4 ENVIRONMENTAL IMPACTS AND MITIGATION

This chapter discusses the affected environment and environmental consequences for the environmental topics listed at the right. Each section describes the resource study area, applicable laws and regulations with which the project would comply, and the effects of each alternative considered in this Draft EIS.

Environmental Topics in Chapter 4

NEPA and SEPA regulations require that an EIS disclose direct, indirect, and cumulative impacts of a proposed action on the environment. *Direct impacts* are caused by the action and occur at the same time and place (40 Code of Federal Regulations [CFR] 1508.8(a)). *Indirect impacts* are caused by the action and are later in time or farther removed in distance but still are reasonably foreseeable (40 CFR 1508.8(b)), such as changes in land use patterns and related effects on air quality. Impacts can be either temporary (short term), such as construction impacts, or permanent (long term), such as with property conversion to a transportation use, or impacts due to project operation. For this EIS, the impacts analysis for each resource is divided into long-term impacts and short-term construction impacts.

A *cumulative impact* results from the proposed action's incremental impact when added to those of other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions (40 CFR 1508.7). Cumulative impacts are considered because the public and government agencies need to evaluate a proposed action and its alternatives in a broad perspective, including how the project might interact with impacts that persist from past actions, with present-day activities, and with other projects that are planned but have not been built yet (reasonably foreseeable future actions); see Appendix H, Other Projects and Actions Considered in Cumulative Effects, for a list of the projects considered. The study area for the cumulative impact analysis is generally a combination of the study areas defined in Chapter 3 for transportation facilities and in Chapter 4 for the various environmental resources. The exceptions are ecosystem-related resources, where

expanded study areas are used to capture potential impacts to the functions of larger ecosystems.

This chapter discusses the proposed project's direct, indirect, and cumulative impacts on each resource analyzed. Mitigation measures are proposed when potential impacts could not be avoided.

4.1 Acquisitions, Displacements, and Relocations

The Lynnwood Link Extension would acquire public and private property for the light rail right-of-way and other facilities. The project also would displace and relocate some residential, commercial, and public uses. The potential property acquisitions are based on the conceptual plans Sound Transit developed for the light rail alternatives (see Appendix F).

This section discusses two types of potential property acquisitions:

- **Partial acquisition**—Part of a parcel would be acquired, but the current use generally would not be displaced. In some instances, such as larger parcels that hold multiple uses, a business or residential unit on a parcel could be displaced, but most uses would remain.
- **Full acquisition**—The full parcel would be acquired and the current use would be displaced. Full acquisitions include parcels that might not be fully needed for the project but would be affected to the extent that current uses would be substantially impaired (e.g., loss of parking or access).

The acquisition and displacement data presented in this section are estimates based on conceptual designs for the light rail alternatives. Final determinations of the property needs for the project, including acquisitions and displacements, will be based on the project's final design after Sound Transit completes the EIS process, selects the alternative to be built, and develops final engineering and design plans. The level of acquisitions discussed in this section provide information useful for comparing alternatives. The estimates of the displaced land uses reflect the conditions at the time the analysis was conducted. Because property uses change, the number and/or type of displacements could vary between what is disclosed in the EIS and what would actually be required. If there is surplus property (property no longer needed for construction or operation of the project) once the project is complete, Sound Transit would likely sell or transfer the surplus property.

In addition to property acquisitions, the project would require temporary construction easements, and the permanent use of public right-of-way owned by WSDOT and local jurisdictions. The areas of the easements are not included in the data presented here, although the impacts of these easements are considered in the analysis. Most

construction staging areas would be located within areas needed for the proposed project's construction, including properties purchased for the light rail right-of-way.

The project would also affect properties by modifying access on some local streets. The Federal Highway Administration (FHWA) and WSDOT must review and approve any change to I-5 ramps or interchanges, and this process could change the access requirements for streets adjacent to a freeway entrance or exit. If WSDOT and FHWA require more restricted road access in order to maintain safe and effective interchange operations, properties that completely lose their access could result in a full or partial acquisition by Sound Transit.

Other impacts associated with acquisitions and displacements are discussed in Section 4.2, Land Use; Section 4.3, Economics; Section 4.4, Social Impacts, Community Facilities, and Neighborhoods; Section 4.16, Cultural, Archaeological, and Historic Resources; Section 4.17, Parks and Recreational Resources; and Section 4.18, Section 4(f) and 6(f) Evaluation.

The light rail alternatives would occupy parts of the I-5 right-of-way, which helps to minimize impacts on adjacent private property. Sound Transit and WSDOT developed a plan to identify which parts of the I-5 right-of-way could be considered for Sound Transit's use on the light rail project. The agencies' collaborative planning considered current conditions on the corridor, applicable design standards for highways and light rail, and WSDOT's ability to make future highway improvements. Ultimately, Sound Transit must secure FHWA's approval for use of the I-5 right-of-way. The planning for the project's right-of-way assumptions resulted in the *I-5 Light Rail Compatibility Report* (Sound Transit 2012), signed by both Sound Transit and WSDOT. The report's findings formed the basis for the conceptual engineering of the Draft EIS alternatives. Estimated WSDOT right-of-way needed for the Lynnwood Link Extension is presented in Section 4.1.2, Long-Term Impacts.

The proposed project will comply with the federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970. The Act and its amendments direct how federal agencies, or agencies receiving federal funding for a project, will compensate property owners or tenants who must relocate if displaced by the project. The project will also comply with Sound Transit's adopted Real Property Acquisition and Relocation Policy, Procedures, and Guidelines and with Chapter 8.26 RCW, which establishes a uniform policy for relocation assistance for people displaced by public projects in Washington. Property acquisition will follow these laws and policies to ensure property owners and tenants are treated uniformly and fairly.

4.1.1 Affected Environment

The study area for the acquisitions, displacements, and relocations analysis generally follows the I-5 corridor from Northgate to Lynnwood near the Lynnwood Transit Center, and includes the parcels that are within the areas where the light rail

alignments, stations, or facilities require right-of-way. This land is heavily developed and contains residential, commercial, industrial, public, and vacant property. Most of the properties in Segments A and B are residential, while Segment C contains commercial, industrial, and public properties. Current and projected land uses adjacent to the light rail alternatives are discussed in Section 4.2, Land Use; estimates of changes in employment due to business displacements are provided in Section 4.3, Economics.

4.1.2 Long-Term Impacts

Sound Transit overlaid the proposed footprint for all the light rail alternatives over the parcel data from King and Snohomish counties to identify which parcels would be affected by each alternative, and to estimate the potential full and partial acquisitions and resulting displacements by the alternatives. Table 4.1-1 presents the estimated number of acquisitions and displacements for each alternative. Table 4.1-2 presents the estimated amount of WSDOT right-of-way Sound Transit would occupy for each light rail alternative.

The tables and maps in Appendix I-4.1, Acquisitions, Displacements, and Relocations, identify the potentially affected properties by alternative. To estimate the number and types of uses affected, Sound Transit used tax assessor data from King and Snohomish counties and also conducted field surveys. During final design, Sound Transit would prepare detailed assessments of uses, underlying ownership, and the parties involved in displacements.

No Build Alternative

No properties within the study area would be acquired with the No Build Alternative. No displacements or relocations would occur.

Segment A: Seattle to Shoreline

The Segment A alternative routes run parallel to I-5 on its east side, although Alternative A1 includes the NE 185th Street Station Option 1, which would have a parking garage located on the west side of I-5. Most of the adjacent properties are single-family residential. These alternatives would affect the most residential properties compared with the other segment alternatives, and the majority of the potential full acquisitions is residential. Most of the properties contain single-family residences, but there are six affected properties that contain rooming or boarding houses, which Sound Transit estimates would involve 49 individual residential displacements. The displacements associated with these six properties would occur with all the Segment A alternatives. Sound Transit would need to acquire property for right-of-way where the available WSDOT right-of-way is too narrow to completely accommodate light rail. Sound Transit would also need to acquire property for stations.

Table 4.1-1. Potential Property Acquisitions and Displacements

Alternative	Number of Affected Parcels	Residential – Single Family		Residential – Multifamily		Commercial and Industrial		Public and Institutional		Vacant Land		Total Full Acquisitions	Total Partial Acquisitions	Total Displacements	
		Full	Partial	Full	Partial	Full	Partial	Full	Partial	Full	Partial			Residential (units)	Businesses and Institutional
Segment A: Seattle to Shoreline[a]															
A1	114	68	42	0	0	0	1	1	2	0	0	69	45	111[b]	1
A3	106	64	37	0	1	0	1	0	3	0	0	64	42	107[b]	0
A5	127	79	43	0	1	0	1	1	2	0	0	80	47	122[b]	1
A7	116	72	39	0	1	0	1	0	3	0	0	72	44	115[b]	0
A10	121	75	41	0	1	0	1	1	2	0	0	76	45	118[b]	1
A11	106	64	37	0	1	0	1	0	3	0	0	64	42	107[b]	0
Segment B: Shoreline to Mountlake Terrace															
B1	5	0	0	0	0	0	1	0	1	1	2	1	4	0	0
B2	18	5	6	0	0	0	1	0	1	1	4	6	12	5	0
B2A	18	5	6	0	0	0	1	0	1	1	4	6	12	5	0
B4	6	0	0	0	0	0	2	0	1	1	2	1	5	0	0
Segment C: Mountlake Terrace to Lynnwood															
C1	106	1	2	76	0	3	22	0	2	0	0	80	26	77	31
C2	29	1	2	0	0	3	20	0	3	0	0	4	25	1	3
C3	15	0	1	0	0	1	10	0	3	0	0	1	14	0	1

[a] These numbers do not include the properties that could be affected if interchange access modifications are necessary for the NE 130th Street Station or NE 145th Street Station.

[b] The total of displaced residential units includes individuals in rooming/boarding houses which are counted under acquisitions as single family parcels based on assessor records.

Table 4.1-2. Estimated WSDOT Right-of-Way Needs

Alternative	Estimated Right-of-Way Occupied (Acre)
Segment A: Seattle to Shoreline	
A1	26
A3	20
A5	20
A7	19
A10	25
A11	20
Segment B: Shoreline to Mountlake Terrace	
B1	14
B2	15
B2A	16
B4	15
Segment C: Mountlake Terrace to Lynnwood	
C1	1
C2	1
C3	3

Alternatives A3 and A11 would have the fewest full acquisitions of the Segment A alternatives because most of their alignments would be elevated (including their respective stations), reducing impacts on adjacent properties. Alternative A5 would have the most full acquisitions of the Segment A alternatives, including the most residential displacements, because much of the light rail guideway would be at-grade bordering residential areas. Moreover, the NE 155th and NE 185th Street stations would also be located in residential areas, and Sound Transit would need to fully acquire parcels to construct the stations and associated parking structures.

A property that contains the Seattle Latvian Evangelical Lutheran Church would be affected by all Segment A alternatives. This church would be displaced under Alternatives A1, A5, and A10 because the alignment is at-grade on this property, if alternative access cannot be provided. The church would not be displaced with Alternatives A3, A7, and A11, where the alignment is elevated and access could be maintained. No commercial, industrial, public, or vacant land would be displaced in Segment A.

Interchanges could be modified for the NE 130th Street and NE 145th Street stations, depending on the alternative selected. If FHWA and WSDOT approve these modifications, Alternatives A5, A7, A10, and A11 would affect additional residential properties. The alternatives with the NE 145th Street Station Option 2 (A3, A10, and A11) could also have additional full acquisitions if access to the

property is eliminated. Figures I-4.1-2 and I-4.2-3 in Appendix I-4.1 show the areas that could be affected by interchange modifications.

Federally designated highway beautification areas are located adjacent to I-5 in this segment. Some of these designated areas could become project right-of-way. Potential visual impacts caused by the use of these beautification areas are discussed in Section 4.5, Visual and Aesthetic Resources; however, any conversion of a beautification area would require replacement land.

Segment B: Shoreline to Mountlake Terrace

Much of the Segment B alternative alignments are within existing highway right-of-way; therefore, light rail in this segment would affect fewer parcels than in Segment A. Alternatives B1 and B4 would not affect any residential properties and would only result in one full acquisition of a vacant parcel. Alternatives B2 and B2A would both fully acquire five single-family residential properties, which would displace those residences.

Segment B would not have any commercial or industrial displacements. There are several highway beautification areas in Segment B, and any conversion of these areas would require replacement land.

Segment C: Mountlake Terrace to Lynnwood

The study area in Segment C is mostly commercial and industrial, with some residential uses. The light rail guideway for Segment C alternatives would be elevated, which would cause fewer full acquisitions because many businesses would still be able to operate with elevated light rail on a portion of their property. Of the three Segment C alternatives, Alternative C1 would affect the most properties. It would acquire all of the Cedar Creek Condominium buildings, requiring 76 residential relocations. It would also fully acquire two office park properties, displacing 31 businesses, and it would acquire a strip of land from Scriber Creek Park.

Alternatives C2 and C3 would affect mostly commercial and industrial properties; however, Alternative C2 would displace only three businesses and Alternative C3 would displace one business.

All three alternatives would affect a portion of an Edmonds School District property.

4.1.3 Construction Impacts

During construction, properties would be affected by staging area acquisitions and temporary construction easements. Staging areas would be required in each segment. Most would be accommodated within permanent right-of-way acquisitions, although some could be located on temporary construction easements.

A temporary construction easement allows for temporary use of a property during construction. When construction is complete, the property is restored to its previous condition for the owner and the easement is terminated. Such easements would be necessary at various locations along the project corridor. The size of the easement would depend on the type of activity expected on the property and the type of land uses in the area; for example, a vacant property would provide an opportunity for a larger easement, whereas easements adjacent to developed property would be smaller to avoid unnecessary impacts.

Off-site staging areas might be needed to stockpile excavated materials or to cast and store precast structural elements. These areas would be located close to work sites to minimize the impact on local traffic.

The potential staging areas and temporary construction easements that are known at this time are discussed below. Final project design and construction planning may identify additional properties.

The construction staging areas for the light rail alternatives would primarily be adjacent to the proposed alternative alignments. Segment A staging areas would be adjacent to the east side of I-5, and in the median and west side of I-5 for the alternatives that would reconstruct existing roadway bridges. In Segment B, staging areas could be adjacent to the east or west side of I-5 or in the center median of I-5. In Segment C, staging areas would be in the center median of I-5, on the west side of I-5, and near or within the Lynnwood Transit Center.

The areas needed for permanent right-of-way would largely supply areas needed for construction staging for the project. The proposed project would use WSDOT right-of-way as well, and could use other available lands on a temporary basis, including parts of local street rights-of-way.

As project design and construction planning are finalized, Sound Transit may identify the need for construction staging areas outside of the proposed project's right-of-way, requiring the acquisition of additional property. Contractors may also negotiate use of additional property directly with the property owner.

4.1.4 Indirect and Secondary Impacts

The project's property impacts resulting from acquisitions, displacements, and relocations would be direct. There could also be indirect and secondary impacts associated with the change in land use, as a property currently used for residential is converted to a transportation use. These potential impacts are discussed in *Section 4.2, Land Use.*

4.1.5 Cumulative Impacts

Another planned public project in the vicinity of the Lynnwood Link Extension could result in higher levels of property acquisitions and displacements than the Lynnwood Link Extension alone. Sound Transit is currently conducting environmental review for a separate project to develop a Link Operations and Maintenance Satellite Facility. One of the alternatives is in the city of Lynnwood, on lands adjacent to the Segment C alternatives. If the Lynnwood site is developed for the maintenance facility, additional properties would be affected within the city.

Otherwise, there are few sizable public or private projects in the project vicinity that would acquire new properties and displace their uses. Changes in project ownership due to other developments would be more likely to occur over time as market transactions occur.

4.1.6 Relocation Opportunities

To determine relocation opportunities in the project vicinity, Sound Transit researched market conditions for available residential and commercial real estate in the area. As shown in Table 4.1-3, the research considered real estate markets within Shoreline, Mountlake Terrace, Lynnwood, and north Seattle; these areas offer the most likely relocation opportunities in the study area. Although property availability will change over time, the research indicates that there would be opportunities for residents and businesses to successfully relocate within the general area, typically within the same city. Some affected properties with unique characteristics (such as a church, or a property with school district uses) could prove more challenging to relocate.

Table 4.1-3. Property Available for Relocation in the Study Area[a]

Type of Property	Buildings/Units	Total Square Feet[b]	Vacancy Rate[c]	Listings[d] (2012)
Apartment	19,640	—	3%	589
Single Family	86,326	—	—	822
Office	424	6,532,000	13%	41
Industrial	293	5,909,000	4%	19
Retail	1,083	17,137,000	4%	39
Hotel	35	1,399,000	—	1

[a] The study area is Shoreline, Mountlake Terrace, Lynnwood, and north Seattle (the southern boundary of north Seattle varies by market segment, and is variably the Ship Canal, NE 65th Street, or NE 85th Street).
[b] Square feet amounts rounded to nearest 1,000.
[c] Vacancy rate on October 24, 2012
[d] Number of listings on October 15, 2012
Sources: Costar, Dupre+Scott, NWMLS, 2012, Kidder Matthews

The relocation of a business or residence is an inconvenience or hardship for those involved. Sound Transit would offer relocation assistance that includes compensation as well as supporting services that consider the unique needs of those being relocated, and this assistance can help reduce inconveniences or hardships. Finally, Sound Transit is required to satisfy federal requirements for residential relocation, which define a "comparable replacement dwelling" as any dwelling that is (A) decent, safe, and sanitary; (B) adequate in size to accommodate the occupants; (C) within the financial means of the displaced person; (D) functionally equivalent; (E) in an area not subject to unreasonable adverse environmental conditions; and (F) in a location generally not less desirable than the location of the displaced person's dwelling with respect to public utilities, facilities, services, and the displaced person's place of employment (42 United States Code [USC] 61). To meet these requirements, Sound Transit may obtain relocation properties that are in better condition and of higher value than the properties being acquired.

Apartments

There are approximately 20,000 apartment units in the study area. With the current vacancy rate at about 3 percent, there are about 589 available apartment units for rent along the project corridor. Finding reasonably priced, similar replacement property for an owner may prove challenging, but Sound Transit would provide relocation assistance and compensation would be provided; owners would be able to choose to replace their property or they could take compensation entirely. For displaced tenants, a sufficient supply of comparable relocation apartments is expected to be available in various locations within the study area.

Single Family

There is a reasonable supply of comparable single-family homes available to meet the relocation needs of single-family home residents displaced by the project. While the local inventory for lower-priced homes can be limited, this does not alter Sound Transit's obligation to find comparable replacement properties and to provide compensation and relocation assistance to ensure the properties are affordable for the displaced parties. The inventory of condominiums and townhouses is smaller, but it is also expected to be adequate for relocation needs.

Office

A sufficient number of office buildings is available for sale each year to replace displaced buildings. A substantial amount of space is also available for lease each year to meet the needs of displaced office tenants. In addition, vacant land and underutilized properties are available for the construction of new office buildings, which can provide additional capacity.

