train is shown on Figure 2-43.

Figure 2-43. Link Light Rail Train

2.3.2 Maintenance

Light rail vehicles would be stored, deployed, maintained, inspected, and repaired primarily at operations and maintenance facilities. The Operations and Maintenance Facility Central, on South Forest Street in SODO, and the Operations and Maintenance Facility East in Bellevue are currently in operation. Sound Transit will construct two additional facilities north and south of Seattle as part of the Sound Transit 3 system expansion program, with a total planned system capacity of 496 light rail vehicles upon completion. The Operations and Maintenance Facility South is planned to be operational between 2030 and 2032, and the Operations and Maintenance Facility North is planned to be operational between 2037 and 2041. The project has been designed to integrate into the system of existing and planned operations and maintenance facilities. The West Seattle Link Extension would connect into the existing Operations and Maintenance Facility Central. Construction of the connection would have only minimal temporary effects on the operation of the facility and would not impact the ability to maintain the light rail system or vehicles.

Terminus stations would have tail tracks and provisions for light maintenance activities such as cleaning the interiors of vehicles. Light rail vehicle, track, and systems maintenance occurs between 1 a.m. and 5 a.m. daily, outside of normal hours of light rail service.



Light rail vehicles operating on the West Seattle Link Extension would be stored, deployed, maintained, inspected, and repaired primarily at the Operations and Maintenance Facility Central. Capacity at the Operations and Maintenance Facility Central will be made available to meet these needs by shifting work to the Operation and Maintenance Facility South. When the West Seattle Link Extension is connected to the existing Downtown Seattle Transit Tunnel in 2039, light rail vehicles operating on the line between Alaska Junction Station and Everett Station would also be stored, deployed, maintained, inspected, and repaired at the new Operations and Maintenance Facility North.

2.4 Minimum Operable Segment

Sound Transit could build the project in phases. Due to funding or other factors, Sound Transit could construct a smaller portion of the project, deferring completion of the full project to Alaska Junction. Sound Transit has developed a M.O.S. for analysis in the event the full project cannot be built at one time.

The West Seattle Link Extension M.O.S. consists of the West Seattle Link Extension from just north of the proposed new SODO Station to the Delridge Station. This M.O.S. can be applied to all of the West Seattle Link Extension alternatives and design options. The M.O.S. is shown in Appendix J.

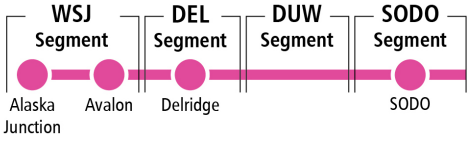
Minimum Operable Segment

A minimum operable segment (M.O.S.) is defined by the Federal Transit Administration (FTA) as "a segment of the Locally Preferred Alternative that provides the most cost-effective solution with the greatest benefits for the project." The M.O.S. must be able to function as a standalone project and not be dependent on any future segments being constructed (FTA 2008). The end-of-line station for an M.O.S is also considered an interim terminus because it is assumed that the project would be fully built out at a later date.

The tail tracks for the M.O.S. would extend approximately 500 feet southwest of Delridge Station. Additional bus stops and bus layover spaces would be needed at Delridge Station either onsite or on local streets to accommodate additional transit connections needed at the Delridge Station. A track connection to the existing Operations and Maintenance Facility Central in SODO is also assumed as part of the M.O.S. The Delridge Station was identified as the M.O.S. because it would be the first station in the West Seattle area and would provide an opportunity for transit integration to connect areas to the south (White Center and Burien) as well as the rest of the West Seattle peninsula. The Avalon Station is not a potential terminus, as it would have added cost for construction of the guideway and station without substantially increasing ridership.

2.5 Alternatives Development and Scoping

As described in Chapter 1, the project is the result of a multi-year planning process. After voter approval for funding the Sound Transit 3 Plan, which includes the project, Sound Transit continued to build on past planning with the Alternatives Development process described below. The FTA is relying on the local planning process to inform the environmental review process under the National Environmental Policy Act (NEPA), consistent with federal regulations (Code of Federal Regulations Title 23, Section 450.318) that allow for it, and the Fixing America's Surface Transportation Act and Infrastructure Investment and Jobs Act that encourage it.



2.5.1 Development of Draft EIS Alternatives

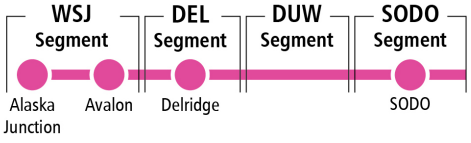
The West Seattle Link Extension is an element of the Sound Transit 3 Plan, financing for which was approved by voters in November 2016. The Representative Project in the Sound Transit 3 Plan identified the mode as light rail, the general project corridor, and the station areas to be served. To identify alternatives to study in the EIS, Sound Transit completed an Alternatives Development process that included a three-level screening process. The Alternatives Development process began with early scoping under Washington's State Environmental Policy Act (SEPA) in February 2018. Sound Transit published an early scoping notice in the SEPA register on February 2, 2018, which initiated early scoping and started a 30-day comment period. Additional public notification was provided with mailed postcards, print and online advertisements, and social media notices. Three public open houses and an agency meeting were held during this comment period, as well as an online open house. During early scoping, Sound Transit requested comments on the preliminary purpose and need statement, potential refinements to the Sound Transit 3 Representative Project (see Appendix M, Summary of Alternatives Development and Initial Assessment Process, for a map of the Representative Project), and potential community benefits and impacts. Comments were accepted by mail, email, online comment forms, and on comment boards and maps at the open houses (both in person and online).

Comments received from government entities (agencies, advisory boards/commissions, and educational institutions), Tribes, businesses, and community organizations made specific recommendations on alternatives to the Sound Transit 3 Representative Project and issues to study, including local and regional mobility, freight mobility and infrastructure, transit integration, TOD, hazardous materials and contaminated sites, air quality, utilities, trails, vibration, and electromagnetic interference. Most of the public comments focused on elevated alignments in West Seattle, with many suggesting a variety of alternatives to these elevated alignments, including tunnels. Additional information on the early scoping process is described in Appendix F, Public Involvement, Tribal Consultation, and Agency Coordination.

Based on feedback received during early scoping, Sound Transit developed an initial set of alternatives. Sound Transit then conducted a three-level screening process (Level 1, Level 2, and Level 3) that analyzed and compared the alternatives using evaluation criteria developed from the project's preliminary purpose and need. For each evaluation criterion, measures and evaluation methods were developed and applied at each level of screening. The evaluation criteria are as follows:

- Reliable service and travel times
- Regional connectivity, transit capacity, and projected transit demand
- Regional centers served and regional plan consistency
- Sound Transit 3 Plan consistency, technical feasibility, and financial sustainability
- Historically underserved populations
- Station area land use plan consistency, modal integration, and environmental effects
- Station area development opportunities, traffic operations, and economic effects

After each screening analysis was complete, the results were presented to the Stakeholder Advisory Group. The Stakeholder Advisory Group consisted of transit riders, residents, key stakeholders, members of the public, and representatives from businesses and major institutional organizations. The Stakeholder Advisory Group recommended alternatives to carry forward to the next level of screening to the Elected Leadership Group. The Elected Leadership Group included elected officials who represent the project corridor and/or Sound Transit Board. The Elected Leadership Group then made recommendations on which alternatives to carry forward to the next screening level. Appendix M lists the alternatives for each level of screening and why some alternatives were recommended to not be carried forward.



There were opportunities for public input between each screening level, which allowed community members to learn more about the alternatives and provide input to the Stakeholder Advisory Group and Elected Leadership Group. Appendix F provides additional information on the public outreach conducted. All Level 3 evaluation alternatives and design options were carried forward into the scoping process for the Draft EIS, which is described in Section 2.5.3, Alternatives Carried Forward for Evaluation in the Draft EIS.