Industrial

Adequate industrial space is available in the market to meet the needs of the few industrial building owners and tenants that would be displaced by the project. The industrial market in the study area is stable; however, the area is becoming increasingly urbanized and market forces will encourage industrial uses to give way to other uses over time. In the future, those seeking relocation opportunities for industrial space in the study area will have fewer choices.

Retail

There is enough retail space for sale and for lease to meet the relocation needs of retailers displaced by the project. Retail space users often have specific location requirements that must be met to ensure success; therefore, Sound Transit would perform a case-by-case assessment to understand how the available inventory could meet the displaced retailer's needs.

Hotels

Displaced hotel property owners would have to locate a property that is for sale or locate a substitute site to construct a new hotel. The study area has 35 hotels, generally located along the I-5 and Highway 99 corridors. Hotels do come up for sale, but the likelihood is probably slim of finding an available property matching the location requirements and physical characteristics of the displaced property. New development sites exist and may provide the best opportunity to replace an existing property.

4.1.7 Sound Transit Acquisition and Relocation Policy Summary

Sound Transit notified property owners whose property would be directly affected by any of the alternatives, but acquisitions of property would begin only after the Final EIS and NEPA process are complete. The agency is available to answer questions and provide additional information about compensation and relocation assistance services, payments, reimbursement eligibility, and the timing of the process. Sound Transit's relocation assistance and advisory services would include, but not be limited to, measures, facilities, or services that might be necessary or appropriate to determine the relocation needs and preferences of each household, business, and organization to be displaced. The agency also would provide current information on the availability, purchase prices, and rental costs of comparable replacement properties.

Sound Transit would work closely and proactively with residents and businesses to help them plan ahead for relocation, and would assist in finding new homes or sites, and help to solve problems that might occur. While the ultimate choice of a relocation site would be up to the affected resident or business, the agency would

help investigate possible locations, including nearby properties. Sound Transit uses interpreters to help those with limited English proficiency understand their choices and options.

Owners would not be required to relocate until they have been paid the agreed purchase price or until an amount equal to Sound Transit's estimate of just compensation has been deposited with the court. Businesses and tenants would not be required to move operations or relocate without receiving at least 90 days written notice.

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

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

Other benefits and compensation might include payment of residential moving expenses and replacement housing payments, non-residential moving expenses, and reestablishment expenses. Sound Transit's *Business and Residential Acquisition and Relocation* handbooks outline compensation and acquisition procedures in detail.

If Sound Transit recognizes special circumstances, proactive help to solve problems would be available.

4.1.8 Potential Mitigation Measures

As discussed above, Sound Transit would compensate affected property owners according to the provisions specified in Sound Transit's Real Estate Property Acquisition and Relocation Policy, Procedures, and Guidelines; the federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970; and the State of Washington's relocation and property acquisition law and regulations. Benefits would vary by property depending on the level of impact, available relocation options, and other factors. The primary mitigation for acquisitions and displacements would be payment of just compensation and relocation assistance.

For temporary construction easements, the property would be restored to its previous condition for the owner and/or another type of compensation would be employed as outlined during the easement's negotiation process.

If federally designated highway beautification areas are converted for project rights-of-way, Sound Transit will mitigate for these impacts. Such mitigation could include providing property along I-5 to replace the converted beautification areas, or by other measures as agreed by WSDOT and FHWA.

4.2 Land Use

This section discusses existing land uses and current zoning (i.e., future allowable land uses), describes changes in land use that would occur as a result of the Lynnwood Link Extension alternatives, and evaluates the consistency of the project with local and regional planning policies.

The land use study area for this EIS consists of the areas immediately adjacent to the proposed alternative routes and within a 0.50-mile radius around the stations.

For this evaluation, the project's land use compatibility and conformance with existing land use policies and plans were measured and compared to the regional and state plans, including the locally adopted plans shown in Table 4.2-1. Appendix I-4.2, Land Use, discusses the regional, state, and local land use plans and policies pertaining to the study area.

Table 4.2-1. Locally Adopted Plans and Policies

City of Seattle
City of Seattle Comprehensive Plan, 2009a
City of Seattle Transportation Strategic Plan, 2005
Seattle Department of Transportation Northgate Coordinated Transportation Investment Plan, 2006
Seattle Pedestrian Master Plan, 2009b
Seattle Bicycle Master Plan, 2007
City of Seattle Transit Master Plan, 2012
City of Shoreline
City of Shoreline Comprehensive Plan, 2012a
City of Shoreline Southeast Neighborhoods Subarea Plan, 2010
City of Shoreline Transportation Master Plan, 2011a
City of Shoreline Environmental Sustainability Strategy, 2008
City of Shoreline Light Rail Guiding Principles, 2011b
City of Mountlake Terrace
City of Mountlake Terrace Comprehensive Plan, 2011
Mountlake Terrace Town Center Design Standards, 2008a
Mountlake Terrace Freeway/Tourist District Design Standards, 2010a
Mountlake Terrace Multifamily Design Standards, 2010b
Mountlake Terrace Economic Vitality Strategy, 2008b
Mountlake Terrace Sustainability Strategy, 2008c
Mountlake Terrace Transit-Oriented Development Study, 2003
Mountlake Terrace Transit Service Strategy, 2010c
Melody Hill Subarea Plan, 2006
City of Lynnwood
City of Lynnwood Comprehensive Plan, 2011
Lynnwood City Center Access Study, 2007
Lynnwood City Center Sub-Area Plan, 2005
Lynnwood City Center Design Guidelines, 2012
City of Lynnwood Mode Split for City Center Street Master Plan, 2009a
Lynnwood City Center Street Master Plan, 2009b
Lynnwood Local Improvement District (LID) Feasibility Study, 2008

4.2.1 Affected Environment

The project corridor is located within King and Snohomish counties, and the alternatives would have stations in four cities (Seattle, Shoreline, Mountlake Terrace, and Lynnwood). Existing land uses in these jurisdictions include a mixture of single-family and multifamily residential, commercial (retail, services, and office uses), institutional, light industrial, and

transportation uses. Many recreational and public open spaces are in the study area. Section 4.17, Parks and Recreational Resources, provides more information on these land uses. The project would not affect any farm land.

Development in the Puget Sound region is strongly influenced by the Growth Management Act (GMA). The GMA requires state and local governments to manage Washington's growth by identifying and protecting critical areas and natural resource lands, designating urban growth areas, preparing comprehensive plans, and implementing them through capital investments and development regulations. The project is within the urban growth boundaries identified by King and Snohomish counties.

PSRC's VISION 2040, adopted in 2008, is the region's integrated long-range growth management strategy. Its strategy is to guide growth, concentrate new employment in urban centers, and link the centers with a high-quality multimodal transportation system. Urban centers are the hallmark of VISION 2040 and its regional growth strategy. Northgate and Lynnwood have been designated as regional growth centers for housing and employment growth, as well as for regional funding.

The following subsections describe existing land uses for each project segment. Future allowable land uses are presented as generalized zoning in Figures 4.2-1a and 4.2-1b. Existing land use and future allowable land uses are based on information from comprehensive plans and planning documents for the cities of Seattle, Shoreline, Mountlake Terrace, and Lynnwood. All land uses have been categorized into dominant land uses to present land use consistently among jurisdictions to the extent possible. Section 4.3, Economics, includes information on projected residential units and business employees within 0.50 mile of the proposed stations.

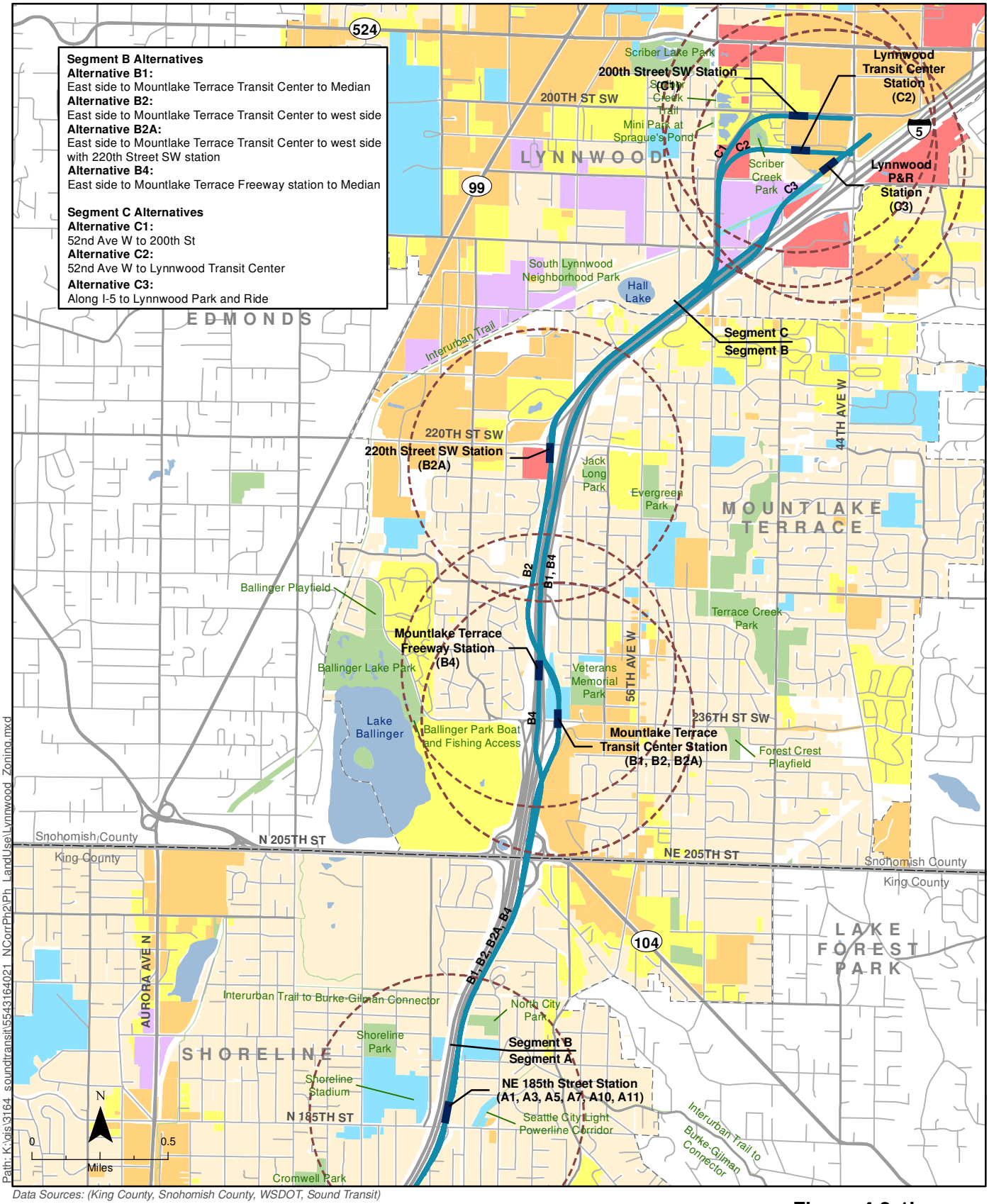
Segment A: Seattle to Shoreline

Segment A begins along the east side of I-5 in the Northgate area, north of NE 103rd Street. Northgate is an urban environment consisting of a regional shopping center and a mix of other uses, such as multifamily residential and commercial usage. The Northgate Apartments multifamily residential complex is northeast of the NE Northgate Way/1st Avenue NE intersection, just north of the shopping center. North of North 115th Street, the area is predominantly single-family residential. Several large public parks and open spaces are in Segment A, as well as several small commercial areas primarily east of I-5, generally along 15th Avenue NE.

Other larger parcels or unique uses in Segment A include the Lakeside School, the Shoreline Fire Station, the King County solid waste transfer facility, the King County Metro bus base, and Shoreline Center, which is part of a larger complex owned and operated by the Shoreline School District. The parks in the project corridor are described in more detail in Section 4.17, Parks and Recreational Resources.

Figure 4.2-1a
Generalized Zoning
Segment A

Lynnwood Link Extension



Data Sources: (King County, Snohomish County, WSDOT, Sound Transit)

Generalized Zoning

- Commercial
- Industrial/Warehouse
- Institutional/Public
- Single Family Residential
- Multi Family Residential
- Mixed Use (Residential/Commercial)
- Park/Open Space

- Light Rail Alternatives
- Station Location
- Waterbody
- 1/2 Mile Station Study Area

Figure 4.2-1b
Generalized Zoning
Segments B and C

The City of Shoreline's *Comprehensive Plan*, Land Use Element, provides policy direction for the City as it coordinates with Sound Transit on the proposed project and considers how land uses around station areas could help foster vibrant, livable, and transit-oriented communities. The land use policies would further guide land use regulations for station areas at NE 145th and NE 185th streets, including transit-supportive developments with residential components mixed with complementary commercial and office uses. The City of Seattle is also studying policies that could apply to areas with transit investments.

Segment B: Shoreline to Mountlake Terrace

Segment B extends from NE 185th Street and continues north of the Mountlake Terrace Transit Center. Most of the segment consists of single-family residential communities, with interspersed areas of multifamily residential, commercial, recreational, and open space uses. Shoreline School District properties are located along the west side of I-5 between NE 185th Street and NE 191st Street, straddling Segments A and B, as well as along the east side of I-5 between NE 191st Street and NE 194th Street. Adjacent to the Shoreline School District property on the east is a park and the single-family residential neighborhood along NE 194th Street. A pedestrian/bicycle overpass at NE 195th Street links neighborhoods east and west of I-5. The SR 104/I-5 interchange area east of I-5 consists of a shopping center and mixed multifamily residential and commercial uses.

The Mountlake Terrace Transit Center is east of I-5 at 236th Street SW. The Mountlake Terrace Town Center is along the 236th Street SW corridor to the east, and consists of a mix of uses such as multifamily residential and commercial. A park is located near the transit center, and single-family residences surround much of the area. Businesses surrounded by small parking lots are predominant in this area. A vacant Edmonds School District property is south of the transit center and 236th Street SW. This area was recently rezoned to allow greater density, including mixed-use development. North to 220th Street SW, the land uses to the west are initially residential and then mostly commercial and multifamily, while the east side of I-5 is mostly single-family residential, with interspersed multifamily residential use. The City of Mountlake Terrace identifies the intersection of 220th Street SW and 66th Avenue West as the commercial center node that will include increased pedestrian access to surrounding areas.

Mountlake Terrace has adopted a form-based code for its town center that consists of six "districts." The central district allows mixed-use development up to seven stories high. Adjacent zones step down to transition to the existing single-family neighborhoods. The City has design standards for all new development in the town center.

Segment C: Mountlake Terrace to Lynnwood

Segment C is entirely within the Lynnwood city limits. Single-family residential use predominates in the south up to the Mountlake Terrace city limit, and then transitions to a mix of uses that includes commercial use northwest of I-5, as well as farther north of 204th Street SW (Alderwood Mall). Industrial uses occupy the west side of I-5 between 204th Street SW and 208th Street SW.

Segment C ends within the Lynnwood City Center, inside of the PSRC-designated regional growth center, which is anticipated to accommodate much of the growth between Northgate and Everett. Within this area are commercial, industrial, and residential uses. Most of the commercial uses are automobile-dependent businesses set back from the street frontage surrounded by surface parking lots. Buildings range in size from small single businesses to "big-box" retail and strip malls. Most of the residential uses are north and west of the city center in a mix of multifamily developments and single-family neighborhoods. Except for Group Health and the parcel owned by the Edmonds School District west of the city center, there are no major institutions in Segment C. The Edmonds School District's future plans for its property include administrative buildings and the District's bus maintenance and storage facility.

Lynnwood's zoning regulations and design guidelines support a high-density neighborhood near the existing Lynnwood Transit Center, which is composed of three districts. The types of use permitted vary among the districts. All Segment C station alternatives are located in the "City Center West" zone, envisioned to have a mix of residential, retail, restaurants, office, and high-density housing. The tail track of Alternative C3 would cross 44th Avenue West into the higher density "City Center Core" zone.

4.2.2 Long-Term Impacts

This section discusses Lynnwood Link Extension's potential impacts on the existing and allowable future land use patterns, and the consistency of the alternatives with regional, state, and local policies.

Direct Impacts. Direct land use impacts would occur in locations where the light rail alternatives would require private or public property acquisitions for the alignment, stations, or parking and traction power substations. These property acquisitions would convert property to a transportation-related use. Direct impacts also include proximity impacts (e.g., traffic, noise, and visual impacts) that could cause changes in adjacent land uses.

Indirect Impacts. Indirect land use impacts involve the development and/or redevelopment of land (such as transit-oriented development) in the vicinity of the proposed project facilities (i.e., light rail line, stations, parking facilities, and traction

power substations). In addition to those uses allowed by current zoning and land use codes, jurisdictions could enact changes in their codes to permit other development and/or redevelopment. One such indirect impact could be transit-oriented development consisting of higher-density, mixed-use residential development, typically around the proposed stations. Some of the station alternatives are on WSDOT property, where conversions to transit-oriented development may be restricted in some circumstances. Transit-oriented developments could still be allowed on non-WSDOT properties. As per Sound Transit policy (see section 4.2.4), Sound Transit would explore opportunities to facilitate transit-oriented development with WSDOT, local jurisdictions and others where such development is appropriate.

Construction Impacts. These include changes to land use that could arise from other kinds of temporary impacts (e.g., noise, air quality, traffic, visual and aesthetic resources) on nearby properties, as well as economic impacts on businesses from construction-related activities.

Property acquisitions are detailed in Section 4.1, Acquisitions, Displacements, and Relocations. This land use analysis also considers findings from other environmental elements, including Chapter 3, Transportation Impacts and Mitigation, and Sections 4.3, Economics; 4.5, Visual and Aesthetic Resources; 4.6, Air Quality and Greenhouse Gases; 4.7, Noise and Vibration; and 4.17, Parks and Recreational Resources.

No Build Alternative

The No Build Alternative includes the existing transportation system and future population and employment growth assumed in adopted plans, but without the Lynnwood Link Extension. It would not require the displacement of any residents or businesses. However, it would be inconsistent with many of the regional land use and transportation policies by not instituting a mass transit system connecting the region's highest growth centers. It would also be inconsistent with the local plans that encourage increased density and/or transit-oriented development patterns in anticipation of light rail service.

Under this alternative, the PSRC policies related to focused and compact growth, frequent transit service, urban center connections, and transportation alternatives to single-occupant vehicles would not be fully implemented. Therefore, it would constrain transportation options, leading to more traffic congestion where higher density is planned or causing less dense development patterns in the growth centers. Less dense development could cause a shift to more automobile-oriented land use patterns, which are typically more spread out and less dense than transit-oriented development patterns. This trend would likely lead to developing more land area and creating longer travel patterns.