2.5.2 NEPA and SEPA Scoping Process

Scoping for this EIS was conducted under NEPA and SEPA. The scoping process began with a Notice of Intent to prepare an EIS in the *Federal Register* on February 12, 2019 (84 *Federal Register* 3541), and a Determination of Significance in the SEPA Register on February 15, 2019. These notices initiated formal scoping and started a required 30-day comment period through March 18, 2019. The FTA and Sound Transit extended this comment period until April 2, 2019, based on requests from the public and the City of Seattle.

Three public scoping meetings and a meeting for agencies and Tribes were held during this period, as well as an online open house from February 15 through April 2, 2019. Sound Transit asked for comments on the preliminary purpose and need statement; the alternatives that Sound Transit should evaluate in the Draft EIS; and social, economic, environmental, and transportation issues to evaluate in the Draft EIS. Comments were accepted by mail, email, online comment forms, phone, and in a variety of forms at the scoping meetings. Appendix F provides additional information on the scoping process and comments received.

2.5.3 Alternatives Carried Forward for Evaluation in the Draft EIS

Following the public scoping period, the Sound Transit Board of Directors reviewed the comments received and the alternatives evaluated in the three-level screening process (see Appendix M for details). In May 2019, the Board approved Motion M2019-51 (Sound Transit Board 2019a), which identified preferred alternatives, preferred alternatives with third-party funding, and other alternatives to study in the Draft EIS. The Board also directed Sound Transit project staff to conduct an initial assessment of additional alternatives suggested during the scoping period to establish whether further detailed study in the Draft EIS was appropriate. Following completion of that initial assessment, the Board reviewed the initial assessment findings and public input. Public outreach during the initial assessment included an online open house, distribution of flyers to residences and businesses, information booths at several fairs and festivals, media briefings, project-wide email updates, as well as personalized emails to community groups to notify them about the opportunity to comment online (refer to Appendix F for additional information). In October 2019, the Board approved Motion M2019-104 (Sound Transit Board 2019b), which identified additional alternatives to study in the Draft EIS.

Table 2-3 lists the West Seattle Link Extension alternatives identified in Sound Transit Board Motions M2019-51 and M2019-104 for study in the Draft EIS.

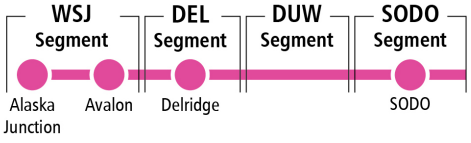


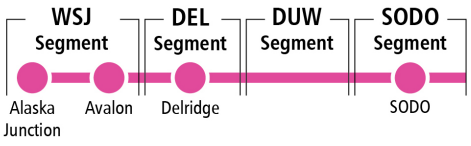
Table 2-3. West Seattle Link Extension Alternatives and Design Options Carried Forward

Segment	Draft EIS Alternative or Design Option	Alternative Name in Sound Transit Board Motion
SODO	Preferred At-Grade (SODO-1a)	E3 At Grade
	At-Grade South Station Option (SODO-1b)	
	Mixed Profile (SODO-2)	SODO Partial Elevated
Duwamish (DUW)	Preferred South Crossing (DUW-1a)	South Crossing
	South Crossing South Edge Crossing Alignment Option (DUW-1b)	
	North Crossing (DUW-2)	North Crossing
Delridge (DEL)	Preferred Dakota Street Station (DEL-1a)	North of Genesee Station
	Dakota Street Station North Alignment Option (DEL-1b)	
	Preferred Dakota Street Station Lower Height (DEL-2a)	
	Dakota Street Station Lower Height North Alignment Option (DEL-2b)	
	Delridge Way Station (DEL-3)	South of Andover Station
	Delridge Way Station Lower Height (DEL-4)	
	Andover Street Station (DEL-5)	Yancy/Andover Elevated
	Andover Street Station Lower Height (DEL-6)	
West Seattle Junction (WSJ)	Preferred Elevated 41st/42nd Avenue Station (WSJ-1)	Elevated Stations
	Preferred Elevated Fauntleroy Way Station (WSJ-2)	
	Preferred Tunnel 41st Avenue Station (WSJ-3a)	Tunnel Station
	Preferred Tunnel 42nd Avenue Station Option (WSJ-3b)	
	Short Tunnel 41st Avenue Station (WSJ-4)	
	Medium Tunnel 41st Avenue Station (WSJ-5)	

Source: Sound Transit Board 2019a and 2019b.

In response to the Board's direction in the Board-approved Motion M2019-51 (Sound Transit Board 2019a), Sound Transit continued to refine the conceptual design of the alternatives for evaluation in the Draft EIS. This resulted in the addition of Alternative DEL-6 and Alternative WSJ-5, which would allow the Delridge Station to connect to a tunnel in the West Seattle Junction Segment. Alternative WSJ-4 was also added to address the Board's direction to evaluate potential cost-savings opportunities.

Based on public input received during scoping for general support for the Alaska Junction Station in the 41st Avenue Southwest and 42nd Avenue Southwest vicinity as well as comments to stay out of Alaska Junction if the alternative is elevated, the Sound Transit 3 Representative Project was broken into two separate alternatives with a north-south oriented elevated Alaska Junction Station: (1) with the station between 41st and 42nd avenues south of Southwest Alaska Street (Preferred Alternative WSJ-1) and (2) with the station at Fauntleroy Way Southwest and Southwest Alaska Street (Preferred Alternative WSJ-2). In response to public support for shifting the existing SODO Station southward, closer to South Lander Street, Sound Transit developed Option SODO-1b. An additional station configuration for Preferred Alternative SODO-1a, the staggered station configuration, was also developed to avoid permanent impacts to the United States Postal Service Carrier Annex and Distribution Center/Terminal Post Office.



2.5.4 Alternatives Not Carried Forward for Evaluation in the Draft EIS

The scoping process generated some new alternative suggestions that were considered but not identified for study in the Draft EIS. These suggestions and the reason they were not carried forward are described in Appendix M.

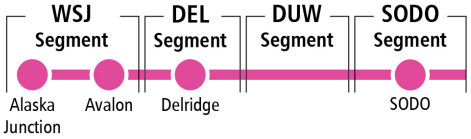
2.6 Draft EIS Public and Agency Comments Suggesting New or Modified Alternatives

Before preparing the Final EIS, Sound Transit reviewed comments on the Draft EIS that suggested modifying the alternatives or the addition of other alternatives. Some comments suggested minor shifts in alignments and stations. Individuals suggested building a gondola instead of light rail to reduce cost, shorten the project schedule, minimize greenhouse gas emissions, and minimize impacts. Some commenters suggested bringing back alternatives considered but not carried forward into the Draft EIS. There were others that noted support for removal of Avalon Station to save on cost. Table 2-4 summarizes the comments received on the Draft EIS that suggested new alternatives or modifications to alternatives. Commenters also suggested providing light rail to communities to the south with larger populations of people of color and low-income households than the areas directly served by the West Seattle Link Extension.

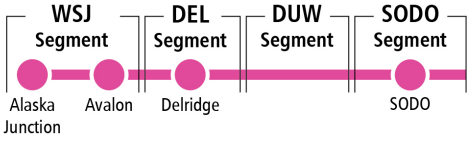
More details on specific comments and Sound Transit's responses are provided in Appendix O, Draft EIS Comment Summary and Response to Comments.

Table 2-4 Summary of Comments Asking for New or Modified Alternatives

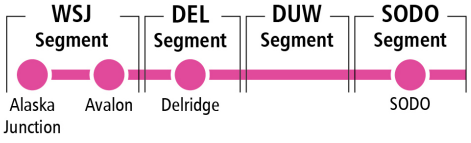
Theme of Comment	Comments/Suggestions
Other Modes	Comments suggested modes of transportation for West Seattle other than light rail as follows: • Most of the comments from individuals suggesting another mode suggested a gondola for West Seattle. Gondola supporters stated that the topography of West Seattle is too hilly for light rail and that the area would be better served by gondola acting like a feeder system to light rail on the east side of the Duwamish Waterway. They feel that a gondola would better meet the transportation needs for West Seattle faster and for less cost, displacement, disruption, and embodied carbon. • Bus rapid transit that feeds into the light rail system on the east side of the Duwamish Waterway. • A light rail alternative adjacent to the Duwamish Waterway where topography is flat and stations would provide access to low-income populations and communities of color, while also providing a gondola connection over Pigeon Ridge to West Seattle. • A new bus-only bridge from West Seattle, across the Duwamish Waterway, connecting to the SODO Busway. • A cable car. • Extended water taxi service. • A foot passenger ferry from Fauntleroy Ferry Terminal to Downtown Seattle.



Theme of Comment	Comments/Suggestions
Pigeon Ridge/West Seattle Tunnel	Comments suggested studying the purple line, Pigeon Ridge/West Seattle Tunnel, from the level 2 alternatives evaluation as described in Appendix M of the Draft EIS. Comments suggested that with rising real estate prices and falling tunneling costs, this alternative may now be considered more affordable than it was during scoping. These comments supported this alternative because they thought it would reduce impacts to habitat and wildlife, minimize construction period road closures, reduce displacements to communities of color and low-income populations, reduce business displacements, and reduce risks from constructing light rail on steep slopes.
New Tunnel Alternatives	There were requests for other tunnel alignments along the West Seattle Link Extension. Comments suggested tunneling under the Duwamish Waterway and then continuing with a tunnel for the rest of the alignment to minimize impacts to West Seattle. A tunnel was requested from the point where the guideway touches land on the west side of the Duwamish Waterway, following the route of the Preferred Alternatives in West Seattle, with the Delridge and Avalon stations, and two Alaska Junction stations at Fauntleroy Way Southwest and at 42nd Avenue Southwest.
Extensions to the South	Comments stated that the West Seattle Link Extension includes stations in the wealthier areas of West Seattle instead of reaching the low-income areas and areas with greater communities of color to the south. Stations were mostly suggested in High Point, White Center, and Burien. The following alternatives were suggested: • Remove the Alaska Junction Station and add a station at 35th Avenue Southwest and Southwest Morgan Street. • An alignment on 35th Avenue Southwest because there would be more room to fit the guideway; with an option of building light rail at-grade in this location that could extend in the future to High Point, Westwood Village, and South Seattle College. • A guideway on a bridge across the Duwamish, elevated along Fauntleroy Way Southwest, with stops at the Fauntleroy Ferry Terminal, White Center, and SeaTac. • A station in Youngstown on Delridge Way Southwest near South Spokane Street then extending the alignment down Delridge Way Southwest at-grade with an additional station between Hillcrest and Highland Park and a station with a park-and-ride at Southwest Roxbury Street and 17th Avenue Southwest. • An alignment to High Point, without going through the junction, since High Point was described as a potential station location identified in City planning efforts. • A station at Westwood Village instead of the Alaska Junction with a park-and-ride to connect other neighborhoods in West Seattle.
Two Extensions	Splitting the West Seattle Link Extension in two, with one extension serving the east side of West Seattle (Delridge) and another extension serving the west side (including the West Seattle Junction). The two extensions would merge to the south in future phases to reach SeaTac Airport. Another suggested alternative was a spur light rail extension to West Seattle Junction through the West Seattle Golf Course, with the main light rail extension continuing south to minimize cost for land acquisition, disruption to neighborhoods during construction, and noise.
Other Suggested Alternatives	The following alternatives were also suggested to minimize impacts to West Seattle neighborhoods: • One light rail station in West Seattle with a parking garage. • Light rail with a terminus station at Harbor Island with a park-and-ride garage with bus connections. • A light rail station on West Marginal Way with electric vehicle shuttles to connect people in West Seattle to the station. • Only one station in West Seattle, on Fauntleroy Way Southwest.



Theme of Comment	Comments/Suggestions
SODO Segment	
New location for SODO-2 Station	Move the station for the Mixed Profile Alternative (SODO-2) north of the existing SODO station to avoid the United States Postal Service facility. Another suggestion was to shift the Alternative SODO-2 station north to preserve the SODO Busway, with an entrance at South Stacy Street.
Underpass for Cross Station Transfers	Provide for cross platform transfers, construct the northbound West Seattle Link Extension guideway in an underpass under the existing light rail line near South Forest Street. Keep the existing SODO Station and construct the new northbound platform in the space currently used for the SODO Trail.
Parallel Tracks	Place the northbound track for both lines parallel to each other and the southbound tracks for both lines parallel to each other.
Station Consolidation	Consolidate the SODO and Stadium stations because they felt the stations were close enough to walk between them.
Duwamish Segment	
Connect to Additional Communities	Connecting to the communities of South Park and Georgetown with light rail extension or bus rapid transit.
Multi-modal Bridge	A new West Seattle replacement bridge for vehicles with light rail running on the side to save costs for both projects.
Immersed Tube Tunnel	An immersed tube tunnel (a tunnel constructed elsewhere, which is then brought to the tunnel site to be sunk into place) for the Duwamish Waterway crossing.
Harbor Island Station	One comment requested a light rail station on Harbor Island.
Delridge Segment	
Tunnels in Delridge	A tunnel beginning in Delridge and continuing to the West Seattle Junction. Another suggestion was Alternative DEL-6 with a longer tunnel that has a tunnel portal east of Southwest Avalon Way.
Stations Further South	Stations south of the Delridge Station in the Delridge neighborhood were suggested. Approximately 450 comments requested further study to shift the Alternative DEL-6 Delridge Station further south to improve walk access and TOD opportunities based on the project-wide comments made by the Urbanist and Seattle Subway. One suggested alternative was to extend the alignment to allow for a station near Louisa Boren Stem K-8 school at 5950 Delridge Way Southwest. Another suggested alternative was to have a station further south down Delridge Way Southwest to serve communities of color and low-income populations and have a greater walkshed and more TOD opportunity. Another comment suggested moving the Alternative DEL-6 Delridge Station closer to the center of Delridge to improve bus connectivity and pedestrian connections
Delridge Playfield and West Seattle Golf Course	A light rail alignment in the north end of Delridge Playfield and the West Seattle Golf Course to avoid property acquisitions and reduce cost.
Relocate Delridge Station	Place the Delridge Station for Alternative DEL-6 over Delridge Way Southwest.
Optimize TOD	Move the station for Alternative DEL-5 and Alternative DEL-6 to the west so that it is more accessible for pedestrians and could have better TOD potential on nearby vacant parcels
Lower DEL-3 and DEL-4 Station heights	Commenters suggested lowering the heights of the Alternative DEL-3 and Alternative DEL-4 stations, so they are similar to the height of Alternative DEL-2a and Option DEL-2b.
Build entirely within right-of-way	An elevated light rail guideway entirely within the existing roadway right-of-way so that residential property acquisitions are not needed.