Long-Term Impacts Common to All Light Rail Alternatives

This subsection evaluates the proposed project's consistency with land use plans and policies and identifies direct impacts common to all the light rail alternatives, common indirect impacts related to transit-oriented development, and direct and indirect impacts by project segment. These assessments are based on existing land use patterns and current zoning along the project corridor and within station areas.

Consistency with Land Use Plans and Policies

Regional, state, and local land use plans in the study area share the goal of improving transit accessibility and encouraging transit use. The Lynnwood Link Extension would connect employment centers and provide for uninterrupted transit access among the four jurisdictions in the project corridor. Sound Transit reviewed regional, state, local, and major institution master plans to determine whether the project would be consistent with the applicable goals and policies.

All light rail alternatives would support long-range planning and growth management to varying degrees. The route and station alternatives are also generally consistent with regional and local plans and policies in the study area. The Lynnwood Link Extension would comply with goals and policies identified in PSRC's VISION 2040 by providing a regional transit system serving a growing transportation need in planned high-density areas, with residential and employment uses within designated urban centers. Also, PSRC has been developing a corridor action strategy, *Growing Transit Communities,* for several of the region's major transit corridors. The project is in PSRC's North Corridor area and it would contribute to the objectives of its action strategy.

Connecting Lynnwood to other designated regional growth centers, such as downtown Seattle and, eventually, Everett, is a Sound Transit Long-Range Plan goal as well as an integral component of PSRC's *Transportation 2040*. Local land use planning documents focus on the types of land uses permitted within zones and the scale to which development is allowed within these zones.

The Lynnwood Link Extension would increase transit levels of service and linkages with other jurisdictions and regional destinations. In station areas such as at NE 145th Street and NE 185th Street, potential comprehensive plan and zoning changes by the City of Shoreline could result in more intensive land uses and economic development around those proposed stations. However, development around station areas in lower-density residential areas is not expected to encourage incompatible commercial or industrial development because of the applicable plans and codes precluding such development. All stations would help serve existing land uses with improved mobility options.

In those areas where the local jurisdictions have indicated the desire to capitalize on the increased mobility of light rail by encouraging higher development density

(including mid- and high-density mixed use of multifamily residential, commercial, and office development), also known as transit-oriented development, the Lynnwood Link Extension would support their goals and policies.

The Lynnwood Link Extension is considered an essential public facility; therefore, under the GMA, when Sound Transit's routing decision has been finalized, the Cities of Seattle, Shoreline, Mountlake Terrace, and Lynnwood would have a "duty to accommodate" the project in their comprehensive plans.

All light rail alternatives would be consistent with the relevant plans and policies of the City of Seattle. The City's plans and policies focus future growth and developments into areas designated as urban villages and are supportive of high-capacity transit service to and from urban villages.

Lynnwood and Mountlake Terrace have policies that support more intensive land uses and economic development around the proposed stations, and both are preparing for regional transit improvements in their station areas. Both Cities are either in the process or have recently amended their comprehensive and neighborhood plans to allow a greater density and mixture of land uses near the proposed stations. All light rail alternatives are generally consistent with the plans and policies of the Cities of Lynnwood and Mountlake Terrace with one exception. All Segment B alternatives would be inconsistent with Goal 8 of the Mountlake Terrace Transit Service Strategy if the alternatives lead to the closure of the freeway station.

The City of Shoreline's City Council recently adopted its updated 2012 *Comprehensive Plan*, which includes several station area planning policies as part of the update. These policies would support developments with residential components mixed with complementary commercial and office uses.

Consistent with Lynnwood's designation as a regional growth center, the City has developed a vision and adopted plans and policies to achieve regional growth targets with a specific focus on the city center. The City completed a *City Center Sub-Area Plan* in 2005 with the following objective: "…to create within 20 years, a compact, intense and lively city center that offers Lynnwood new opportunities for culture, commerce and habitation."

The Lynnwood Link Extension would assist the project corridor cities by better enabling the desired land use changes and densities to be achieved. Further information on the project's consistency with plans, goals, and policies is provided in Appendix I-4.2, Land Use.

Changes in Land Use

All of the light rail alternatives would require the acquisition of properties to build the Lynnwood Link Extension. Table 4.2-2 shows the area calculations for acquisitions by land use for each alternative. Property acquisitions are detailed in Section 4.1 and

Appendix I-4.1. Although property acquisitions, displacements, and the conversion of land use would occur prior to construction, they are considered an operational impact because of their long-term effects. Any acquisition of property would convert existing land uses to public right-of-way (which is a transportation-related use) for construction and operation of the Lynnwood Link Extension (i.e., staging areas, light rail track, stations, traction power substations, or parking facilities).

Table 4.2-2. Estimated Area of Acquisitions by Land Use (in acres)

	Alternatives												
Land Use[a]	**A1**	**A3**	**A5**	**A7**	**A10**	**A11**	**B1**	**B2**	**B2A**	**B4**	**C1**	**C2**	**C3**
Commercial	0.02	0.01	0.01	0.01	0.01	0.01	-	-	0.02	0.04	5.47	-	5.29
Industrial	-	-	-	-	-	-	-	-	-	-	3.34	4.80	1.56
Institutional	0.31	0.32	0.34	0.34	0.33	0.32	0.51	0.51	0.51	0.19	-	-	-
Multifamily	-	0.07	0.07	0.07	0.07	0.07	-	-	-	-	0.83	0.02	-
Public[b]	0.55	0.39	2.99	0.62	0.01	0.39	3.32	3.35	3.35	-	0.56	5.94	9.97
Single Family	8.82	8.81	9.70	8.98	10.55	8.81	-	-	0.53	-	0.04	0.04	-
Vacant	-	-	-	-	-	-	0.39	0.90	0.90	0.37	-	-	-
Total	**9.70**	**9.60**	**13.11**	**10.02**	**10.97**	**9.60**	**4.22**	**4.76**	**5.31**	**0.60**	**10.24**	**10.80**	**16.82**

[a] Land use designations developed from King County and Snohomish County assessor data.

[b] Does not include use of WSDOT property.

The land to be acquired would constitute only a small portion of the total land use for each category in the project vicinity and would not materially change the regional or local land use or development patterns. Following construction, remnant land areas that would not be needed for operation of the project could be made available for redevelopment consistent with the current zoning. No known visual or noise impacts associated with the project would alter existing or planned future land use.

Table 4.1-1 in Section 4.1 shows how many parcels in each alternative would be converted to a transportation-related use. The totals represent the number of affected parcels outside the existing transportation rights-of-way. They are estimates based on the current early conceptual designs.

The development and redevelopment potential in station areas is discussed later in this section under Section 4.2.4, Indirect and Secondary Impacts.

Segment A: Seattle to Shoreline

Most of the full property acquisitions in Segment A would be single-family residences. The total single-family acquisitions would range from about 8 acres to about 10 acres, depending on the alternative. However, multifamily residential and commercial properties would also be affected. Alternative A5 would affect the most parcels in this segment. Alternatives A3 and A11 would affect the fewest parcels;

however, the alternatives overall would affect a similar range of parcels and primarily the same areas, with the most notable differences in the station areas.

Alternative A1: At-grade/Elevated with NE 145th and NE 185th Stations

Alternative A1 would affect primarily single-family residential parcels but require fewer full single-family property acquisitions compared with most of the other Segment A alternatives. The conversion of properties to a transportation use would not markedly alter the predominant pattern of single-family land use in the Segment A portion of the project corridor.

For NE 145th Street Station Option 1, a row of single-family residences would be acquired to accommodate a three-story parking structure for about 500 vehicles. There is an established residential neighborhood to the north and east and a public golf course to the south. With these largely residential and parkland surroundings immediately adjacent to the station, there is a low potential for the station to indirectly cause additional changes in land use and development patterns. However, the City of Shoreline has recently adopted policies supporting transit-oriented development as part of its updated 2012 *Comprehensive Plan,* in which this location is designated as a Light Rail Station Study Area. An approved Subarea Plan could allow redevelopment and related changes to land use patterns north of NE 145th Street over time. Currently, the City of Seattle does not have plans or policies supporting transit-oriented development in this location.

With the NE 185th Street Station Option 1, the at-grade station would include a park-and-ride facility west of I-5. The areas surrounding the station itself are largely residential, but the parking structure would be adjacent to the Shoreline Conference Center. There are no current plans to redevelop the center; therefore, the potential is low for the station to cause additional changes in land use and development patterns that are different from existing conditions. The City of Shoreline's updated 2012 *Comprehensive Plan* designates this location as a Light Rail Station Study Area. The City would support transit-oriented development at this location through the approval of a Subarea Plan.

Alternative A3: Mostly Elevated with NE 145th and NE 185th Stations

Alternative A3 is similar to Alternative A1, but with a mostly elevated profile alignment to NE 145th Street. Alternative A3 would have the fewest full single-family property acquisitions in Segment A, and the conversions in land use would not affect the overall pattern of single-family land use or the development character in the area.

Land use impacts resulting from the NE 145th Street Station Option 2 or NE 185th Street Station Option 2 would be similar to those under Alternative A1.

Alternative A5: At-grade/Elevated with NE 130th, NE 155th, and NE 185th Stations

Alternative A5 is similar to Alternatives A1 and A3 but would have different station sites in its southern section, and a different site configuration for the station at NE 185th Street. It would have the most full single-family property acquisitions among other Segment A alternatives, largely from the at-grade alignment and the need for land to accommodate three stations.

Except for the localized conversions of existing land uses to a transportation-related use, changes in land use with Alternative A5 would not markedly alter the predominant pattern of single-family land use or development character in the corridor. The potential is low for additional changes in land uses and development character under this alternative.

The NE 130th Street Station Option 1 is in a residential area and therefore its property acquisition impacts would be limited. Because of the mostly single-family residential surroundings, the potential is low for the station to directly or indirectly change land use and development patterns in the area.

The NE 155th Street Station would include a parking structure that would displace single-family residences. The potential is low for the station to cause additional changes in land use and development patterns. The City of Shoreline has not designated this area as a Light Rail Station Study Area in its *Comprehensive Plan's* Land Use Element.

The NE 185th Street Station Option 3 would have land use impacts similar to the NE 185th Street Station with Alternative A3, except for the areas used under the Seattle City Light transmission line.

Alternative A7: Mostly Elevated with NE 130th, NE 155th, and NE 185th Stations

Alternative A7 is similar to Alternative A5, but with a mostly elevated profile alignment to NE 145th Street. Property impacts would mostly involve single-family residential properties along the alignment and at station areas, with Alternative A7 in the middle of the range for impacts from Segment A alternatives.

Changes in land use with Alternative A7 are not expected to markedly alter the predominant pattern of single-family land use or development character in the corridor. The effects by station would be similar to Alternative A5 for the NE 130th Street Station Option 2, but Alternative A7 would avoid any residential displacement. The effects of the NE 155th Street Station would be the same as under Alternative A5, where residential displacements and the park-and-ride would be the primary changes in land use. For the NE 185th Street Station Option 2, the long-term

impacts of Alternative A7 would be the same as described for Alternative A3 and would primarily be from acquiring land for the station and park-and-ride facility.

Alternative A10: At-grade/Elevated with NE 130th, NE 145th, and NE 185th Stations

Alternative A10 would be similar to Alternative A1 up to NE 130th Street, then it would be similar to Alternative A5. Alternative A10 would affect more properties than most of the other Segment A alternatives, in part because it would have three stations and more at-grade sections, which require more land.

Similar to the other Segment A alternatives, changes in land use with Alternative A10 would affect parts of single-family areas but would not markedly alter land use or development character. The NE 130th Street Station Option 1 effects would be low with Alternative A10, as with Alternative A5. The NE 145th Street Station Option 1 would be the same as described for Alternative A1, which would affect a row of single-family homes. The NE 185th Street Station Option 3 with Alternative A10 would have impacts similar to those described for Alternative A1. These effects would involve an at-grade station in a residential neighborhood adjacent to I-5 and parking areas that would displace residential properties and use the Seattle City Light transmission line right-of-way for surface parking.

Alternative A11: Mostly Elevated with NE 130th, NE 145th, and NE 185th Stations

Alternative A11 is similar to Alternative A3, except that a NE 130th Street Station would be included. Alternative A11 would have the same level of impact on properties as Alternative A3. Displaced uses would be single-family properties; Alternative A11 land use effects would be similar to those described for Alternative A3 because the NE 130th Street Station would have limited land use effects.

Changes in land use with Alternative A11 are not expected to markedly alter the predominant pattern of single-family land use or development character in the corridor.

Segment B: Shoreline to Mountlake Terrace

Segment B would cause fewer property acquisitions and related changes to land use than Segment A, largely because Segment B has more available right-of-way to use along I-5. Most of the acquisitions for these alternatives would be related to the use of Mountlake Terrace Transit Center property and property owned by the Edmonds School District. A small amount of single-family land use and vacant land would also be converted to transportation-related uses. Based on the current design, Alternatives B2 and B2A, which would cross to the west side of I-5, would affect the greatest number of parcels in this segment. Alternatives B1 and B4, which would

cross to the freeway median, would affect the fewest parcels. All Segment B alternatives would be inconsistent with Goal 8 of the Mountlake Terrace Transit Service Strategy if they lead to the closure of the freeway station.

Alternative B1: East Side to Mountlake Terrace Transit Center to Median

Alternative B1 would have the fewest conversions of land to a transportation use among the Segment B alternatives. It would not alter the predominant pattern of single-family land use or development character in the project corridor.

An elevated station would be east of the existing parking structure, straddling 236th Street SW, and would serve the Mountlake Terrace Transit Center and park-and-ride structure. A small amount of property would be acquired, mostly south of 236th Street SW, and converted to transportation use, but no displacements would occur. The station has the potential to support future development in the City's proposed town center to the east and south, which could include intensifying commercial and higher-density multifamily uses primarily east of the station.

The City of Mountlake Terrace has identified this station site in previous studies as having the potential for transit-oriented development. The City's Town Center Plan includes a civic center and also outlines a vision to spur development in the surrounding area. Land use and zoning have been modified to support this plan. The area south of the station has recently been rezoned to accommodate higher use development.

Alternative B2: East Side to Mountlake Terrace Transit Center to West Side

Alternative B2 is the same as Alternative B1 between NE 185th Street Station and the north side of the Mountlake Terrace Transit Center Station (same station as B1). Alternative B2A would have a station at 220th Street SW, but Alternative B2 would not.

Alternative B2 would affect the most parcels, which are mostly single-family residential. It would convert more properties to a transportation use than Alternative B1 or B4.

Changes in land use with Alternative B2 are not expected to markedly alter the predominant pattern of single-family land use or development character in the corridor. The Mountlake Terrace Transit Center effects would be low.

Alternative B2A: Optional 220th Street SW Station

Under Alternative B2A, an elevated station would be provided above 220th Street SW with a parking garage for up to 200 vehicles located on the north side of the street, with the access driveway off 60th Avenue West. The station would serve

major employers such as Premera Blue Cross and the Mountlake Terrace City Hall, as well as numerous nearby multifamily developments east and west of I-5. The station would be in the Melody Hill subarea. The station has the potential to support future development, which could include intensification of commercial and higher-density multifamily uses.

Alternative B4: East Side to Mountlake Terrace Freeway Station to Median

Alternative B4 is primarily within WSDOT rights-of-way and would affect only six properties, with impacts similar to Alternative B1. Except for potential intensification of land uses east of the station area, Alternative B4 changes in land use are not expected to markedly alter the predominant pattern of single-family land use or development character in the area because applicable plans and codes preclude incompatible uses in those areas.

The Mountlake Terrace Freeway Station would be located on I-5 at the existing flyer stop adjacent to the existing transit center. The freeway station would be extended to the north, retrofitted to accommodate light rail trains, and closed to bus use. The station would be entirely within the median of I-5, with a new pedestrian bridge extending east over I-5 to 232nd Street SW. Small amounts of property would be acquired between I-5 and 232nd Street SW for this connection; however, no displacements would occur. Similar to the Mountlake Terrace Transit Center site in Alternative B1, this station has the potential to support future development in Mountlake Terrace's proposed downtown core to the east and residential neighborhoods west of I-5. Such development could include intensification of commercial and higher-density multifamily uses east of the station in the proposed downtown core.

Segment C: Mountlake Terrace to Lynnwood

Segment C extends to the proposed Lynnwood Transit Center stations and the City Center subarea. The proposed stations would be on the east end of the City Center West zone. This zone is envisioned to include a dense mix of commercial (office, retail, and service) uses and a concentration of residential units. In Alternative C3 the tail track would cross over 44th Avenue West ending in the City Center Core zone, which accommodates higher-density mixed-use development.

The number of properties affected by acquisitions is a key difference among the Segment C alternatives. Alternative C1 would affect over 100 parcels, with 50 full acquisitions, while Alternative C2 would affect 29 parcels with four full acquisitions, and Alternative C3 would affect 15 parcels with one full acquisition. Most of the acquisitions would be commercial, but multifamily, single-family, and public uses would also be converted.

Alternative C1: 52nd Avenue West to 200th Street SW

The Alternative C1 route has several sections along arterial streets, including 52nd Avenue West, Cedar Valley Road, and 200th Street SW. It would affect the most properties of the Segment C alternatives. This includes a multifamily residential condominium property with nearly 80 units, several single-family properties, industrial or commercial properties, and public properties. One of the public properties that would be affected is Scriber Creek Park, a Section 4(f) resource. The conversion of these lands to transportation use would be localized and would not markedly alter the overall pattern of land use or development character in the Lynnwood area.

The 200th Street SW Station would be located on the east side of 48th Avenue West and south of 200th Street SW. South of the station, there would be two new parking structures, and the elevated guideway would continue east to 44th Avenue West. The station would be at the west edge of the designated Lynnwood City Center and adjacent to a large multifamily development.

Commercial property between the existing transit center and 200th Street SW would be acquired and converted to transportation use as the parking structure that would serve the station. The tail tracks to the light rail terminus would displace some parking that now serves commercial land uses.

The station would be compatible with area development patterns and could reinforce intensification of commercial and higher-density multifamily uses near the station. Any such intensification would increase the activity levels adjacent to nearby residential uses. The development of the station would not likely affect currently planned projects, most of which have transit-oriented development goals.

Alternative C2: 52nd Avenue West to Lynnwood Transit Center

Alternative C2 would acquire and convert fewer properties than Alternative C1, and it would not convert any multifamily residential properties. The Lynnwood Transit Center Station would convert parts of an existing park-and-ride facility but would provide a larger parking structure to increase overall parking capacity. The station would be at the west edge of the designated Lynnwood City Center.

The station would be compatible with area development patterns and could reinforce intensification of commercial and higher-density multifamily uses near the station. Any such intensification would increase the activity levels adjacent to nearby residential uses. The station would not likely affect currently planned projects, most of which have transit-oriented development goals.

Alternative C3: Along I-5 to Lynnwood Park-and-Ride

Alternative C3 would acquire and convert the fewest properties to transportation use. The affected parcels would be single-family, commercial, industrial, public, and institutional properties, and only one existing use (La Quinta Inn) would be displaced. These changes in land use are not expected to markedly alter land use patterns or development character.

The Lynnwood Transit Center Station Options 1 and 2 have different layouts but would affect the same areas, and the land use impacts for both options would be similar. Both station options would be compatible with area development patterns and could reinforce intensification of commercial and higher-density multifamily uses near the station.

4.2.3 Construction Impacts

Construction Impacts Common to All Light Rail Alternatives

Construction of the Lynnwood Link Extension would temporarily affect existing land uses due to construction activities (e.g., staging areas, earthmoving, and truck traffic). The temporary impacts would include potential increases in noise levels, dust, traffic congestion, visual changes, and increased difficulty accessing residential, commercial, and other uses. Chapter 2, Alternatives Considered, describes construction methods for the light rail alternatives. Although some businesses might experience hardship during construction, this would not affect the land use type unless the property became vacant.

For more information on impacts, including impacts on the existing uses (i.e., businesses and residences) and measures to avoid, minimize, and mitigate for those impacts, see Chapter 3, Transportation Impacts and Mitigation, and Sections 4.3, Economics; 4.4, Social Impacts, Community Facilities, and Neighborhoods; 4.5, Visual and Aesthetic Resources; 4.6, Air Quality and Greenhouse Gases; and 4.7, Noise and Vibration.

Construction would also require temporary construction easements, and the permanent use of public right-of-way owned by WSDOT and local jurisdictions, beyond the property acquisitions needed within the project limits. The easements would be temporary and the property returned to preconstruction conditions upon project completion. Following construction, the remaining parcels could be redeveloped consistent with the land zones for these parcels. Section 4.1, Acquisitions, Displacements, and Relocations, provides more information on the methods to be implemented to compensate those affected.

Segment A: Seattle to Shoreline

No additional impacts would occur in Segment A other than those described above. Construction activity required for the Segment A alternatives would take place primarily on the east side of I-5, although Alternative A1 could also realign a road and construct a parking garage on the west side of I-5. Most construction staging along the Segment A alignments would occur in the proposed guideway, station, and park-and-ride rights-of-way.

Segment B: Shoreline to Mountlake Terrace

No additional impacts would occur in Segment B other than those described above. Construction activity required for the Segment B alternatives would take place either adjacent to the east side of I-5 (all Segment B alternatives), in the center median of I-5 (Alternatives B1 and B4), or on the west side of I-5 (Alternatives B2 and B2A). Most construction staging along the Segment B alignments would occur in the proposed guideway, station, and park-and-ride rights-of-way.

With Alternatives B1, B2, and B2A, construction staging of the elevated Mountlake Terrace Transit Center Station would occupy part of the existing surface parking lot, and parking spaces would be temporarily displaced. Access to the existing parking structure would be maintained as well as bus operations that currently serve the transit center.

There may be opportunities to use vacant adjacent lots such as the abandoned school site south of 236th Street SW owned by the Edmonds School District. The contractor would need to coordinate with the school district or other vacant land owners on the use of these sites.

Segment C: Mountlake Terrace to Lynnwood

No additional impacts would occur in Segment C other than those described above. Construction activity required for the Segment C alternatives would take place either in the center median of I-5 or on the west side of I-5, and near the Lynnwood Transit Center. Most construction staging along the Segment C alignments would occur in the proposed guideway, station, and park-and-ride rights-of-way.

4.2.4 Indirect and Secondary Impacts

Improved transit access can increase the convenience and desirability of surrounding residential, commercial, and office properties. The type of development at stations with available land and supportive zoning in place tends to be more intense, mixed-use development that supports high-density residential, commercial, and office-related uses.

Federal, state, regional, and local governments have an array of programs and policies to support transit-oriented development near mass transit projects. Sound Transit has

identified key principles for its transit-oriented development program, the *Sound Transit Program TOD Strategic Plan* (Sound Transit 2011c); and then adopted the Transit-Oriented Development policy in 2012 (Resolution R2012 – 24). The policy has the following goals:

- Increase the value and effectiveness of transit by increasing transit ridership.
- Support implementation of state, regional and local growth plans, policies and strategies.
- Foster relationships with local jurisdictions, regional agencies, private developers, local residents, businesses, community groups and other stakeholders to facilitate transit-oriented development.
- Encourage convenient, safe multi-modal access to the transit system, with an emphasis on non-motorized access.
- Support economic development efforts.
- Encourage creation of housing options including market-rate and affordable units.
- Support implementation of other related Sound Transit plans and policies, with an emphasis on the agency's Sustainability Plan.
- Protect and enhance Sound Transit's assets and investments.

The policy instructs Sound Transit to consider transit-oriented development potential in the development of its transit projects. This includes identifying agency and community transit-oriented development opportunities and strategies, as well as considering opportunities for partnerships with public and private interests. The policy also encourages Sound Transit to consider transit-oriented development in its decisions about the acquisition, use, and disposition of land.

National studies of transit-oriented development typically cite three key conditions that indicate higher potential for development:

1. Stations are located in prime regional and community centers that are attractive to typical market forces.
2. Regional and local real estate markets are active.
3. Public policies and regulations allow or encourage intensive development in station areas.

The benefits of successful transit-oriented development have included improved mobility, increased supplies of affordable housing, increased transit ridership in a more efficient urban form, and opportunities for urban redevelopment. Higher-density land uses around stations can also bring increased economic activity. Section 4.3, Economics, discusses the economic benefits associated with the Lynnwood Link Extension.

Sound Transit completed a *Station Area Development Potential Report* to assess the potential for each proposed light rail station to support transit-oriented development (Sound Transit 2013). To assess land use and economic development performance, the report considered access to regional growth centers and the station area

development potential for the station areas served by each alternative. An overall rating was assigned to each station area based on its relative potential to support transit-oriented development, which was assessed by four elements:

- Existing conditions supporting transit-oriented development
- Transit-supportive plans and policies
- Station access
- Potential development opportunities

The four elements, when considered together, allow an overall assessment of the development potential at each station area. The ratings for transit-oriented development potential are defined as limited, moderate, and strong. These ratings are qualitative and may be modified as the project design is refined and/or demographics change, new plans and policies are adopted by jurisdictions, and more detailed transit-oriented development analyses are completed. Table 4.2-3 shows the results by station area. A higher potential for transit-oriented development indicates a higher potential for indirect changes in existing land use and development patterns in station areas. However, the ratings closely relate to the types of currently allowed development within 0.50 mile of station areas based on existing plans and policies. The project would provide an opportunity for jurisdictions to implement regional policies related to mass transit (see Appendix I-4.2, Land Use) as well as increased densities, especially transit-oriented development.

The station area with the highest development potential is the station that would serve the existing Lynnwood Transit Center; three station alternatives are being considered to serve the transit center and the results are similar for each. Although the existing conditions include large blocks with automobile-dependent businesses and surface parking, the City of Lynnwood has developed a long-range vision to achieve regional growth targets in this area by adopting specific plans and policies.

The station areas with moderate development potential are the station variations serving the Mountlake Terrace Park-and-Ride and the 220th Street SW Station (also in Mountlake Terrace). The City of Mountlake Terrace has conducted more extensive transit-oriented development planning than the other jurisdictions. However, the station area development is limited by the amount of property dedicated to road rights-of-way (I-5) and the Nile Golf Course.

The remaining station areas have limited development potential, primarily because they are predominantly single-family neighborhoods and include large parks, or because current land use and comprehensive plans for the areas do not allow or encourage higher-density development. However, the City of Shoreline, as previously mentioned, is initiating light rail station area planning at NE 145th Street and NE 185th Street near I-5, which could result in changes in land use in these areas, thereby facilitating transit-oriented development.

Table 4.2-3. Summary of Station Area Development Potential by Station Area

Lynnwood Link Extension: Station Area Transit-oriented Development (TOD) Potential

Station Area	Overall TOD Potential	Existing Conditions Supporting TOD	Transit-supportive Plans & Policies	Station Access	Potential Development Opportunities
200th Street SW Station (Lynnwood)					
Lynnwood Transit Center Station (Lynnwood)					
Lynnwood Park-and-Ride Station (Lynnwood)					
220th Street SW Station (Mountlake Terrace)					
Mountlake Terrace Freeway Station (Mountlake Terrace)					
Mountlake Terrace Transit Center Station (Mountlake Terrace)					
NE 185th Street Station (Shoreline)					
NE 155th Street Station (Shoreline)					
NE 145th Street Station (Shoreline)					
NE 130th Street Station (Seattle)					
Northgate Station (Seattle)		Northgate Station not included in assessment - station constructed as part of Northgate Link project prior to Lynnwood Link Extension; overall assessment based on current development plans for the area. Northgate is a PSRC-designated Regional Growth Center and City of Seattle-designated Urban Center.			

Assessed Potential

Limited Moderate Strong

Note: Station sites under refinement and assessments are based on preliminary concepts. Construction staging areas are not yet identified and are not included in this assessment.

4.2.5 Cumulative Impacts

Cumulatively, the Lynnwood Link Extension and other planned transportation and development projects would help achieve local and regional goals encouraging high-density, transit-oriented development. Other major planned developments could be attracted by the investments made by the project, and this could accelerate the rate of development or redevelopment in station areas.

The proposed Lynnwood site alternative for the Link Operations and Maintenance Satellite Facility is within an area that is currently zoned for commercial and light industrial uses; Alternatives C1 and C2 also would use these parcels. If the Lynnwood site is chosen for the maintenance facility, it would conflict with the existing master plan by the Edmonds School District to develop a school bus base and other district administrative facilities on one of the affected properties.

Construction of the Lynnwood Link Extension would likely be occurring at the same time as the maintenance facility project, if that project is built at the Lynnwood site alternative. There would be simultaneous construction activity along 52nd Avenue West and Cedar Valley Road, which would exacerbate the impacts previously described as construction impacts in central Lynnwood.

4.2.6 Potential Mitigation Measures

No mitigation related to land use would be required during construction or operation of the Lynnwood Link Extension. In general, the project would not result in inconsistencies with adopted land use plans. Although Sound Transit cannot avoid all disturbances to adjacent land uses during construction, project impacts are not expected to cause substantial changes in land use. Therefore, no specific mitigation measures related to land use would be required.

Refer to Section 4.1, Acquisitions, Displacements, and Relocations, for complete information on how Sound Transit would minimize the impacts associated with required acquisitions, displacements, and relocations. For measures that would minimize construction and operation impacts on adjacent land uses, refer to Chapter 3, Transportation Impacts and Mitigation, and Sections 4.3, Economics; 4.5, Visual and Aesthetic Resources; 4.6, Air Quality and Greenhouse Gases; 4.7, Noise and Vibration; and 4.17, Parks and Recreational Resources.

4.3 Economics

This analysis identifies potential adverse and beneficial effects of the alternatives on local and regional economies. Sound Transit evaluated direct and indirect economic impacts in the project area at three different levels:

- **Regional.** Economic impacts on the regional economy (such as effects on employment, traffic mobility, and congestion) were analyzed for King, Kitsap, Pierce, and Snohomish counties.
- **City.** Project effects were assessed on the tax revenue for cities with property acquisitions (Seattle, Shoreline, Mountlake Terrace, and Lynnwood).
- **Site-specific.** Site-specific impacts were evaluated for a 0.50-mile area around the light rail route and stations.

4.3.1 Affected Environment

Regional Demographic and Economic Trends

The forecast population data for the region and for King, Kitsap, Pierce, and Snohomish counties show that the region will grow by over 1.3 million inhabitants by 2040, which would total 5 million inhabitants, or about a 1 percent increase in population per year (PSRC 2006). Snohomish County is predicted to grow more quickly, at 1.3 percent, than the other counties. The number of households is predicted to grow somewhat faster than the overall population, about 1.2 percent a year regionally, reflecting faster growth in smaller households. Generally, travel demand tracks more closely to the growth in the number of households than it does to population.

Median household income in the Central Puget Sound region is higher than the state average. The U.S. Census Bureau showed King County had the highest median household income in the region at about $65,000 in 2010. Snohomish County was second at about $62,000 in 2010 (Washington OFM 2011). Incomes in King County grew by 23 percent, while Snohomish County incomes increased by 17 percent, when compared to 1999 U.S. Census levels.

Employment in the region is expected to grow at an approximate average rate of 1.2 percent through 2040. Snohomish County is expected to have the fastest job growth, at 1.7 percent a year, and King County will be growing by 1.1 percent a year. The region also tends to have lower unemployment than the state or the nation, as shown in Figure 4.3-1. These trends support the predictions for generally increasing travel demand in the region and the project corridor.

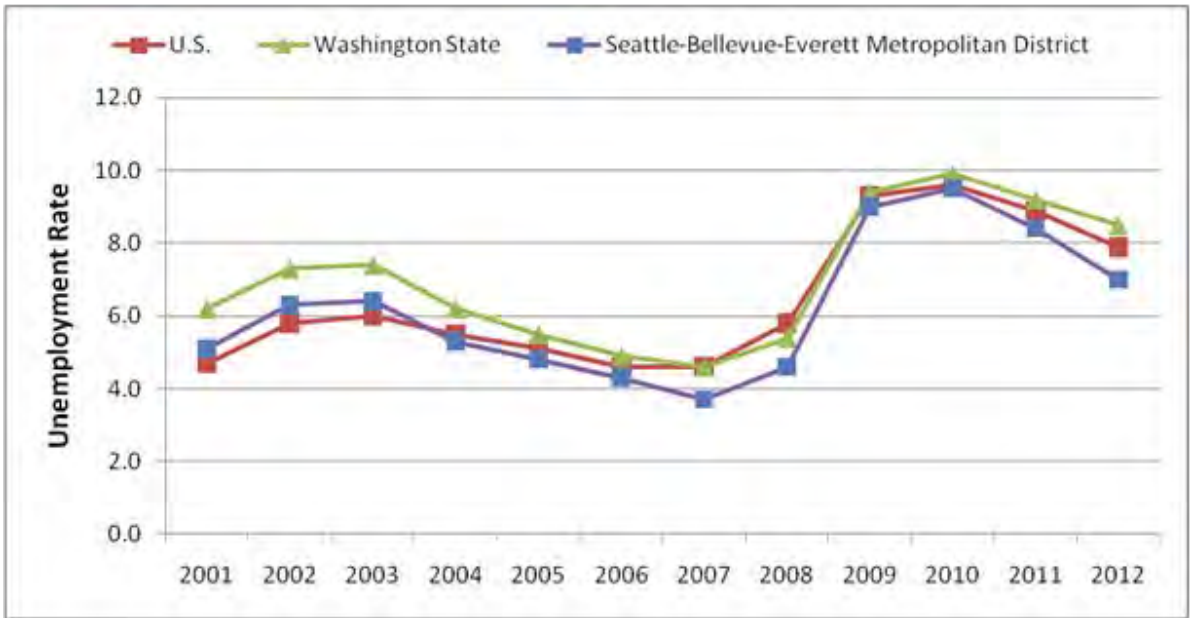


Figure 4.3-1 Unemployment Rates, 2001 to 2012

Demographic and Economic Trends in Project Area

Table 4.3-1 shows population, household, and employment forecast trends for each project segment from 2010 to 2040. Segments B and C show the largest growth rates.

Table 4.3-1. Population, Housing, and Employment Forecasts by Segment

Segment	2010	2040	Average Annual Growth Rate 2010 to 2040 (percent)
Segment A: Seattle to Shoreline			
Population	67,455	84,978	0.8
Housing Units	32,116	44,107	1.1
Employment	27,232	37,399	1.1
Segment B: Shoreline to Mountlake Terrace			
Population	32,588	47,395	1.3
Housing Units	14,603	23,809	1.7
Employment	10,344	16,865	1.7
Segment C: Mountlake Terrace to Lynnwood			
Population	25,804	37,528	1.3
Housing Units	10,914	17,795	1.7
Employment	13,761	22,437	1.7

Sources: Population and housing units from 2010 U.S. Census; employment data from PSRC. 2040 forecasts based on PSRC 2006 Puget Sound Economic and Demographic Forecasting.

The cities within the project area—Seattle, Shoreline, Mountlake Terrace, and Lynnwood—rely heavily on property tax and sales tax revenues to fund general services for their respective jurisdictions. Revenues collected by each city, other than taxes, consist of funding from federal and state sources, such as direct federal grants and state-shared revenues, and fees collected from government-operated facilities, including the issuing of licenses and permits. In addition to funding city programs, property tax levies also provide funds for county programs, fire prevention, libraries, schools, and other governmental services. Table 4.3-2 shows funding sources for each city.

Table 4.3-2. Revenue Sources: Percent of Revenues by City

City (Budget Year)	Property Tax	Sales Tax	Other Sources
Seattle (2012)	28	17	55
Shoreline (2012)	28	21	51
Mountlake Terrace (2011 to 2012)	22	9	69
Lynnwood (2011 to 2012)	17	31	52

Sources: City of Seattle 2012 Adopted Budget; City of Shoreline 2012 Proposed Budget; City of Mountlake Terrace 2011–2012 Adopted Biennial Budget; and City of Lynnwood 2011–2012 Adopted Biennial Budget

Regional Transportation of Goods and Services

Regional and interstate commerce relies heavily on I-5, which is heavily congested. Longer travel times, increased costs, and less reliable pick-up and delivery times for truck operators result in some businesses being forced to move all or part of their business to less congested regions or avoid the Puget Sound region altogether.

In an effort to avoid moving away from the region, some transport companies are working with their customers to arrange deliveries in non-peak hours; however, many smaller customers do not find it cost-effective to extend their hours of operation. Traffic congestion also limits access to labor. As a result, companies might look to less congested parts of the metropolitan region or to other cities for future expansion. Chapter 3, Transportation Impacts and Mitigation, provides further discussion of future travel conditions, including freight, along the I-5 corridor.

4.3.2 Long-Term Impacts

A new light rail system such as the Lynnwood Link Extension can cause changes in the local business environment and surrounding neighborhoods. These changes, in turn, may benefit or adversely affect the success of existing businesses and influence future economic opportunity in the area. Direct economic impacts of each alternative could include business and employee displacements and the corresponding potential tax impacts, as well as potential changes in development patterns and regional freight mobility. Indirect impacts could also result from other changes related to the presence of the project, such as transit-oriented developments, or the overall effect of having the project in specific neighborhoods. Economic conditions could also change as the result of other effects such as the removal of businesses within an area, changes in parking availability, noise, visual conditions, or access. Indirect benefits could include increased economic activity around transit stations as a result of increased pedestrian traffic, higher density and mixed land uses, and redevelopment opportunities.