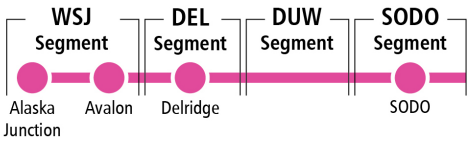


Theme of Comment	Comments/Suggestions
West Seattle Junction Segment	
One station at corner of Fauntleroy Way Southwest and 39th Avenue Southwest	Only one station in the West Seattle Junction Segment at Fauntleroy Way Southwest and 39th Avenue Southwest (the current location of Trader Joe's).
Tunnel under California Avenue Southwest	A tunnel station with a mezzanine under California Avenue Southwest to facilitate bus transfers.
Tunnel under Fauntleroy Way Southwest	A tunnel under Fauntleroy Way Southwest rather than 41st or 42nd Avenue Southwest to avoid impacts to smaller streets in residential areas and make future extensions easier.
Remove Avalon Station	Remove the Avalon Station because it would be close to the Alaska Junction Station, and removing the Avalon Station could lower costs. Comments mentioned that the two stations were within the same walkshed and removing the Avalon Station could help pay for a tunnel in this segment. Numerous comments asked to keep the Avalon Station to allow fast access to/from buses along 35th Avenue Southwest, including those from White Center and Burien, and to allow for access from large multi-family residential buildings nearby.
Move Avalon Station	Move the Avalon Station to the vacant field of the West Seattle Stadium to activate more public space and improve pedestrian safety on Southwest Avalon Way. Another commenter suggested moving the station to Rotary Viewpoint Park and do not continue closer to the Alaska Junction. Comments stated that this modification would reduce displacements, serve bus connections well, and allow for future extensions along 35th Avenue Southwest.
New Tunnel Alignment	Place the station in a tunnel immediately adjacent to the West Seattle Bridge.
Move Alaska Junction Station	Move the station to the Southwest Edmunds Street/Erskine Way Southwest/California Avenue Southwest intersection to reduce cumulative impacts to available street parking on 41st Avenue Southwest.
Remove Alaska Junction Station	Do not build the Alaska Junction Station to save on costs and minimize neighborhood impacts; instead, extend light rail to reach low-income and communities of color to the south.
Extend Alignment	One comment suggested that the alignment continue past California Avenue Southwest. It was also suggested to locate elevated light rail entirely within the street right-of-way to avoid acquisition of large new apartment buildings.

2.7 Construction Approach

This section provides an overview of potential construction activities and timing. The West Seattle Link Extension would have a muti-year construction period and would be completed in 2032. The majority of the construction timeline for the project would be for civil construction. Concurrent work at multiple construction areas would be required to complete the project in this timeframe. Civil construction would include demolition, utility and drainage relocations, and construction of guideways (including guideway columns and foundations), tunnels (including access at tunnel portals), bridges, stations and station access, track, and supporting facilities such as traction power substations and vent shafts. Civil construction would be followed by installation of the systems that power and control the trains. This would be followed by testing and startup activities, when communications, safety, and emergency systems would be tested and certified before beginning operations for the public.

Civil construction refers to the physical construction activities such as demolition, grading, and construction of project elements. Civil construction is followed by systems installation and testing.



The greatest potential for construction impacts would occur during civil construction. The following major civil construction activities could cause environmental impacts and community disruption:

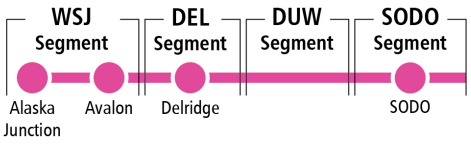
- Partial and full demolition of existing structures (buildings, pavement) and debris removal
- Remediation of existing contamination at construction sites
- Building temporary vehicular, bicycle, and pedestrian detour routes
- Protective works (such as underpinning) for buildings that would not be demolished
- Clearing and vegetation removal
- Fill and excavation
- Utility extensions, relocations, or disruptions
- Drainage system relocations and new connections, including stormwater vaults
- Construction staging area use
- Guideway structure construction
- Tunnel construction, particularly at the tunnel portals and vent shafts
- Tunnel cross passage construction, including ground treatment near the cross passages
- Delivery of materials and equipment
- Removal and hauling of excavation spoils and other construction debris
- Station construction, including elevated stations and tunnel stations under street rights-of-way
- Crossover track, tail track, and other special trackwork construction, including at-grade, elevated, and underground trackwork structures
- Bridge construction
- Slope stabilization (such as retaining wall) construction
- Ground treatment and improvement (such as stone guideway columns, jet grouting, and ground freezing)
- Pile-driving and shaft drilling
- Roadway reconstruction

The following sections describe the sequence, methods, and anticipated duration for each major type of construction.

2.7.1 Construction Sequence and Activities

Construction of linear projects such as light rail is typically divided into various segments or line sections based on similarities in configurations such as at-grade or elevated structures, tunnels, or retained-cut sections; sequence and schedule constraints; and geographical constraints. These segments or line sections may include stations, substation and signal control facilities, access facilities, tunnel vents, and other related improvements.

Site-specific conditions, permit requirements, and market conditions at the time of construction, among other factors, affect how a project is built. Sound Transit would coordinate with the appropriate jurisdictions on land use approvals, right-of-way use and land disturbance permits, and other permits required for construction.



A work-specific construction plan would be confirmed during final design to establish the various construction phases and contract packages, their estimated schedule and duration, and appropriate sequencing. Where possible, construction activities would be coordinated with other capital improvement projects or joint development projects to help minimize construction impacts. The West Seattle Link Extension would have a project management plan. Construction contracting documents reflect the project management plan and relevant best management practices to minimize construction disruption and permitting conditions and requirements and includes, but is not limited to:

- Notification requirements.
- Noise variance locations.
- Maintaining access to private properties.
- Overall and site-specific plans.
- Monitoring of sensitive structures close to excavation or higher vibration activities.
- Construction Access and Traffic Management Plan that includes components to maintain business access, minimize construction disruption during large events, provide alternate routes for freight, general traffic, and non-motorized access, manage parking, and maintain transit operations (bus, streetcar, light rail), as appropriate.
- Construction Mitigation Plan addressing property effects to businesses. This could include a 24-hour hotline, providing detours and signage, providing marketing materials for affected business districts, etc.
- Construction Vibration Control Plan.

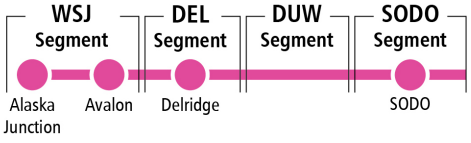
These plans would continue to be updated throughout construction as needed.

Typical construction for surface and elevated guideways and stations would occur on a 5- to 6-day work week and would occur primarily between the hours of 7 a.m. and 10 p.m. In some locations, additional shifts, all-week, nighttime, or 24-hour construction activities could be necessary to reduce impacts from roadway closures. Tunneling work would typically occur between 20 and 24 hours per day, 6 to 7 days per week.

2.7.2 Typical Construction Activities

Typical construction activities necessary prior to construction, regardless of the track alignment or profiles, would involve partial and full demolition of existing structures; removal or modifying underground tiebacks; vegetation clearing and soil fill, excavation, and grading; relocating utilities and drainage systems; remediation of contaminated sites; preparing construction access; building temporary construction roads where access is not available from existing roads; temporarily closing some roads or traffic lanes; and detouring traffic.

Underground utility work and support or strengthening of areaways may require temporary steel plates in the roadway and temporary lane closures. When work occurs in roadways, reconstruction of streets, sidewalks, and other existing facilities may occur. Overhead utility relocation work may consist of temporary lane closures, site access limitations, vegetation removal, and demolition of existing structures. Work could include construction of new utility pole foundations, and installation of poles, anchors, vaults, conduit, and cables, followed by removal of existing overhead utilities. Outside of road right-of-way, restoration of work areas could be necessary.



When work would be adjacent to a roadway, removal of on-street parking, closure of lanes or closure of the full roadway may be needed. Where the project would partially or fully close streets, through traffic would be rerouted on detours while maintaining access to existing businesses and residences. Road closures and detours would require approval by the Seattle Department of Transportation or Washington State Department of Transportation. More detailed information on road closures, lane closures, and detours is provided in Chapter 3, Transportation Environment and Consequences, and in Appendix N.1, Transportation Technical Report.