No Build Alternative

Under the No Build Alternative, future economic development or redevelopment would be less because the project is planned as a key element of the regional and local transportation, land use, and economic development plans. Traffic congestion would worsen compared to existing conditions and there would be fewer alternatives to single-occupancy vehicle travel or buses that would experience congestion. The No Build Alternative could affect future economic development because it could make the project corridor communities comparatively less attractive as places to live or do business. The increased cost of doing business resulting from incidental and recurring delays with no alternative to avoid congestion includes the costs caused by travel delay and wasted fuel, that is, the value of lost time in passenger vehicles and the increased operating costs of commercial vehicles in congested traffic. Chapter 3, Transportation Impacts and Mitigation, provides further discussion of delays associated with future peak-period travel.

Light Rail Alternatives

Displacements

Table 4.3-3 presents estimates of the number of businesses and employees displaced at properties that would be fully acquired by the light rail alternatives in Segments A, B, and C.

In Segments A and B, none of the light rail alternatives would displace businesses or employees.

In Segment C, all of the light rail alternatives would displace businesses and employees. Alternative C1 would have the highest impact because Sound Transit would acquire properties holding 31 employers that provide a place of employment for an estimated 108 employees. Alternative C2 would affect three businesses with about 72 employees, and Alternative C3 would affect one business with an estimated 47 employees. With all three Segment C alternatives, this represents less than 1 percent of the employment within the Segment C study area (the areas within 0.50 mile of the alternative alignments), and much less than 1 percent of Lynnwood's total employment. Relative to the size of the employment base within the region, the business and employee displacements by the light rail alternatives would have a low impact on economic conditions regionally, but they would require transitions for the affected businesses and employees. Displacements do not necessarily count as permanent job losses because the displaced businesses would receive relocation assistance to help them continue operating, as described in Section 4.1, Acquisitions, Displacements, and Relocations. However, a business could relocate out of the area, or choose to accept compensation rather than reopening in a new location; in these cases, jobs may be lost.

Table 4.3-3. Estimated Property Acquisition Impacts on Businesses and Employees

	Full Displacements		Commercial, Public, and Institutional Property Acquisitions	
Alternative	**Businesses**	**Employees**	**Partial**	**Full**
Segment A: Seattle to Shoreline				
Alternative A1: At-grade/Elevated with NE 145th and NE 185th Stations	0	0	3	1
Alternative A3: Mostly Elevated with NE 145th and NE 185th Stations	0	0	4	0
Alternative A5: At-grade/Elevated with NE 130th, NE155th, and NE 185th Stations	0	0	3	1
Alternative A7: Mostly Elevated with NE 130th, NE155th, and NE 185th Stations	0	0	4	0
Alternative A10: At-grade/Elevated with NE130th, NE 145th, and NE 185th Stations	0	0	3	1
Alternative A11: Mostly Elevated with NE130th, NE 145th, and NE 185th Stations	0	0	4	0

Table 4.3-3. Estimated Property Acquisition Impacts on Businesses and Employees

Alternative	Full Displacements		Commercial, Public, and Institutional Property Acquisitions	
	Businesses	Employees	Partial	Full
Segment B: Shoreline to Mountlake Terrace				
Alternative B1: East Side to Mountlake Terrace Transit Center to Median	0	0	2	0
Alternative B2: East Side to Mountlake Terrace Transit Center to West Side	0	0	2	0
Alternative B2A: Optional 220th Street SW Station (elevated)	0	0	2	0
Alternative B4: East Side to Mountlake Terrace Freeway Station to Median	0	0	3	0
Segment C: Mountlake Terrace to Lynnwood				
Alternative C1: 52nd Avenue West to 200th Street SW	31	108	24	3
Alternative C2: 52nd Avenue West to Lynnwood Transit Center	3	72	23	3
Alternative C3: Along I-5 to Lynnwood Park-and-Ride	1	47	13	1

Sources: King County Finance Services, Finance and Business Operations, 2012 Real Property Tax
Snohomish County Assessor's Office, 2012 Real Property Tax

Impacts of Displacements on Tax Base of Cities

With each light rail alternative, Sound Transit would acquire residential and commercial properties and remove those properties from tax rolls. Table 4.3-4 estimates the annual initial property tax impacts on cities resulting from the loss of taxes on fully acquired properties. These property tax impacts reflect property taxes as of 2012. When referring to the property tax impacts of acquisitions, the term "initial property tax impacts" is used because the initial impact would be lower property tax revenue. In most cases, the impact would be less than 0.25 percent of the local jurisdiction's property tax revenues; in all cases, the impact would be less than 0.5 percent. If businesses relocate outside of the local jurisdiction, this could also reduce local tax revenues, affecting sources ranging from business and operations taxes to sales or payroll taxes.

Table 4.3-4. Estimated Initial Property Tax Impacts on Cities by Alternative

Alternative	Annual Initial Property Tax Impact	Percent of Budgeted City Property Tax Revenue
Segment A: Seattle to Shoreline		
Alternative A1: At-grade/Elevated with NE 145th and NE 185th Stations	$228,000	0.1

Table 4.3-4. Estimated Initial Property Tax Impacts on Cities by Alternative

Alternative	Annual Initial Property Tax Impact	Percent of Budgeted City Property Tax Revenue
Alternative A3: Mostly Elevated with NE 145th and NE 185th Stations	$217,000	0.1
Alternative A5: At-grade/Elevated with NE 130th, NE155th, and NE 185th Stations	$263,000	0.1
Alternative A7: Mostly Elevated with NE 130th, NE155th, and NE 185th Stations	$242,000	0.1
Alternative A10: At-grade/Elevated with NE130th, NE 145th, and NE 185th Stations	$250,000	0.1
Alternative A11: Mostly Elevated with NE130th, NE 145th, and NE 185th Stations	$213,000	0.1
Segment B: Shoreline to Mountlake Terrace		
Alternative B1: East Side to Mountlake Terrace Transit Center to Median	$0	0
Alternative B2: East Side to Mountlake Terrace Transit Center to West Side	$18,000	0.4
Alternative B2A: Optional 220th Street SW Station (elevated)	$18,000	0.4
Alternative B4: East Side to Mountlake Terrace Freeway Station to Median	$0	0
Segment C: Mountlake Terrace to Lynnwood		
Alternative C1: 52nd Avenue West to 200th Street SW	$133,000	0.8
Alternative C2: 52nd Avenue West to Lynnwood Transit Center	$40,000	0.2
Alternative C3: Along I-5 to Lynnwood Park-and-Ride	$33,000	0.2

Sources: King County Finance Services, Finance and Business Operations, 2012 Real Property Tax
Snohomish County Assessor's Office, 2012 Real Property Tax

The consequence of full parcel acquisition is typically permanent conversion from private to public ownership. Parcels in public ownership are exempt from property taxes.

In Segment A, Sound Transit would acquire private properties and have similar property tax impacts for all six alternatives. These impacts, however, would be relatively small (0.1 percent) when compared to the combined 2012 estimated property tax revenues for Seattle and Shoreline (about $268 million). The property tax impacts would be caused mainly by fully acquiring single-family residences.

The Segment B impacts on property taxes would only occur with Alternatives B2 and B2A and have about an $18,000 initial property tax impact annually.

As shown in Table 4.3-3, for all three alternatives in Segment C, Sound Transit would acquire commercial, public, or institutional properties that are currently places of employment. Alternative C1 would affect the most properties.

While the acquisitions would at first reduce property tax revenues, the long-term fiscal impact on a jurisdiction would depend on a number of other factors. Initially, property taxes would no longer be collected from the properties Sound Transit would fully acquire along the light rail route. As a result, the rates charged to remaining taxpayers could increase slightly (less than 0.01 percent) to recover budgeted funds, or budgets for essential government services could be reduced accordingly. In the long run, some of the land purchased for the construction of the Lynnwood Link Extension may not be permanently needed and could be released for development after the project is built. In addition, some displaced businesses would likely either rebuild at a new location or relocate to an existing building elsewhere within the jurisdiction's boundary. Finally, if the project were to encourage future private development and investment, the long-term property tax revenues and other tax revenues could increase. This increase would occur when existing businesses are reestablished, staging areas are released for development, and new development is attracted as a result of the Lynnwood Link Extension. For example, new development is expected to occur in Segment C where the City of Lynnwood has adopted new land use plans to increase density and promote mixed-use development.

These positive fiscal impacts could be offset somewhat by the absence of new construction that might have occurred on properties acquired and retained by Sound Transit. Thus, the long-term property tax impacts would have too many variables to be predicted quantitatively, but they would likely be less than the initial property tax impacts. The overall property tax impact is expected to be low.

Impacts on Regional Transportation of Goods and Services

The main impacts on regional transportation of goods and services would result from changes in freight mobility on the I-5 corridor and the surface street network. Compared to the No Build Alternative, the light rail alternatives would result in similar 2035 peak-period travel times in the corridor. Freight mobility changes for the light rail alternatives would be minor along the I-5 corridor. On city streets, some of the light rail alternatives, with mitigation, could improve conditions compared to No Build. The light rail alternatives would also allow travelers to use transit to avoid congestion, but regional freight conditions would stay similar to conditions without the light rail project. There could be slight reductions in travel times and volumes as some travelers switch to transit, but this would have little impact on regional freight mobility. Chapter 3, Transportation Impacts and Mitigation, further discusses I-5 transportation impacts.

4.3.3 Construction Impacts

Construction brings money into the economy from construction jobs, the purchasing of local goods and services for construction, and the money spent by construction crews in the community where construction occurs. On the negative side, constructing any light rail alternative could result in economic impacts by blocking visibility and access to businesses, causing traffic delays, and rerouting traffic on detours that increase travel times and make access to some locations difficult.

Potential Beneficial Economic Impacts from Construction

Constructing any light rail alternative would increase employment and associated consumer spending in the project vicinity during construction. The extent of these impacts would depend on the source of project funding and the composition of work crews used during project construction.

In economic impact analyses, typically only inflows of funds from outside a region are considered "new money" that will lead to new employment and income in that region. Funds from local or regional sources are transfers that could be spent by residents and businesses on other economic activities.

While federal grants may provide a source of funding, the local funds required for approximately one-half to two-thirds of the proposed project's construction costs are anticipated to be raised primarily in the communities benefiting from the project. The influx of federal funds (assumed to be $600 million) would account for between one-third and one-half of the total capital cost, depending on the alternatives selected within each segment.

In addition, project construction would lead to positive economic effects beyond the federal grants. Sound Transit would issue bonds to pay for project construction, and this money would go primarily to businesses in the region within a relatively short period of time. Principal and interest on the bonds would be repaid over many years using a variety of funding mechanisms. Some of the future repayments also could be made in the form of taxes, such as sales and use tax and rental car tax, on visitors to the region, which represent additional inflows of funds to the region. Therefore, there would be a temporary impact because bonded funds would be spent over approximately 6 years, stimulating direct and indirect construction spending in the region. While the added taxes to pay for the project could reduce spending in other areas of the economy, this would be offset by taxes paid by visitors to the region.

The estimated magnitude of the project's economic stimulus is shown in Table 4.3-5, which provides an estimated range of the direct expenditures and the number of direct employees who would be hired as a result of the low- and high-cost estimates, based on the combinations of alternatives for each segment. The number of direct

employees was calculated using the Washington Office of Financial Management's model for predicting employment based on construction cost estimates.

Table 4.3-5. Estimated Direct Expenditures and Direct Employment from Lynnwood Link Extension Construction

Cost Estimates and Employment	Project Construction
High-Cost Estimate	
Total direct expenditure (million 2012 $)	$1,735
Direct Employment	
Total direct employment	10,200
Annual direct employment	1,700
Low-Cost Estimate	
Total direct expenditure (million 2012 $)	$1,227
Direct Employment	
Total direct employment	7,200
Annual direct employment	1,200

Source: Sound Transit and Washington Office of Financial Management Input-Output Model, 2011.

Wages paid to workers in construction trades or supporting industries would be spent on other goods and services; these are referred to as induced impacts. Direct, indirect, and induced impacts would occur in the region from project construction. The indirect and induced impacts are often called "multiplier" impacts. Multiplier estimates for the state of Washington (Washington OFM 2007) suggest that an additional 64 percent of value added (i.e., payments made by industry to workers, interest, profits, and indirect business taxes) would result from new direct construction spending in the region. Moreover, an additional 0.94 new jobs would be created for every direct job associated with the project, increasing the potential number of jobs generated in the region from approximately 10,400 to 20,000 with the high-cost estimate.

Although the typical methodology for economic impact analysis would count only the $600 million of federal grant funding as new spending for the purpose of determining economic impacts, the actual benefits would be greater because of the multiplier effects, but these are difficult to determine precisely. Regardless of the specific method used to quantify economic impacts, it is clear that the project would create substantial short-term economic activity in the region during construction and that all of the light rail alternatives would provide approximately the same magnitude of short-term economic impact.

Potential Adverse Economic Impacts from Construction

Construction activity can affect local businesses because of the associated changes in traffic circulation, access, parking, noise, and visual effects. The work in Segment C

would likely have the greatest impact on nearby businesses in terms of noise, dust, and restricted access, and potential customers might choose to avoid businesses due to a perception of inconvenience caused by construction activities. Along any given area of the project corridor, major construction is anticipated to last approximately 1 to 2 years.

The project would require construction access from the WSDOT right-of-way on I-5 and from local streets adjacent to the project corridor. All light rail alternatives would affect traffic operations on arterials adjacent to the guideway and stations. For all street reconstruction, travel lanes on local streets along the guideway would experience periodic daytime closures. Truck access to the guideway during construction would be along city arterials leading to streets adjacent to the guideway. Construction activities along the guideway might reduce or restrict property access, and the contractor would need to maintain access during construction or coordinate with property owners and businesses.

In some locations, I-5 shoulders could be narrowed and/or lane widths reduced to provide space for construction activities adjacent to the freeway. This configuration could increase congestion and travel times on the freeway, which could result in lost productivity and higher costs for businesses operating in the corridor.

4.3.4 Indirect and Secondary Impacts

Sound Transit evaluated the indirect economic impacts of the light rail alternatives based on the following: field observations of each alternative route, the number of housing units and employees to be served by the stations, and information presented in Chapter 3, Transportation Impacts and Mitigation; Section 4.2, Land Use; Section 4.5, Visual and Aesthetic Resources; and Section 4.7, Noise and Vibration.

The operation of the light rail alternatives could have both positive and negative indirect economic impacts. Light rail projects can increase development and redevelopment potential adjacent to stations, with potential increases in property values. Negative indirect economic effects arise from access or traffic flow changes or restrictions, decreased parking, noise increases, or impaired visibility that could reduce patronage of a business or decrease value in property.

The availability of light rail increases transit access and pedestrian activity, especially in areas surrounding the stations and between important nodes of economic activity. Improved transit access can positively affect the convenience, visibility, and desirability of surrounding residential and commercial properties. Increased pedestrian activity can increase the patronage of adjacent retail businesses. This activity might create a synergy of business owners and employees being more interested in relocating where there is convenient access to the light rail line. This would lead to more dense and mixed land uses around stations and related increased economic activity. This pattern

is referred to as transit-oriented development and is addressed further in Section 4.2, Land Use. The economic impacts are summarized here.

Numerous case studies conclude that residential and commercial property values near light rail transit stations typically increase and are valued higher than similar properties that are not near the transit stations (TRB 2004). While proximity to good-quality transit is an important trait of transit-oriented development, this is not the only factor that adds value. When combined with higher-than-typical densities, consumer retail and services, and pedestrian amenities, proximity to transit can confer land-value benefits that are well above those of competitive markets. The transit-oriented development synergy of proximity, density, mixed uses, and walking-friendliness, under the right conditions, gets expressed through accelerated gains in property values and overall real-estate market performance (TRB 2004).

However, these benefits are not automatic; property value increases generally require a strong demand for real estate, locations in neighborhoods free from signs of stagnation and distress, and public policies such as zoning bonuses that further leverage transit-oriented development and transit system expansion to produce the spillover benefits of a highly integrated transportation network. Property values are also affected by external forces and might change in response to fluctuations in the economy, consumer confidence, and local development pressures. In addition, because transit-oriented development takes time to evolve, property value benefits will also take time to accrue (TRB 2004). While these positive effects might occur in all the project segments because the jurisdictions have either adopted or are contemplating plans that would support transit-oriented development, the benefits would most likely be experienced in Northgate (Segment A) and Lynnwood (Segment C), where major regional urban growth centers are planned.

Many studies have found property value impacts from light rail transit are usually positive, although some studies have documented decreased property values, particularly along a light rail route rather than in the vicinity of stations (e.g., Cervero 2004). Disruptive noise levels; light, shadow, and view impacts; and reductions in vehicle access and parking can affect property values and sales for businesses that depend on vehicular access. Negative impacts on property values would most likely occur when the light rail project results in noise or visual impacts noticeably greater than what currently exists. Such impacts are often associated with elevated, and to a lesser degree, at-grade alternatives. All of the Lynnwood Link Extension light rail alternatives would be at-grade or elevated.

Potential adverse indirect effects could be influenced by the same external forces described in the preceding paragraphs for the positive indirect effects, such as changes in real-estate demand, local zoning, or the local economic climate.

4.3.5 Cumulative Impacts

Changes in transportation systems can directly influence changes in nearby land uses through acquisition and displacement. These changes can have direct economic effects on businesses and local governments, or create indirect economic benefits by providing opportunities for economic revitalization. The Lynnwood Link Extension, as well as other planned transportation and development projects, is expected to have some beneficial economic effects, including job creation and increased spending for other developments. Construction employment would rise as the Lynnwood Link Extension and other planned transportation and development projects are constructed. However, these effects would be of limited duration, not occur simultaneously, and only marginally alter the total employment base in the region.

PSRC forecasts for future regional and local activity account for changes in population, housing, and regional employment given continued economic growth. The Lynnwood Link Extension and other transportation and development projects were included in these forecasts.

Other major projects in the project area include a potential site for the Sound Transit Link Operations and Maintenance Satellite Facility in Lynnwood, and eight other transportation projects of regional significance, such as the SR 99 Alaskan Way Viaduct Replacement and SR 520 Bridge Replacement and HOV projects, and five private development projects. The Edmonds School District also has a district support center and bus maintenance base project planned for a site in Lynnwood that overlaps with the potential site for the maintenance facility.

The Link Operations and Maintenance Satellite Facility and the larger transportation projects would have similar or greater capital expenditures and multiplier effects on the regional economy as the Lynnwood Link Extension. Most other transportation and private development projects are not of a size or scale to have an economic effect on the region.

If the Link Operations and Maintenance Satellite Facility is constructed in Lynnwood near the Segment C alternatives, the two projects could be built during the same time period, and areas such as 52nd Avenue West and Cedar Valley Road could have a greater level of construction-related and impacts. The Edmonds School District's support services facility also could be constructed at the same time as the Lynnwood Link Extension, which could increase construction period impacts.

Similarly, if the maintenance facility was built on the Lynnwood site, economic impacts from displacements would increase cumulatively for all alternatives in Segment C because Sound Transit would have to acquire additional property for the proposed maintenance facility. Some of the parcels needed for Alternatives C1 and C2 would also be needed for the maintenance facility; however, a number of the partial acquisitions would likely change to full acquisitions, thereby increasing the

number of business displacements and the amount of lost property tax revenue experienced by the City of Lynnwood. The maintenance facility would also displace some of the opportunities for increased development and redevelopment potential adjacent to stations or potential increases in property values southwest of the Lynnwood Link Extension station alternatives. This would reduce the potential indirect economic benefits in an area identified as having the highest redevelopment potential along the project corridor.

Localized impacts on businesses in the area could be mitigated to an extent during concurrent construction of the two projects by coordination of their transportation management plans and construction activities.

4.3.6 Potential Mitigation Measures

Businesses near construction activities might be adversely affected during construction by noise, dust, and restricted access. Any major construction project inconveniences or disturbs the residents, businesses, and business customers adjacent to project construction activities. While some businesses would suffer little or no adverse effect, others might experience a noticeable decline in sales, increase in costs, or a decrease in efficiency. Mitigation for noise and vibration impacts is described in Section 4.7, Noise and Vibration. Construction might cause adverse impacts on businesses from reduced access or general construction activity that affects local transportation; the mitigation for such impacts is discussed in Section 3.6, Potential Mitigation Measures, of Chapter 3, Transportation Impacts and Mitigation.

Businesses displaced by the project would receive relocation assistance, as described in Section 4.1, Acquisitions, Displacements, and Relocations, to mitigate adverse impacts.

To reduce impacts as much as possible, Sound Transit would dedicate staff to work specifically with affected businesses during construction to minimize project-associated impacts. Construction mitigation plans would be developed to address the needs of businesses and could include, but are not limited to, the following measures:

- Provide a 24-hour construction telephone hotline.
- Provide business cleaning services on a case-by-case basis.
- Provide detour, open for business, and other signage as appropriate.
- Establish effective communications with the public through measures such as meetings and construction updates, alerts, and schedules.
- Implement promotion and marketing measures to help affected business districts maintain their customer base, consistent with Sound Transit policies, during construction.

- Maintain access as much as possible to each business and coordinate with businesses during times of limited access.
- Provide a community ombudsman.

4.4 Social Impacts, Community Facilities, and Neighborhoods

This section discusses how the Lynnwood Link Extension might affect people, businesses, community facilities, and neighborhood character and cohesion along the project corridor. The analysis reflects the findings of other environmental analyses, including transportation, property, land use, economics, visual and aesthetic resources, air quality, noise and vibration, parks and recreational resources, and public services. The section concludes with a discussion of environmental justice, which summarizes the analysis of impacts on minority and low-income populations in Appendix C, Environmental Justice Analysis.

4.4.1 Affected Environment

The study area for the social environment extends 0.5 mile from the alternative alignments and stations. There are 18 neighborhoods adjacent to the project corridor. The names and boundaries of most of the neighborhoods are designated by local governments—the Cities of Seattle, Shoreline, Mountlake Terrace, and Lynnwood.

Study Area Neighborhoods

Most of the study area neighborhoods were developed as single-family housing in the decades following World War II, primarily in the 1950s and 1960s. Growth has continued in recent decades through infill and redevelopment. As of 2010, nearly 126,000 residents and an estimated 60,000 jobs were located in census tracts within 0.5 mile of the project corridor, which is anchored by major regional commercial centers at Northgate in Seattle and Lynnwood.

Figure 4.4-1 shows the 18 neighborhoods in the study area, with some neighborhoods adjacent to more than one segment. These neighborhoods are individually described in Attachment C-1 in Appendix C.

Minority Populations

The residents within the project corridor's neighborhoods are more diverse than the region overall, with an average of over 37 percent minority residents (non-White and Hispanic persons) compared with a two-county average of 32.7 percent for King and Snohomish counties. The demographics of all but three of the corridor neighborhoods exceed the regional average and have higher proportions of Asian, mixed race, and Hispanic populations. The students at neighborhood schools are from many racial and ethnic groups. Several attachments to Appendix C provide detailed racial and ethnic composition of the region, study area, neighborhoods, and the alternative alignment and station impact areas. Figure 4.4-2 shows the 2010 distribution of minority populations in the study area census tract block groups.

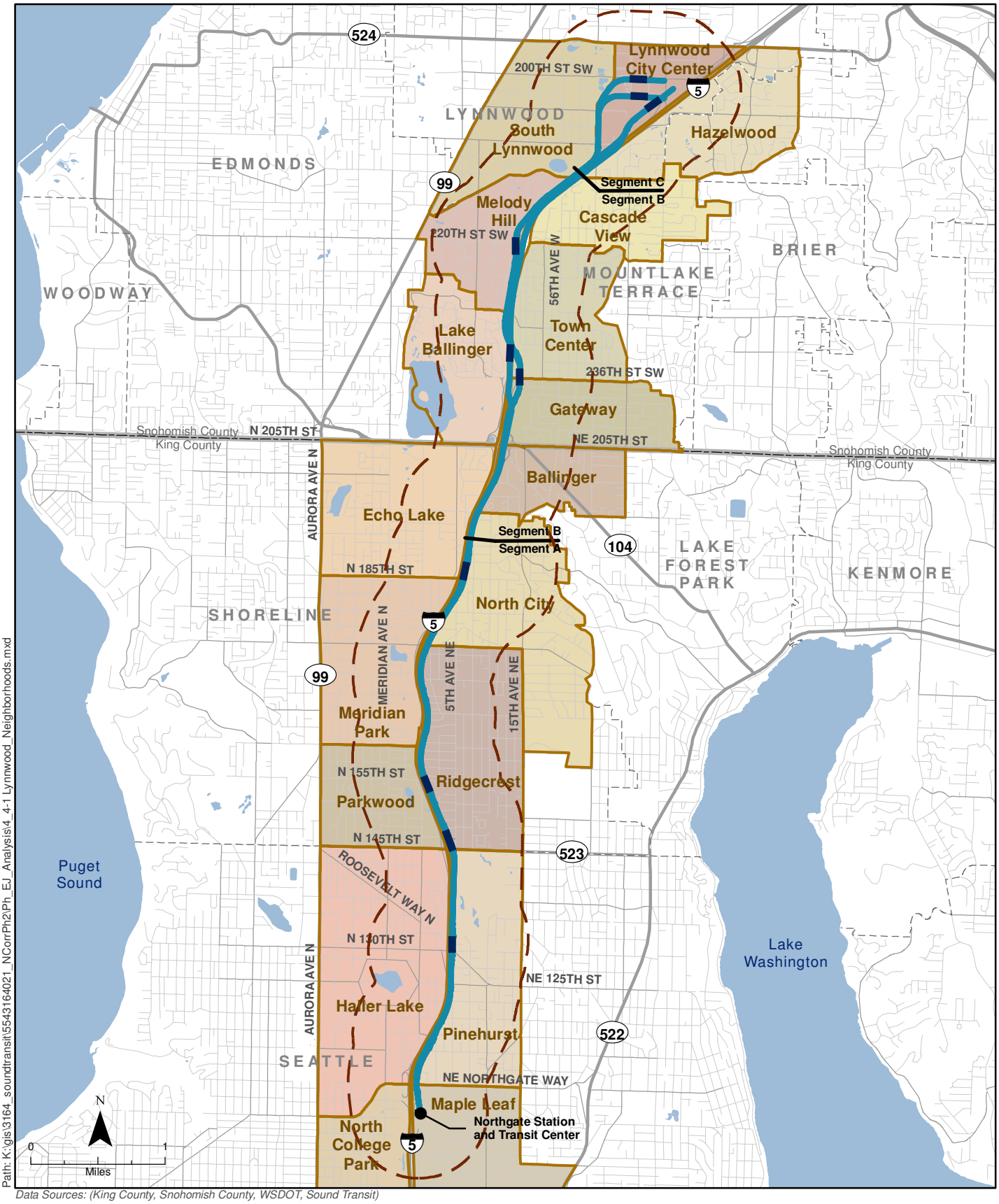
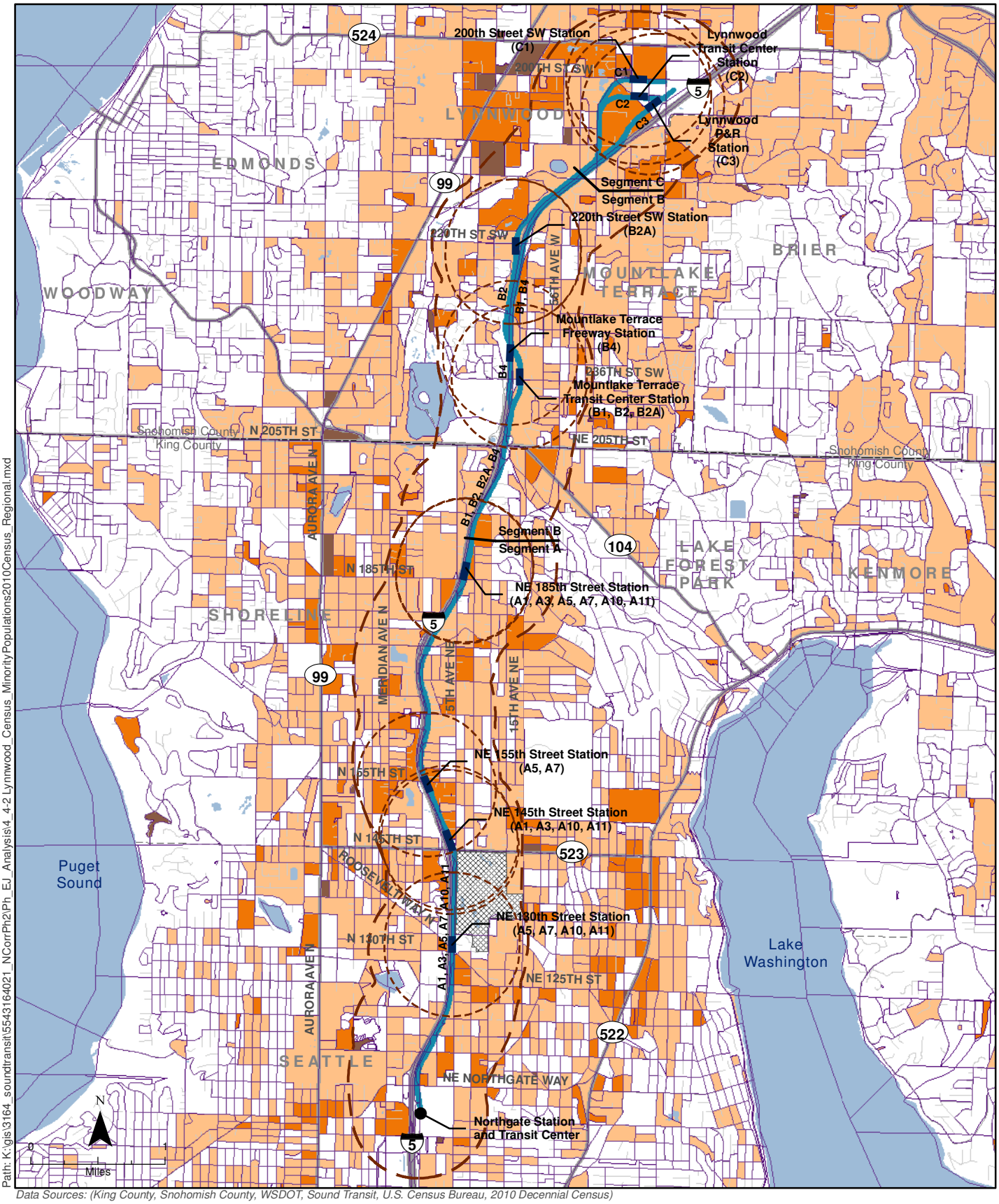


Figure 4.4-1
Neighborhoods



Path: K:\gis\3164_soundtransit\5543164021_NCorrPh2\Ph_EJ_Analysis\4_4-2 Lynnwood_Census_MinorityPopulations2010Census_Regional.mxd

Data Sources: (King County, Snohomish County, WSDOT, Sound Transit, U.S. Census Bureau, 2010 Decennial Census)

2010 Census Blocks
- 0 - 25%
- 26 - 50%
- 51 - 75%
- 76 - 100%
- Non-populated Park Area

- Light Rail Alternatives
- Station Location
- Roadway
- Local Street
- 1/2 Mile Station Buffer
- Study Area
- City Boundary
- County Boundary
- Waterbody

Figure 4.4-2
Minority Populations
2010 Census
(Percentage of Minority Individuals)
Lynnwood Link Extension

Low-income Populations

The residents within the project corridor are generally less well off than residents in the two-county region. Household income is lower than the regional median, with the 2009 median household income of about $58,000, or 85 percent of the regional median household income (Census 2010b). An estimated 11.3 percent of the study area population lives at or below the federal poverty level. Appendix C has detailed population low-income statistics for the region, study area, and neighborhoods. Figure 4.4-3 shows the overall 2010 distribution of low-income populations for study area census tracts.

Household Characteristics

In the study area neighborhoods, many of the households are one-person households (34 percent) (Census 2010a), but couples or families form most of the other households. About 12 percent of households are non-family units. Children and the elderly comprise 18 percent and 11 percent, respectively, of the study area population. An estimated 4 percent of all study area households are transit-dependent, but three neighborhoods (Pinehurst, South Lynnwood, and Lynnwood City Center) have more transit-dependent households (7 to 8 percent). Attachment C-7 in Appendix C has a detailed breakdown of these data.

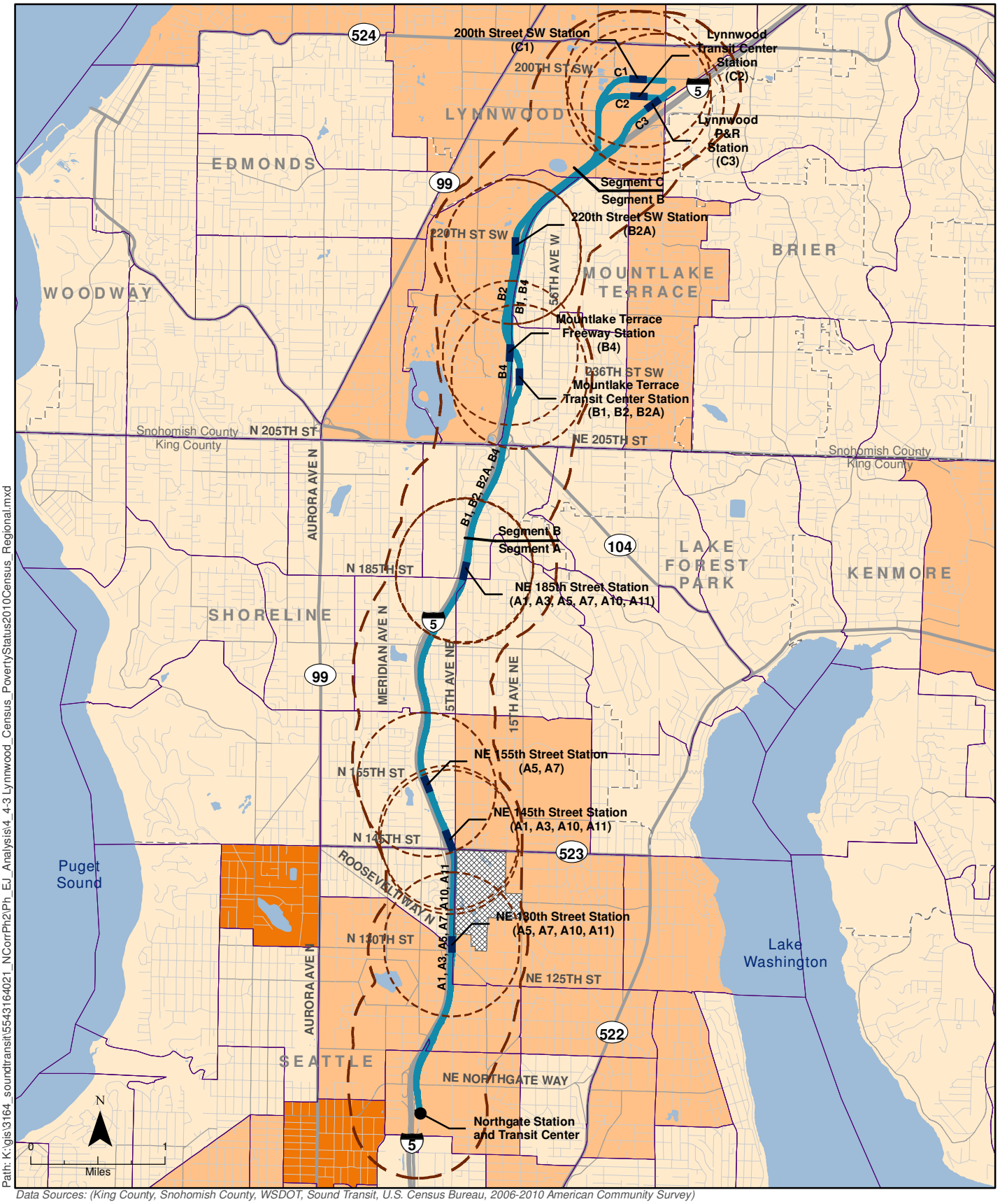
Within the project corridor neighborhoods, about 54 percent of homes are owner-occupied and 46 percent renter-occupied (Census 2010b). Figure 4.4-4 shows the location of low- and lower-cost housing within about 0.5 mile of the corridor alternative alignments, which includes public low-income housing and mobile home communities.

Community Facilities and Linkages

Community facilities in the study area include public and private schools, parks, recreation and community centers, senior centers, libraries, municipal buildings, fire and police emergency services, medical clinics and hospitals, religious institutions, and cemeteries. Figure 4.4-4 shows the community facilities within about 0.5 mile of the light rail alternative alignments.

Transportation Network

Many parts of the project corridor have streets with a grid pattern, particularly in King County, but I-5 interrupts this pattern. In King County, the highway generally is parallel to major north-south arterials, but the highway angles to the northeast in Snohomish County. Public bus service runs along most major arterials. Local streets tend to lack sidewalks, but traffic volumes are generally low. Chapter 3, Transportation Impacts and Mitigation, further describes the study area transportation system.