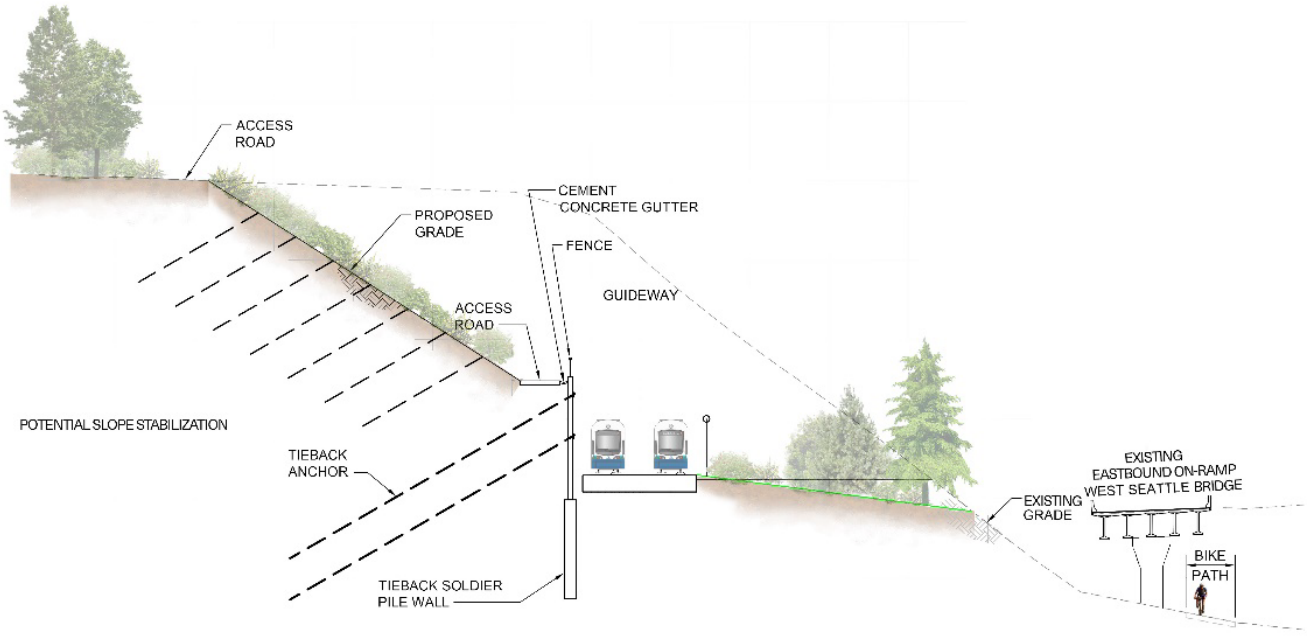
Dewatering could be needed throughout the project corridor and could be done using mechanical methods such as sumps, pumps, and dewatering wells. These systems pump water to the surface for discharge, storage, or recharge into the ground. Discharge would follow the National Pollution Discharge Elimination System permit requirements from the Washington State Department of Ecology. Water would be treated, if necessary, prior to discharge.

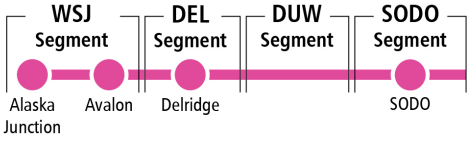
Ground improvements, or mechanical methods to address weak soils to enable building on them, might be needed at many places along the project corridor, especially in areas of fill material on top of tide flats and for tunnel portals and cross passages. Ground improvement methods may include jet grouting, ground freezing, rock displacement, or a combination of these methods.

Steep slope stabilization would be necessary at the north edge of Pigeon Point. For all alternatives, the outer layer of unstable soil would be excavated. Depending on the alternative, slope stabilization could include retaining walls, slope drains, soil nails, and other reinforcements (Figure 2-44). Drainage above the slope could be routed to catch basins or small vaults, and replanting on the slope could occur after construction. Construction of the guideway could require temporary work trestles.

Post-construction landscaping would include native, adaptive, hardy, drought tolerant, and low maintenance plants. Native plants are required for all ecosystem restoration work.

Figure 2-44. Pigeon Point Typical Section





2.7.3 Elevated Light Rail Construction

Construction of elevated guideway would begin with construction of the substructure foundations and shallow excavations to relocate utilities. The foundations would likely consist of shallow spread footings or deeper drilled shafts. Ground improvement would be provided around drilled shafts, where required. Following the foundations, concrete guideway columns and piers or straddle bents that support the guideway would be constructed cast-in-place (Figure 2-45). False-work (Figure 2-46), which is a temporary support structure, would be required in places where cast-in-place construction is used. False-work would support elements of the substructure while the concrete is placed and the concrete gains enough strength to support itself.

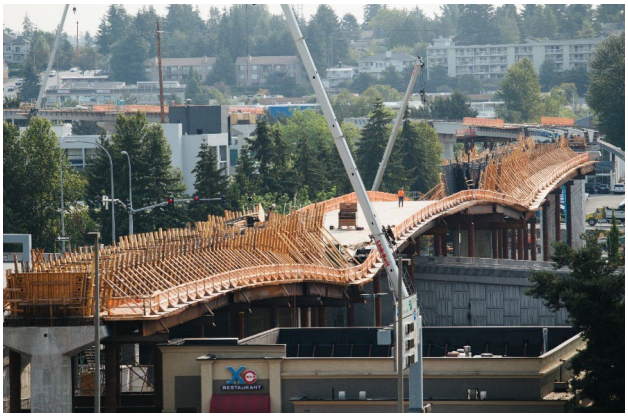
The elevated guideway superstructure (the part of the structure above the foundations) could be constructed of reinforced concrete which would either be cast-in-place or pre-cast. False-work could be used in places to support the cast-in-place superstructure. Pre-cast elements would be transported to the construction area and lifted into place with cranes. Construction of elevated stations would begin similar to construction of the guideway but would then include construction of the station platforms and buildings.

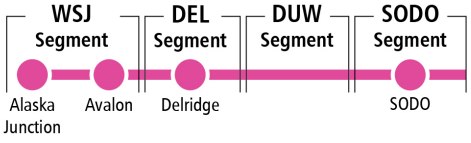
Elevated guideways (Figure 2-47) would require construction similar to bridges where longer spans are needed in order to cross roadways, railroads, or due to topography (refer to Section 2.7.7, Bridge Light Rail Construction – Over-water Crossings). Pile driving may be used during construction of the elevated guideway.

Figure 2-45. Construction of Guideway Columns

Figure 2-46. Construction of Elevated Guideway Showing False-work

Figure 2-47. Construction of Elevated Guideway Over Roadways





2.7.4 At-grade Light Rail Construction

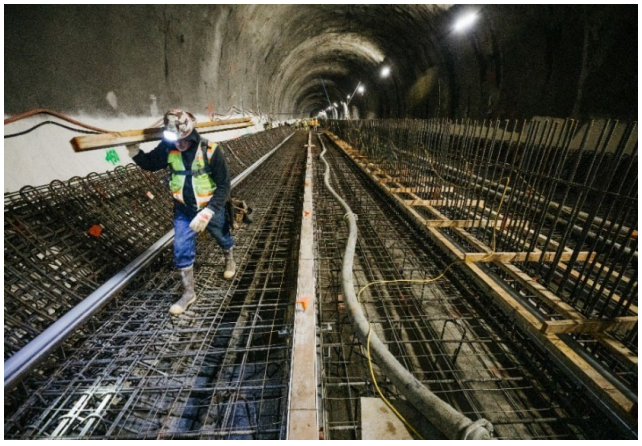
Construction methods for at-grade guideways would be similar to typical road construction. Construction would involve shallow excavations to relocate utilities and construction of the subgrade, ballast walls, track, and station platform slabs. Dewatering may be needed during construction, depending on groundwater depth. Drainage structures and below-grade light rail infrastructure would also be installed. Construction of at-grade stations would be similar to typical building construction. The SODO Station for Preferred Option SODO-1c, Alternative SODO-1a and Option SODO-1b in the SODO Segment would be constructed at-grade.