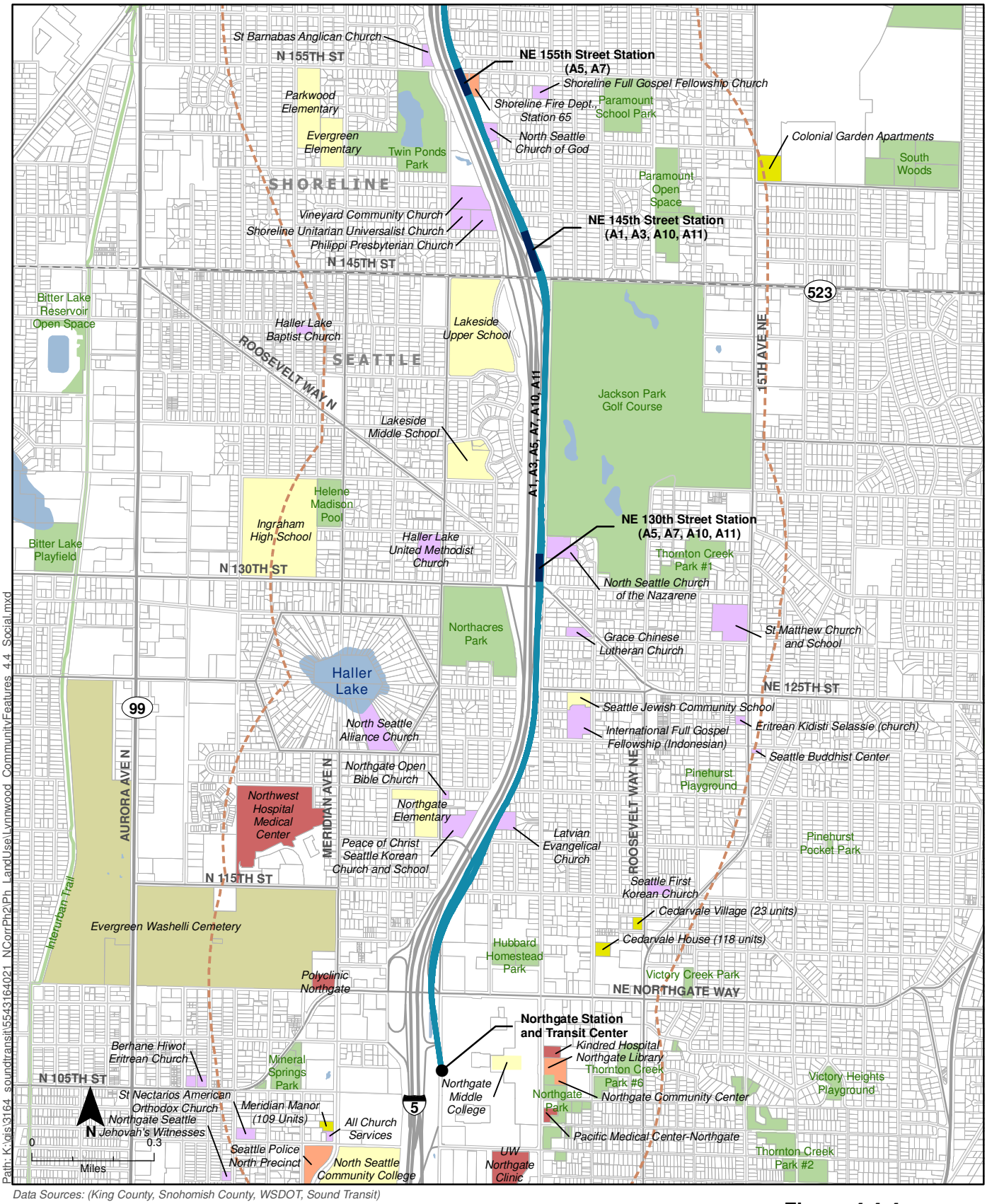
Path: K:\gis\3164_soundtransit\5543164021_NCorrPh2\Ph_EJ_Analysis\4_4-3 Lynnwood_Census_PovertyStatus2010Census_Regional.mxd

Data Sources: (King County, Snohomish County, WSDOT, Sound Transit, U.S. Census Bureau, 2006-2010 American Community Survey)

2010 Census Tracts
- 0 - 10%
- 11 - 20%
- 21 - 30%
- 31 - 100%
- Non-Populated Park Area

- Light Rail Alternatives
- Station Location
- Roadway
- Local Street
- 1/2 Mile Station Buffer
- Study Area
- City Boundary
- County Boundary
- Waterbody

Figure 4.4-3
Low-income Populations 2010 Census
(Percentage of Individuals Below Poverty Level)
Lynnwood Link Extension



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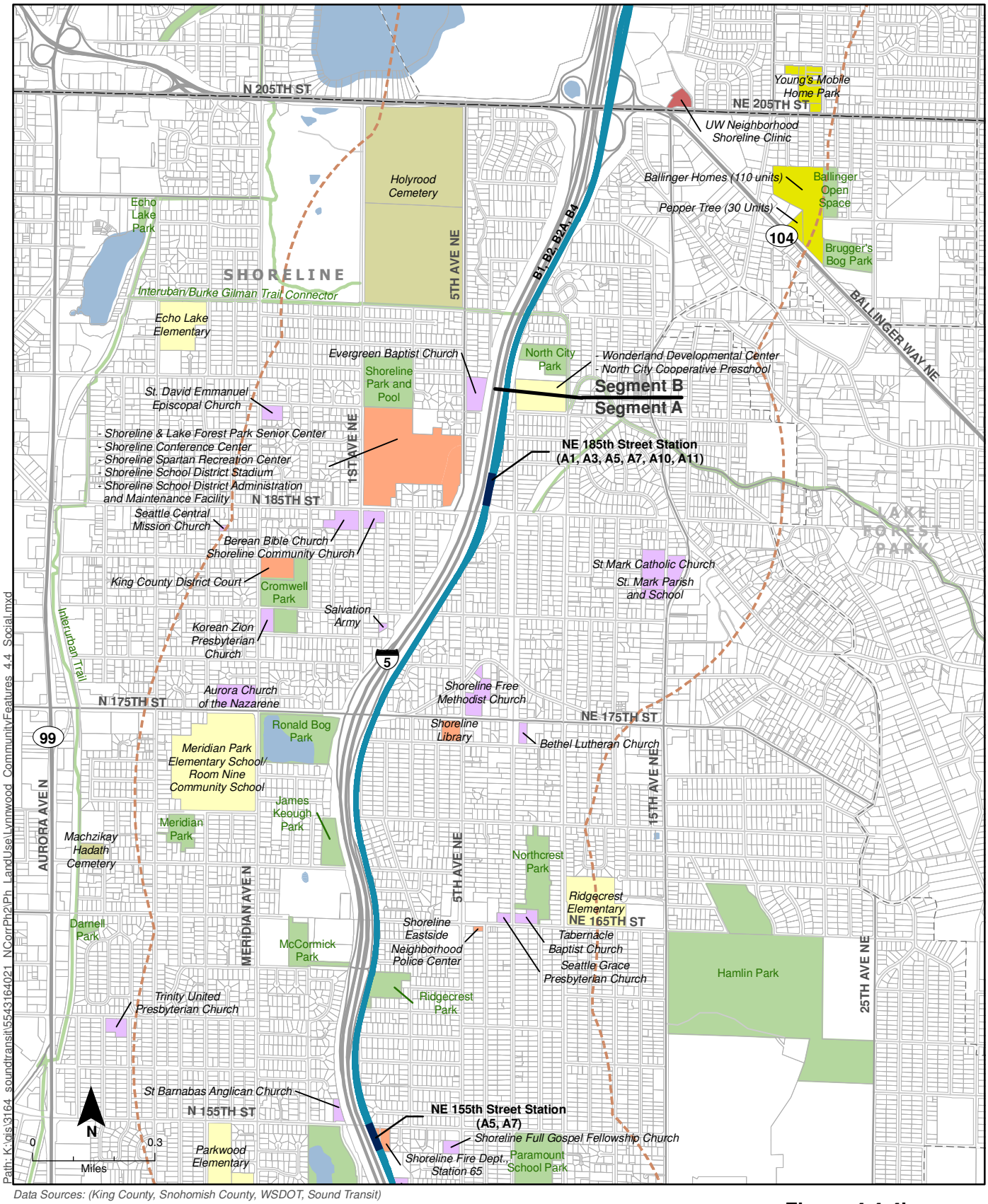
Data Sources: (King County, Snohomish County, WSDOT, Sound Transit)

- Community and Municipal
- Low- and Lower-Cost Housing
- Schools
- Medical
- Religious
- Cemetery
- Light Rail Alternatives
- Station Location
- Parcel Boundary
- Roadway
- Local Street
- City Boundary
- County Boundary
- Park
- Waterbody
- Half-mile Project Buffer

Figure 4.4-4a
Community Facilities Within 0.5 Mile of Light Rail Alternatives

Lynnwood Link Extension



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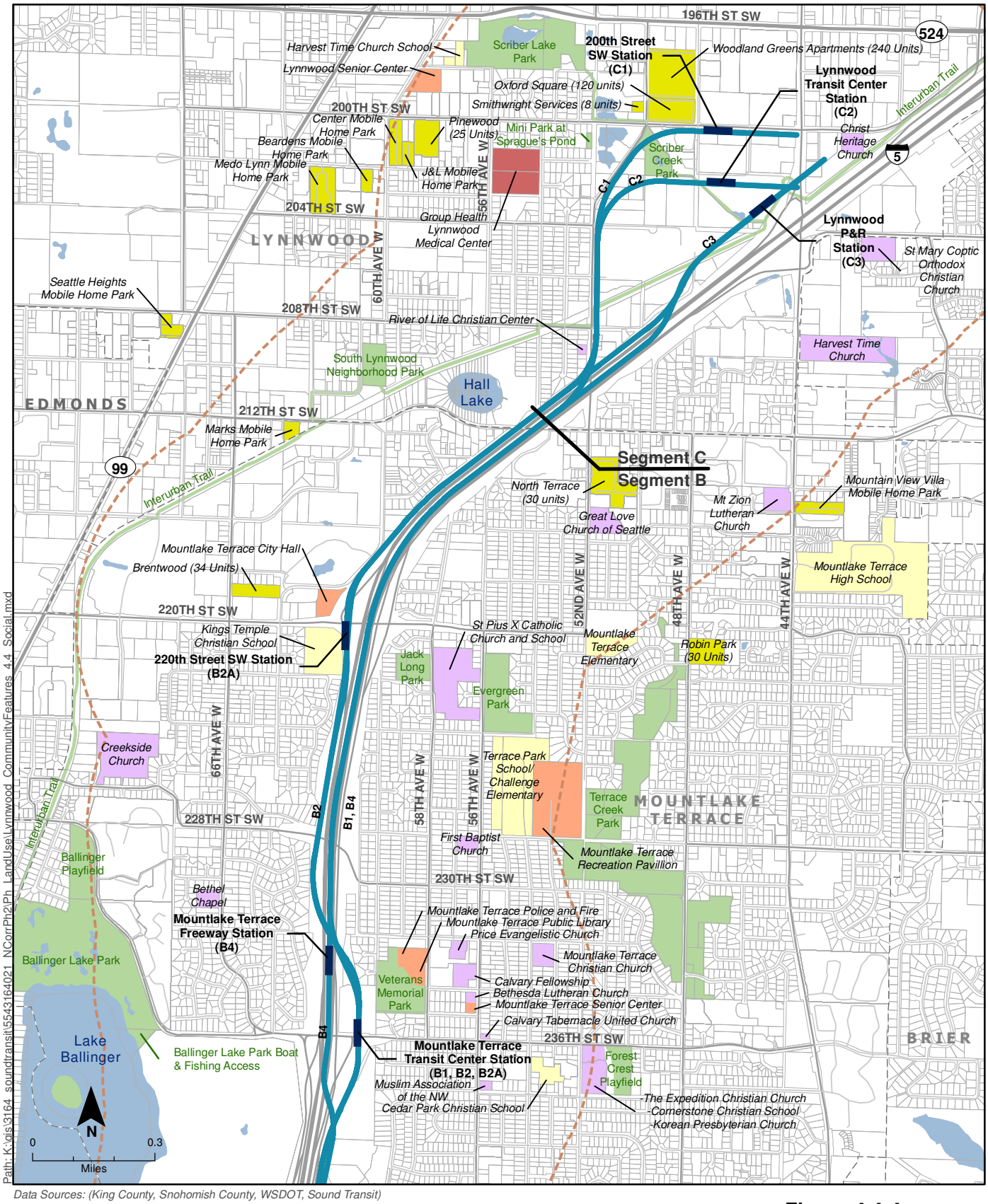
Data Sources: (King County, Snohomish County, WSDOT, Sound Transit)

- Community and Municipal
- Low- and Lower-Cost Housing
- Schools
- Medical
- Religious
- Cemetery
- Light Rail Alternatives
- Station Location
- Parcel Boundary
- Roadway
- Local Street
- City Boundary
- County Boundary
- Park
- Waterbody
- Half-mile Project Buffer

Figure 4.4-4b
Community Facilities Within 0.5 Mile of Light Rail Alternatives

Lynnwood Link Extension



Data Sources: (King County, Snohomish County, WSDOT, Sound Transit)

- Community and Municipal
- Low- and Lower-Cost Housing
- Schools
- Medical
- Religious
- Cemetery
- Light Rail Alternatives
- Station Location
- Parcel Boundary
- Roadway
- Local Street
- City Boundary
- County Boundary
- Park
- Waterbody
- Half-mile Project Buffer

Figure 4.4-4c
Community Facilities Within 0.5 Mile of Light Rail Alternatives

Lynnwood Link Extension

Cohesion

Neighborhood cohesion within the study area is relatively strong, with well-defined neighborhood boundaries, good transportation connections, stable land uses and housing, and opportunities for local interaction. In all cases, I-5 is a neighborhood boundary for adjacent neighborhoods. In Seattle and Shoreline, the western boundary of adjacent neighborhoods tends to be defined by Aurora Avenue, whereas the eastern boundary of adjacent neighborhoods is defined by 15th Avenue NE. The major east-west arterials tend to form the southerly and northerly boundaries of the neighborhoods. The grid street pattern also facilitates mobility and access within neighborhoods. Moving north into Mountlake Terrace and Lynnwood, Aurora Avenue remains a common boundary for neighborhoods west of I-5; however, the eastern boundaries of neighborhoods east of I-5 are less well defined because the streets are not in a grid pattern and the landscape includes more natural barriers such as lakes, hills, and ravines.

Originally developed in the decades following World War II, the project corridor neighborhoods are mature. Land uses are relatively stable and many residents have lived in the same home for decades. The neighborhoods have many public facilities and community amenities, with many places providing opportunities for interaction. Schools, libraries, community centers, churches, and neighborhood shops foster interaction between neighborhood residents. All of the local governments have neighborhood and community planning programs that foster community interaction.

4.4.2 Long-Term Impacts

The discussion below considers impacts on the social environment from the construction and operation of the light rail alternatives compared with the No Build Alternative. It is based on the impacts and mitigation described in other environmental effects analyses in this Draft EIS and assesses how they might affect corridor neighborhoods and populations.

No Build Alternative

Under the No Build Alternative, no properties would be acquired and no households or businesses would be displaced. Existing community facilities and services would not be affected. The cohesion of the 18 neighborhoods adjacent to the project corridor would be similar to today, although local and regional congestion would increase. Otherwise, little change would occur in air quality, noise, or transit service coverage, although transit travel times and reliability would suffer. There would be little potential for disproportionately high and adverse effects on minority and low-income populations. These populations often depend on transit more than the general population, so they would not benefit from improved transit service,

decreased travel time, increased reliability, and increased access to regional community facilities and jobs as provided under the light rail alternatives.

Light Rail Alternatives

Segment A: Seattle to Shoreline

Population and Business Changes

The Segment A alternative alignments and stations would be on the east side of I-5 where all of the property acquisitions and displacements would occur, with the exception of Alternative A1 that would have parking located on the west side of I-5 at NE 185th Street. The Segment A alternatives would fully acquire 64 to 80 parcels, depending on alternative alignments (see Table 4.1-1 in Section 4.1, Acquisitions, Displacements, and Relocations). Between 107 and 122 residential units would be displaced. Only one of the fully acquired parcels is not residential.

Community Facilities and Transportation Network Changes

The Segment A alternatives would largely avoid impacts on community facilities, but the at-grade Alternatives A1, A5, and A10 would place the guideway near the main entrance to the Latvian Evangelical Lutheran Church in the Pinehurst neighborhood, which could lead to a full acquisition of the property. Sound Transit is exploring measures to avoid the impact by redesigning the church's access. Because this is an ethnic church, parishioners may reside some distance from the church and surrounding neighborhoods.

All Segment A alternatives would acquire a strip of land along the west edge of Ridgecrest Park adjacent to I-5. Alternative A1 also would affect an edge of the Shoreline Stadium parking lot, which serves the stadium, the Spartan Recreation Center, and the Shoreline Conference Center. The community benefits of these facilities would not be affected. See Section 4.17, Parks and Recreational Resources, for additional information. Some streets, bridges, and sidewalks would be modified or reconstructed in Segment A, but this would not permanently affect access to community facilities.

Character and Cohesion Changes

The character and cohesion of neighborhoods adjacent to Segment A would not be notably altered from current conditions because the new light rail would be largely within the I-5 right-of-way and would not represent an additional physical barrier. The light rail facility could be perceived as reinforcing I-5 as a barrier, but there would be no physical change to neighborhood interactions, and stations servicing all surrounding neighborhoods could help offset the sense of a barrier. Noise impacts

would be avoided by design measures, which could include noise walls on the guideway or ground, or sound insulation in affected residences or buildings.

Depending on the Segment A alternatives, between 106 and 127 full and partial acquisitions would occur in the Pinehurst, Ridgecrest, Echo Lake, and North City neighborhoods. Full acquisitions would affect more than 50 residences in the Ridgecrest neighborhood and less than 35 in the other two neighborhoods. The acquisitions would be along I-5 on the periphery of these neighborhoods. Clusters of acquisitions, however, would be needed for proposed stations at NE 145th, NE 155th, and NE 185th Streets, depending on the alternative. These acquisitions would affect about a block of homes in the station areas. Because the homes are on the edge of the affected neighborhoods, the impact on community cohesion from these acquisitions would be less than if the homes were more centrally located in these neighborhoods.

Overall, neighborhood character and cohesion would not be adversely affected by any of the Segment A alternatives.

Segment B: Shoreline to Mountlake Terrace

Population and Business Changes

There would be limited social, community facility, and neighborhood impacts in Segment B. Alternatives B1 and B4 would not displace any households, while Alternatives B2 and B2A would displace up to five single-family residences (see Table 4.1-1 in Section 4.1, Acquisitions, Displacements, and Relocations). No businesses would be displaced under any of the Segment B alternatives.

Community Facilities and Transportation Network Changes

No community facilities would be displaced or adversely affected in Segment B, and the street and sidewalk network would be reconstructed to minimize impacts on access and mobility.

Character and Cohesion Changes

Neighborhood character and cohesion would remain intact for the eight neighborhoods adjacent to Segment B, and no new barriers would be placed within the existing neighborhoods. While the Cities of Shoreline and Mountlake Terrace have neighborhoods on either side of I-5, the new light rail largely within the highway right-of-way would not represent an additional physical barrier although it could be perceived as reinforcing the physical separation. The transit stations would attract patrons from adjacent neighborhoods, which could help offset the sense of a barrier. Other effects such as noise and visual impacts would be mitigated. Neighborhood

character and cohesion would not be adversely affected under any Segment B alternatives.