2.7.5 Retained-Cut Light Rail Construction

Retained-cut guideway and station construction would be similar to at-grade guideways but would be more intensive and of longer duration because of retaining walls required on one or both sides (Figure 2-48). In some locations, subsurface anchors, tiebacks, or internal bracing would be required to support the retaining wall. Depending on the depth of the retained-cut and groundwater conditions, dewatering may be necessary. Some retained-cut stations would involve construction of a lid over the station that is similar to cut-and-cover construction, as well as reconstruction of streets, sidewalks, and other existing facilities over or around the cut (see Section 2.7.6, Tunnel Light Rail Construction). Pile driving may be used during construction of the retained-cut guideway.

Figure 2-48. Retained-cut Construction

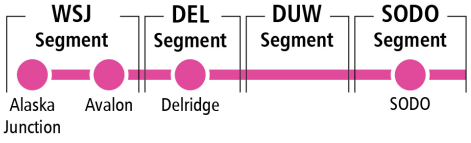
Figure 2-49. Tunnel Construction



2.7.6 Tunnel Light Rail Construction

Tunnel and underground station construction may involve tunnel boring (using tunnel boring machines), cut-and-cover construction, or sequential excavation mining.

Tunnel construction requires either open-cut tunnel portals or shafts for equipment to launch, or enter, and to be retrieved from the tunnel at each end. On hillsides, the portal would be dug directly into the hillside, while in flatter areas, an access shaft or pit would be excavated from the surface. Once a portal or shaft is dug, tunnel excavation can begin, and the tunnel would be lined with concrete (Figure 2-49). Excavated material, or spoils, would be transported to the shaft or tunnel portal for stockpiling or hauling, as needed. Spoils can be transported back through the completed tunnel sections using small trains, conveyors, or pipes.



Cut-and-cover construction involves excavating from the surface and is essentially a retained cut that is subsequently lidded. The excavation can be decked over during construction, either partially or totally, at the street level to allow traffic to continue once the excavation is deep enough to allow earthmoving equipment below (about 10 to 15 feet). It would take 6 to 12 months in some areas to establish these temporary decked areas, and there would be some traffic disruption during their installation. Openings in the decking are needed to remove excavated material and bring in construction materials. Following completion of the excavation, the permanent underground structures would be installed using cast-in-place concrete techniques. Cut-and-cover work may also include backfill with imported fill or suitable excavated material following the lid or station roof construction. Cut-and-cover construction would be used for more shallow stations, at tunnel portals, where tunnel depths are shallow, where tunnel lengths are too short for boring or mining methods, or to address other construction constraints.

Sequential excavation mining involves excavating a tunnel using a pre-defined sequence of several smaller excavations (known as “headings”) to build up the larger final cross section of the full tunnel. It is used where excavation of the full tunnel in a single heading could result in instability. Additional measures to stabilize the ground during excavation may be required and could include the use of temporary structural elements such as steel bars, ground improvement such as jet grouting installed either from the surface or within the tunnel, or stabilization measures such as dewatering or ground freezing, also from within the tunnel or from the surface. The excavated headings and full tunnel cross section would initially be lined with shotcrete. Subsequently a permanent waterproofing membrane and final cast-in-place concrete lining would be installed in the completed tunnel excavation.

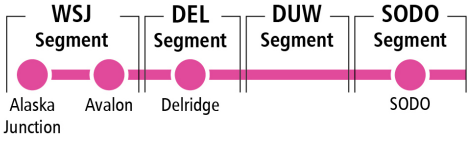
Tunnel boring machines are large mining machines that dig through the earth to create large tunnels with minimal ground disturbance and smooth tunnel walls that are easy to line. Excavated dirt is removed through a conveyor belt that transports it out of the tunnel.

For the Avalon and Alaska Junction stations associated with tunnel alternatives and design options, cut-and-cover construction would likely be used. Cut-and-cover construction would also be used at tunnel portals until the excavation is deep enough for mining. The tunnels and associated tail tracks in the West Seattle Junction Segment could use either tunnel boring machines or sequential excavation mining because they are relatively short, shallow tunnels. Spoils would be removed at the surface via shafts where future station entrances would be located.

For all proposed tunnel construction methods, the need for fresh air requires that a mechanical ventilation system and fans be in place. Fans could run for 24 hours a day and could be audible at tunnel portals, stations, or access locations.

Tunneling could require some forms of soil stabilization before tunneling begins. Methods could include jet grouting, cement grouting, dewatering, ground freezing, a combination of these methods, or other methods.

Excavated material would be removed and hauled to a permitted disposal site. Truck hauling would require a loading area, staging space for trucks awaiting loading, and provisions to prevent tracking soil on public streets. Truck haul routes and trucking hours would require approval by the City of Seattle. Surface hauling could occur at night during off-peak traffic periods or could be concentrated during the day to minimize noise in noise-sensitive areas.



2.7.7 Bridge Light Rail Construction - Over-water Crossings

2.7.7.1 Duwamish Waterway

The Duwamish Segment alternatives and design option would build bridges over the Duwamish Waterway. If bridge foundations are in the water, or in an area with a high water table, such as Harbor Island, most of them would be constructed inside sheet-pile cofferdams (temporary enclosures providing a dry working area in the water) where needed. Cofferdams would be driven or vibrated into place and would be removed when work is complete, likely by vibrating them out of the ground. Bridge foundations constructed inside the cofferdams would include drilled shafts and cast-in-place concrete pile caps. In other areas, foundation excavations would be supported by a temporary shoring system, such as soldier pile shoring.

Temporary work trestles could be installed in the East or West Waterways to support material delivery and operation of heavy equipment. Temporary work trestles would be constructed with driven or vibrated steel-pipe pile bents, framing, and decking, then removed when the work is complete. Barges for material supply and supporting cranes would also be required for construction of foundations in water and would be moored outside of the navigation channels. For all bridge types, netting and scaffolding under the bridge would be used during construction to support heavy equipment.

The fixed bridge over the East Waterway would be a balanced cantilever segmental box girder for all alternatives and options. Over the West Waterway, high-level fixed bridge structure types could include balanced cantilever segmental box girder, extradosed, cable-stayed, or truss superstructures. The bridge structure types are shown on Figure 2-50. For Preferred Alternative DUW-1a, the bridge type over the West Waterway would either be cable-stayed or steel truss to avoid having permanent structures in the water. Temporary work trestles over the East and West Waterway would not be needed for construction of this alternative. Bridge type would be determined during final design based on various factors including engineering feasibility and constraints, environmental effects, cost, and coordination with other agencies on permitting requirements.

The bridge superstructures (the part of the bridge above the foundation) would be constructed following construction of the foundations. The superstructure of a segmental bridge would be constructed with a balanced cantilever method, which means constructing one short segment at a time alternating on each side of the column. Extradosed bridge superstructure construction would be very similar to that of the balanced cantilever segmental box girder except that every few segments, a stay cable would be installed. Cable-stayed construction would be similar to the extradosed bridge except that many more cables would be required. The balanced cantilever segmental box girder, extradosed and cable-stayed bridge superstructures could be constructed as pre-cast or cast-in-place segments. Barges would be used to lift materials from the water to the superstructure during construction. Cast-in-place construction method could be used to minimize barges needed since with this construction method, materials could be lifted from land. The steel truss would be made up of three spans. Once the piers are constructed, the two end-spans and a portion of the main span cantilevering from the pier would be constructed on false-work in large segments. The remaining preassembled portion of the center span would then be lifted into place as one piece.

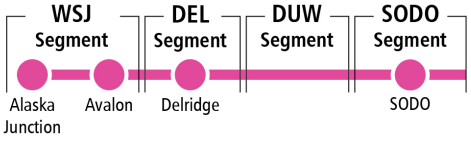
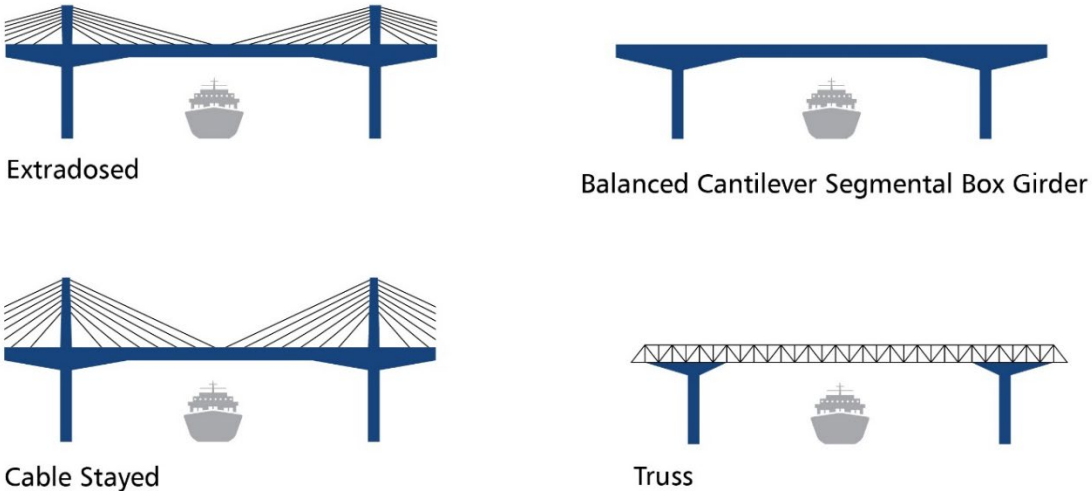


Figure 2-50. Bridge Structure Types



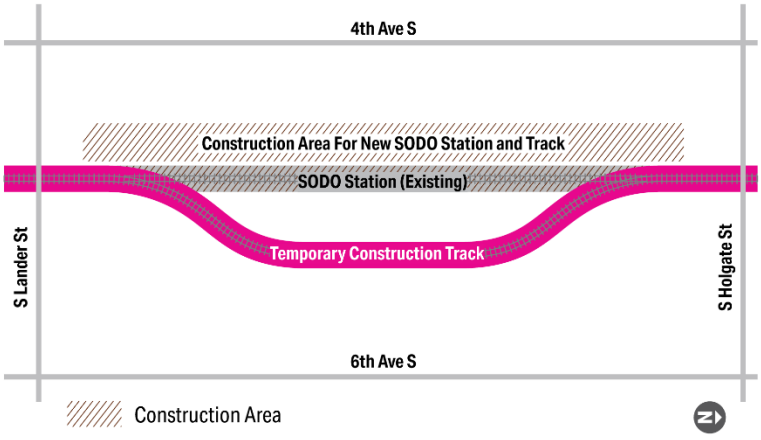
2.7.7.2 Longfellow Creek

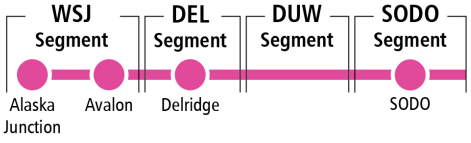
Preferred Option DEL-6b and Alternative DEL-7 would cross a portion of the Longfellow Creek open channel. Grading and fill would occur on either side of Longfellow Creek to create a level surface for construction of the guideway columns and movement of equipment. Drilled shafts would be needed for the guideway columns in this area and due to a high water table, a slurry solution of water and polymers will be used to maintain pressure inside the shaft casing. During construction, the creek would remain open, and construction would not require a creek bypass or for the creek to be piped in place. Temporary work trestles over the creek would also not be needed. After construction, the site would be regraded to existing conditions and replanted as discussed in Section 4.9.7, Mitigation Measures, of Section 4.9, Ecosystems.

2.7.8 Temporary Light Rail Track Construction

During construction of the new SODO station, there would be a long-term closure of the existing SODO station and detour tracks (known as shoofly tracks) would be constructed to keep the 1 Line operational around the station (Figure 2-51). Details of construction phasing at SODO Station would not be finalized until final design.

Figure 2-51. Temporary Construction Tracks





2.7.9 Staging Areas and Construction Easements

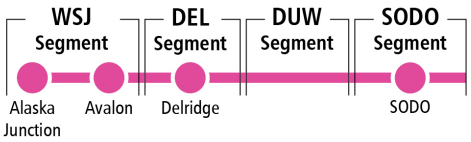
Construction staging areas (Figure 2-52) are needed before, during, and for a short time after construction work, for the following:

- Equipment storage
- Construction materials delivery and storage
- Demolition or spoils storage and handling, truck loading, and hauling
- Contractor trailers
- Concrete batch plants or concrete pumping
- Assembling and launching or retrieving tunnel boring/excavation equipment
- Prefabricating reinforcing steel cages and mats
- Prefabricating, cleaning, and disassembly of column and cap form systems
- Collection, storage, treatment, and discharge of construction water and groundwater
- Access roads
- Construction crew parking

Figure 2-52. Staging Area Adjacent to New Guideway Under Construction

All profile types would have construction staging areas along the alignments. Contractors would use the property on which the facility is being constructed and property that Sound Transit would acquire for permanent facilities or for construction staging, or other properties as negotiated by the contractor. Staging areas would typically be close to the work area and would be throughout the project corridor. Staging areas would generally be 1 acre per mile for elevated or at-grade construction, 3 to 5 acres for water crossing structure construction, 2.5 to 3 acres for tunnel boring machine launch tunnel portals, 1.5 acres for sequential excavation mining launch tunnel portals, and 1.5 acres for station sites in addition to the station footprint. Tunnel receiving portals would be approximately 1 acre. Following construction, staging areas may be used for the project or redeveloped consistent with approved zoning and Sound Transit's Equitable Transit Oriented Development Policy (Resolution R2018-10).

Most construction work would occur in areas acquired for project right-of-way or designated staging areas, but temporary construction easements could be needed from adjacent properties. Following construction, areas with temporary construction easements would be restored to pre-construction conditions.



2.7.10 Duration of Construction Activities

Table 2-5 lists the anticipated duration for each major construction component of the project described in Section 2.7.2, Typical Construction Activities; Section 2.7.3, Elevated Light Rail Construction; Section 2.7.4, At-grade Light Rail Construction; Section 2.7.5, Retained-cut Light Rail Construction; Section 2.7.6, Tunnel Light Rail Construction, and Section 2.7.7, Bridge Light Rail Construction – Over-water Crossings. The estimated durations presented in the table do not necessarily indicate that continuous intensive construction activity would occur at the station areas for the entire duration. It is likely there would be periods of time when minimal or less intensive construction activity would occur. Construction activities are anticipated to occur between 2025 and 2032. Civil construction is anticipated to be completed within approximately 4.5 years. Track installation, overhead catenary system installation, and system testing would take approximately 2 additional years to complete.

Table 2-5. Major Construction Activities and Duration

Construction Activity	Estimated Duration
Partial/full demolition of existing structures; protective works for buildings; clearing and vegetation removal; fill and excavation; utility extensions, relocations, or disruptions; drainage system changes	2 to 12 months depending on the activity. Partial/full demolition of existing structures and relocation of utilities and the drainage system would be the most time intensive activities.
Guideway construction	2 to 4 years.
Tunnel portal construction	1.5 to 2 years (including preparation of associated construction staging area).
Tunnel construction	2 years.
Bridge construction	3 to 5 years.[a]
Station construction	3 to 4 years (retained-cut stations); 3 years (elevated stations); 3 to 4 years (cut-and-cover stations).

[a] The new light rail bridge over the Duwamish Waterway could take up to 5 years to construct, with most of the work during the fifth year isolated to the deck.

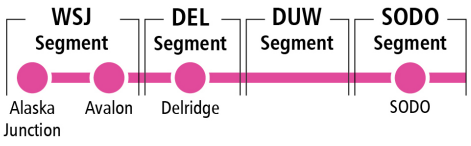
2.8 Environmental Practices and Commitments

Sound Transit views environmental stewardship as a responsibility of all employees, contractors, and consultants. The agency integrates environmental ethics and sustainable business practices into the agency's planning, design, construction, and operations.

The agency goes beyond regulation in its commitment to environmental stewardship and sustainability. Sound Transit's 2004 Environmental Policy states that the agency will satisfy all applicable laws and regulations and mitigate environmental impacts consistent with Sound Transit's policies, as well as strive to exceed compliance, restore the environment, avoid environmental degradation, and prevent pollution and conserve resources (Sound Transit 2004). The agency's 2007 Sustainability Initiative builds on this and identifies the agency's sustainability objectives as also addressing social and economic development issues (Sound Transit 2007).

LEED Certification

LEED certification is a globally recognized symbol of sustainability achievement. To achieve LEED certification, a project earns points by adhering to prerequisites and credits that address carbon, energy, water, waste, transportation, materials, health, and indoor environmental quality.



Sound Transit implements these commitments through an International Organization for Standardization (ISO) 14001-certified Environmental and Sustainability Management System. The Board-approved long and short-term goals for the management system's environmental and sustainability objectives are found in Sound Transit's 2015 and 2019 Sustainability Plan update documents (Sound Transit 2019c). Sound Transit also anticipates seeking Envision certification for the West Seattle Link Extension and Leadership in Energy and Environmental Design (LEED) certification for certain project facilities.

Envision

Envision is a holistic sustainability framework and rating system that enables a thorough examination of the sustainability and resiliency of all types of civil infrastructure. It is a comprehensive tool that can assist public and private agencies in delivering civil infrastructure that tackles climate change, addresses public health needs, cultivates environmental justice, creates jobs, and spurs economic recovery.

2.9 Project Funding and Cost Comparison

2.9.1 Project Funding

In 2016, voters approved funding for Sound Transit 3, which includes funding to construct the project. Additional funding sources to complete the project could include FTA or other federal agency grants or additional voter-approved tax revenue.

Sound Transit Funding

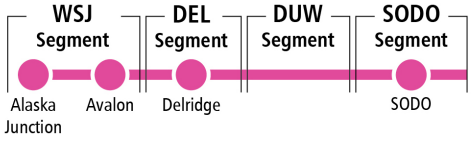
Sound Transit's regional transit programs and projects are typically funded through a combination of voter-approved taxes collected in a three-county district, FTA grants and loans, bonds, and farebox revenue.

2.9.2 Cost Comparison

2.9.2.1 Capital Cost

This section provides preliminary capital costs for each West Seattle Link Extension alternative and design option, and a combined capital cost for the project as a whole. These costs are based on early design and will be refined during final design. Capital costs are one-time costs and include construction costs, anticipated/estimated mitigation, right-of-way/property acquisition costs, engineering costs, equipment costs and contingency, but not the cost of additional light rail vehicles needed to operate the expanded system. Some of the alternatives and options studied would impact federally funded facilities and would require Sound Transit to pay back a portion of federal dollars already expended such as RapidRide stations. The capital cost estimate for the alternatives and options does not include the cost of impacting federally funded facilities.

Estimated West Seattle Link Extension capital costs based on the current level of design are shown in Table 2-6. The cost estimates have increased since the Draft EIS due to Board-directed refinements for the Preferred Alternative, advancement of design, and application of a market adjustment factor which is applied to construction costs.



2.9.2.1.1 West Seattle Link Extension Minimum Operable Segment

The estimated West Seattle Link Extension M.O.S. capital cost would be between approximately $2.90 and $3.75 billion, depending on the alternatives and design options included. This cost estimate is based on the current level of design and would apply to an M.O.S. from SODO Station to Delridge Station.

2.9.2.2 Operation and Maintenance Costs

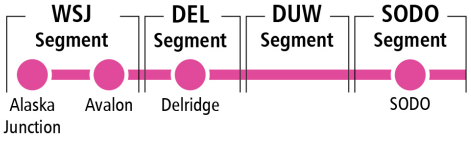
This section provides operation and maintenance costs for the project. The major determinants of operation and maintenance costs are service levels, running time, and trackway profile.

The West Seattle Link Extension would have estimated operation and maintenance costs of between $54 and $60 million, annually, with tunnels having higher operating costs.

The West Seattle Link Extension M.O.S. would have annual operation and maintenance costs of about $34 million.

Table 2-6. Estimated West Seattle Link Extension Cost Comparison in 2024 Dollars

Segment	Alternative or Design Option	Estimated Capital Cost Comparison
SODO	**Preferred At-Grade Lander Access Station Option (SODO-1c)**	**$750 to 800 million**
	At-Grade Alternative (SODO-1a)	$750 to 800 million
	At-Grade South Station Option (SODO-1b)	$950 million to 1.05 billion
	Mixed Profile Alternative (SODO-2)	$950 million to 1.05 billion
Duwamish (DUW)	**Preferred South Crossing Alternative (DUW-1a)**	**$1.90 to 2.15 billion**
	South Crossing South Edge Crossing Alignment Option (DUW-1b)	$ 1.90 to 2.10 billion
	North Crossing Alternative (DUW-2)	$2.15 to 2.35 billion
Delridge (DEL)	**Preferred Andover Street Station Lower Height South Alignment Option (DEL-6b)**	**$700 to 750 million**
	Dakota Street Station Alternative (DEL-1a)	$850 million to 1.05 billion
	Dakota Street Station North Alignment Option (DEL-1b)	$950 million to 1.00 billion
	Dakota Street Station Lower Height Alternative (DEL-2a)	$600 to 650 million
	Dakota Street Station Lower Height North Alignment Option (DEL-2b)	$700 to 750 million
	Delridge Way Station Alternative (DEL-3)	$800 to 850 million
	Delridge Way Station Lower Height Alternative (DEL-4)	$600 to 650 million
	Andover Street Station Alternative (DEL-5)	$750 to 800 million
	Andover Street Station Lower Height Alternative (DEL-6a)	$550 to 600 million
	Andover Street Station Lower Height No Avalon Station Tunnel Connection Alternative (DEL-7)	$700 to 800 million



Segment	Alternative or Design Option	Estimated Capital Cost Comparison
West Seattle Junction (WSJ)	**Preferred Medium Tunnel 41st Avenue Station West Entrance Station Option (WSJ-5b)**	**$1.75 to 1.90 billion**
	Elevated 41st/42nd Avenue Station Alternative (WSJ-1)	$1.70 to 1.85 billion
	Elevated Fauntleroy Way Station Alternative (WSJ-2)	$1.05 to 1.15 billion
	Tunnel 41st Avenue Station Alternative (WSJ-3a)	$2.10 to 2.35 billion
	Tunnel 42nd Avenue Station Option (WSJ-3b)	$2.20 to 2.40 billion
	Short Tunnel 41st Avenue Station Alternative (WSJ-4)	$1.65 to 1.80 billion
	Medium Tunnel 41st Avenue Station Alternative (WSJ-5a)	$1.60 to 1.80 billion
	No Avalon Tunnel Alternative (WSJ-6)	$1.40 to 1.50 billion

Note: The cost range provided is a risk-based value and may be adjusted as the project progresses.