Segment C: Mountlake Terrace to Lynnwood

Population and Business Changes

While two of the Segment C alternatives would require only a limited number of acquisitions, Alternative C1 would affect one single-family residence and would displace a condominium complex with 76 residences. An additional 31 businesses would be displaced due to acquisition of three commercial properties. Alternatives C2 and C3 would affect one to three businesses and one to no residences, respectively. If the affected businesses relocate within the area, employment impacts could be reduced. However, some of the businesses may relocate out of the area or choose to close, which would adversely affect the employees.

Community Facilities and Transportation Network Changes

No community facilities would be acquired in Segment C, although two park facilities would be affected by partial acquisitions. The light rail guideway would be elevated over the Interurban Trail under all Segment C alternatives, but the effects would not alter the functions of the trail. Alternative C1 would place part of the elevated guideway in Scriber Creek Park, and Alternative C2 would place the guideway nearby. See Section 4.17, Parks and Recreational Resources, for information about impacts on Scriber Creek Park. The primary function of these facilities would remain available to the public use, and with mitigation, the impacts could be minimized. None of the Segment C alternatives would alter the functions of the existing transportation network (streets and sidewalks).

Character and Cohesion Changes

General neighborhood character and cohesion are not expected to change for the three neighborhoods adjacent to Segment C. None of the alternatives would require property acquisition or displacement impacts in the South Lynnwood or Hazelwood neighborhoods; therefore, character and cohesion would not change in these two neighborhoods. All of the Segment C acquisition and displacement impacts would occur in the Lynnwood City Center neighborhood.

Developed land uses in the Lynnwood City Center neighborhood are primarily large-lot commercial and industrial uses. Alternatives C1 and C2 would travel along the east side of 52nd Avenue West, which is the eastern boundary of the neighborhood. Alternative C1 would travel through the northern part of Scriber Creek Park and continue adjacent to multifamily residential properties and commercial uses. Alternative C2 would turn eastward before the park, which would avoid residential impacts. Both of these alternatives would feature design measures

to avoid noise impacts, but the elevated guideways would change views. Alternative C3 would have the least effect on this neighborhood because it is largely adjacent or parallel to I-5.

Alternative C1 also would acquire a condominium community with 76 units. The displacement of the condominium complex would break up a distinct community, but would not affect the overall character and cohesion of the Lynnwood City Center neighborhood.

4.4.3 Construction Impacts

Construction activities temporarily affecting the social environment are discussed below. Any construction activity that requires displacing businesses or residences is considered a long-term impact.

Population and Business Changes

During about 6 years of construction that could occur along the project corridor, residents as well as businesses and their workers would be in the vicinity of construction activities. However, in any given location, major construction would typically last 1 to 2 years. Construction itself would be unlikely to alter population levels or the presence of businesses.

Community Facilities and Transportation Network Changes

During construction, access to community facilities and general mobility for all modes of transportation would at times be changed by increased congestion, reduced use of traffic lanes or sidewalks, and closure of some streets and sidewalks. These changes might result in small increases in travel distance and travel time. For example, reconstruction of the 117th Street bridge could require detours, and this would create longer travel times or different routes to community facilities such as the Northgate Elementary School. North-south bus transit routes are not expected to be adversely affected, although travel on east-west routes may be slow or detoured at times, particularly at arterial crossings of I-5 where light rail stations would be constructed. Access to and from neighborhood community facilities and to destinations outside of neighborhoods may be affected. While they avoid permanent impacts, there is the potential for Alternatives A3, A7, or A11 to temporarily remove access to the Latvian Evangelical Lutheran Church. Access to and from other neighborhood facilities would be maintained.

Character and Cohesion Changes

Land uses up to four blocks from the construction zone could be exposed to short durations of increased noise, vibration, dust, construction truck traffic, and visual changes, but generally these effects would be limited to properties immediately

adjacent to the construction areas. For example, in Segments A and B, the effects would be limited because I-5 is already a boundary between neighborhoods. In Segment C, the Alternatives C1 and C2 alignments follow an arterial into the Lynnwood City Center neighborhood and would be adjacent to commercial and light industrial properties as well as residences. The construction activities with these two alternatives and the related noise, vibration, dust, visual impacts, and truck traffic would be closer to more of the larger neighborhood than with Alternative C3, which continues generally adjacent to I-5. Still, only a portion of the larger Lynnwood City Center neighborhood would be affected, which would limit changes to overall neighborhood character and cohesion.

4.4.4 Indirect and Secondary Impacts

Over time, implementation of the Lynnwood Link Extension could result in indirect and secondary impacts, particularly in station areas. For all light rail alternatives, the start of light rail operation would likely coincide with modifications in bus routes operated by others transit agencies to avoid duplicate services along the I-5 corridor and to improve services to the station areas. Construction of the light rail transit facilities could influence real-estate market forces that could increase the potential for transit-oriented development at some station locations as permitted by local zoning regulations. Such changes may be greater in the Lynnwood City Center neighborhood, where transit-oriented development potential is most likely, but most of the immediately surrounding area is characterized by commercial, light industrial, or parking uses. See Section 4.2.2 in Section 4.2, Land Use, for a discussion of long-term changes in land use. Moderate levels of redevelopment may occur in station areas in Mountlake Terrace and Shoreline. In the long term, these station areas at the edges of neighborhoods may become new neighborhood activity centers, which could support livability and sustainability.

4.4.5 Cumulative Impacts

The social and neighborhood character adjacent to the project corridor would change only somewhat with the construction and operation of the Lynnwood Link Extension. The I-5 corridor, between the Northgate Mall area and the existing Lynnwood Transit Center, was developed in the 1950s and 1960s; adjacent neighborhoods are built-out. Zoning adjacent to the project corridor also is largely designated for single-family residences and/or reflects existing land uses. Planned and future development would generally occur consistent with adopted land development policies and zoning regulations, which currently would be lower density development similar to existing land uses. Cumulative effects could occur in corridor neighborhoods if large development projects or transportation improvements were located in neighborhoods adjacent to the light rail alignment.

The Sound Transit Link Operations and Maintenance Satellite Facility project is evaluating an alternative site in Lynnwood east of 52nd Avenue West and north of I-5. The neighborhood directly west of this site has minority and low-income populations. The maintenance facility alternative would displace businesses and other enterprises in an area that is currently developed with a variety of light industrial and commercial uses. The maintenance facility would not notably alter transportation conditions, including neighborhood accessibility or traffic levels. Construction impacts (such as noise, light and glare, dust, and traffic) could affect the nearby residential areas.

The Edmonds School District master plan includes a district support facility on property that includes administrative offices and bus maintenance and storage in Lynnwood. This property overlaps partly with the site alternative under consideration for the Sound Transit operations and maintenance facility. The development of one or both of these projects would be within an area with other light industrial uses, but a residential neighborhood is across the street.

The impacts of the Lynnwood Link Extension alternatives, in combination with other past, present, or future projects and actions, with available mitigation applied, would not result in appreciably higher impacts on communities or neighborhoods.

4.4.6 Potential Mitigation Measures

No mitigation related to social impacts, community facilities, and neighborhoods would be required during construction or operation of the Lynnwood Link Extension beyond the design and mitigation measures described in other sections of this Draft EIS. Other sections of this Draft EIS identify potential measures that would minimize effects on the quality of life and neighborhood cohesion. These other sections include: Chapter 3, Transportation Impacts and Mitigation, with measures to address impacts from parking, congestion, and construction; Section 4.1, Acquisitions, Displacements and Relocations, with measures to provide compensation and assistance to affected parties; Section 4.3, Economics, which includes measures to minimize construction impacts on businesses; Section 4.5, Visual and Aesthetic Resources, which outlines mitigation to address areas with high visual impacts; Section 4.6, Air Quality and Greenhouse Gases, which identifies practices to reduce construction air quality concerns; Section 4.7, Noise and Vibration, which outlines the project's commitments to address impacts; and Section 4.17, Parks and Recreational Resources, which describes how park impacts would be reduced during construction and longer term. To reduce potential cumulative impacts if the maintenance facility is sited in Lynnwood, Sound Transit would coordinate planning efforts of the two projects, including identifying appropriate design measures, mitigation, and community outreach to minority and low-income populations near the two projects.

4.4.7 Environmental Justice Analysis and Preliminary Determination

The assessment of environmental justice impacts is required by Presidential Executive Order 12898, Federal Actions to Address Environmental Justice to Minority Populations and Low-Income Populations (February 11, 1994); the USDOT Order 5610.2, Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (April 15, 1997); and the USDOT Order 5610.2(a) (May 2, 2012), updating the USDOT policy to consider environmental justice principles in all programs, policies, and activities. These orders, along with FTA guidance (FTA Circular 4703.1), require agencies to (1) avoid, minimize, and mitigate disproportionately high and adverse effects on minority and low-income populations; (2) ensure full and fair opportunities for public involvement by members of minority and low-income populations during project planning; and (3) prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority and low-income populations. The discussion below summarizes the environmental justice analysis provided in Appendix C, which also has detailed statistics on neighborhoods along the project corridor.

As of 2010, nearly 126,000 residents and an estimated 60,000 jobs were located in census tracts within 0.5 mile of the project corridor, which is anchored by major regional commercial centers at Northgate and Lynnwood. Many of the study area's 18 neighborhoods have higher percentages of minority (non-White race and Hispanic ethnicity) and low-income persons than rates that characterize the King-Snohomish two-county region or Sound Transit's service area. The study area population as a whole is 37.3 percent minority, but the rate exceeds 51 percent in the South Lynnwood and Lynnwood City Center neighborhoods. Despite this diversity, the study area does not appear to have any culturally distinct communities such as those characterized by restaurants, businesses, or religious institutions that cater to a particular group. An estimated 11.3 percent of the study area population is low-income, but two Lynnwood neighborhoods exceed 18 percent. Two other neighborhoods, Maple Leaf and Town Center, have lower proportions of minority and low-income populations than the regional average.

Considering the diverse demographic characteristics all along the project corridor, some minority and/or low-income households could be affected by the construction or long-term operation of the project. Research, however, did not indicate that minority or low-income persons might be concentrated in areas that would receive more impacts. The primary impact affecting individuals and businesses would be due to property acquisitions and displacements. Section 4.1, Acquisitions, Displacements, and Relocations, discusses these impacts and identifies mitigation measures that would address these property-related impacts. However, the displacement of some residents from their current neighborhoods could be a personal hardship. Noise and visual

impacts also would affect some areas immediately adjacent to the project corridor. Section 4.7, Noise and Vibration, describes noise levels during operation and mitigation for these noise impacts. While some of the visual impacts could be mitigated over time, some areas would still have high visual impacts. Section 4.5, Visual and Aesthetic Resources, has more detail on impacts and mitigation measures.

In addition to the mitigation measures that would help reduce the severity of long-term impacts, the Lynnwood Link Extension would offer benefits to minority and low-income populations. Air quality could improve, and area noise levels may be reduced in some areas compared to conditions with the No Build Alternative. Minority and low-income populations, including transit-dependent persons and particularly those residing within an easy walking distance of proposed light rail stations, would benefit by the improved access to regional transit, including higher levels of service, reduced travel time, and better access to regional centers and the associated public services and employment opportunities. An analysis of transit travel time savings, or user benefits in the project corridor, would receive benefits from the proposed project. The analysis indicates that all corridor minority and low-income populations would receive positive transit travel time savings.

Minority and low-income populations would be near construction areas, as would members of the general population. The effects of construction include short-term visual changes; access modifications; and construction-related noise, vibration, dust, and traffic. Most of the construction laydown and staging areas would be along I-5, which would reduce impacts on nearby neighborhoods and populations. Multimodal transportation mobility and access within neighborhoods and destinations outside of adjacent neighborhoods would be maintained. Although impacts from construction would be temporary, construction could extend up to 1 to 2 years in any given location and could be perceived by nearby residents and business owners as a long-term condition.

The environmental justice analysis also considered indirect and cumulative impacts. The Lynnwood Link Extension project would not have high and adverse, indirect or cumulative impacts on population, businesses, community facilities, the transportation network, or community cohesion.

Project Outreach to Minority and Low-Income Populations

Since the start of the project planning, Sound Transit has been conducting community outreach and public involvement activities that include targeted outreach to minority and low-income populations. To involve ethnic populations with limited English proficiency, mailings and handouts have been translated to foreign languages common in the study area. FTA and Sound Transit also contacted federally recognized-tribes with interests in the area—Muckleshoot Indian Tribe, Snoqualmie Tribe, Suquamish Tribe, Tulalip Tribes, and the Yakama Nation. The agencies also contacted non-federally recognized tribes.

Sound Transit has held briefings with a wide variety of community organizations, including neighborhood associations, service organizations, and churches. These meetings covered existing characteristics of the community, the need for project improvements, the project's decision-making process, concerns about parking, and concerns about property impacts. Appendix L includes a listing of project outreach events and notices. Appendix C discusses comments and concerns from meetings in areas with low income and minority groups. The issues raised have been similar to those of the general public, and include property impacts, traffic, noise, station access, and the project's decision making process. Sound Transit's outreach activities will continue throughout the project's development.

Preliminary Environmental Justice Determination

Before all mitigation is applied, the proposed Lynnwood Link Extension would likely result in a limited set of adverse impacts on minority and low-income populations residing or conducting business in the project corridor. These impacts are expected to be the same in type and magnitude as those that would be experienced by the general population living or working along the corridor. Mitigation measures would be implemented to reduce effects to levels below those considered high and adverse.

The minority and low-income populations in the study area would benefit from the transit improvements the Lynnwood Link Extension would provide, including expanded access and travel time savings. Moreover, these benefits would be equal to or greater than the benefits to the general public.

With the proposed design measures, BMPs, off-setting benefits, and mitigation commitments, FTA has preliminarily concluded that the Lynnwood Link Extension would not result in disproportionately high and adverse environmental effects on minority and low-income populations.

4.5 Visual and Aesthetic Resources

Visual and aesthetic resources include the natural and cultural features of the landscape that contribute to the public's appreciative enjoyment of the environment. These resources can include individually identifiable features such as natural landmarks (for example, mountain peaks and hills, bodies of water, stands of trees), features constructed by man (individual buildings or the downtown skyline), or entire landscapes such as a valley ringed by hills.

Impacts on the visual environment are defined in terms of the extent to which elements of the proposed project would change the perceived visual character and quality of the environment. Appendix G, Visual Simulations and Illustrations, provides detailed visual simulations produced for this analysis.

The study area for visual resources consists of viewsheds along the project corridor (Figure 4.5-1). The viewsheds represent distinct landscape units that provide views of the alternatives. They encompass the travel lanes of I-5 for most of the route, and they also include areas on either side of the project corridor where people could see the project alternatives. Many of the viewpoints are marked by changes in topography, neighborhoods, streets, bridges, or tree cover, and they range in width from a half block to up to 0.5 mile from the project corridor.

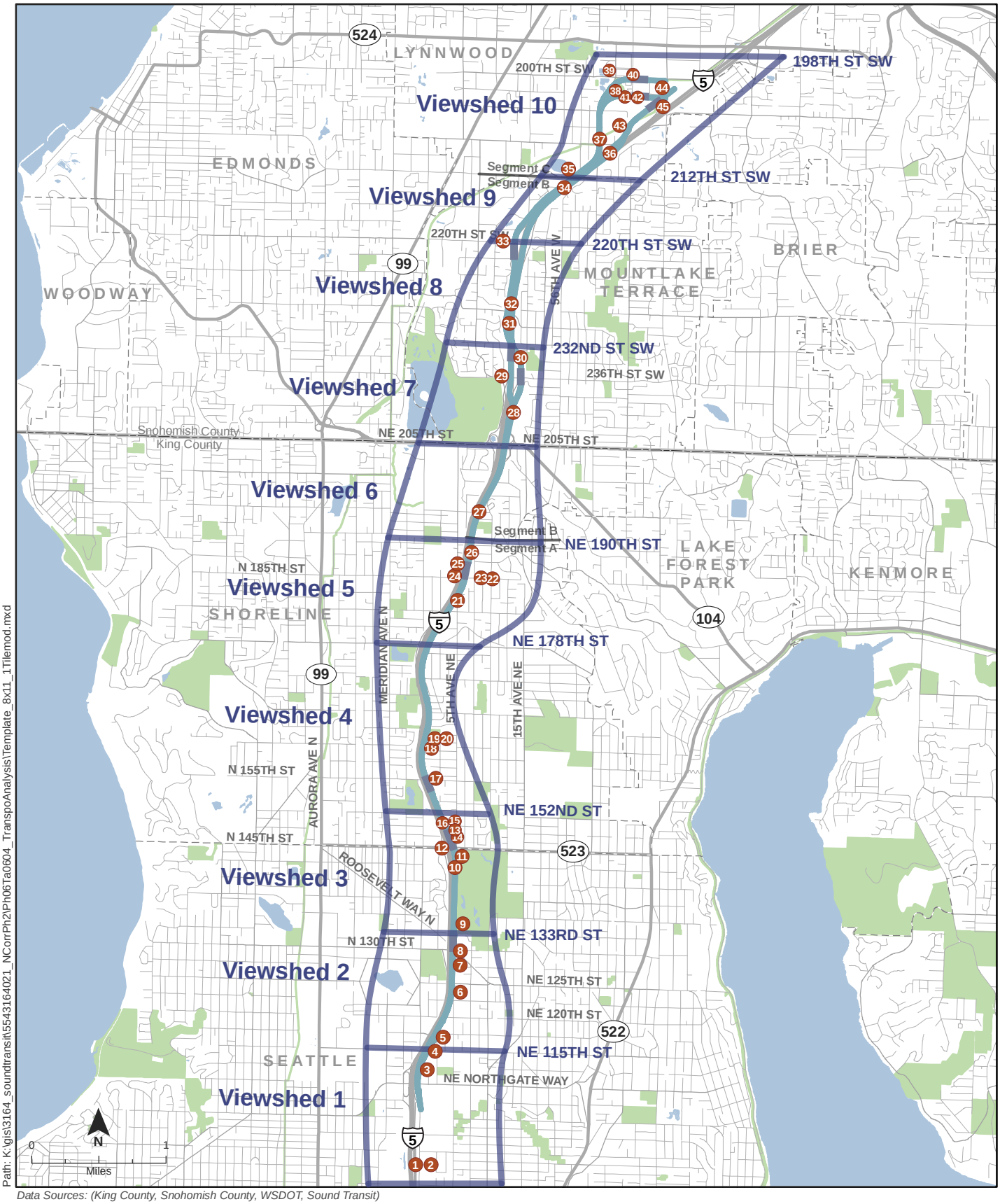
4.5.1 Affected Environment

Sound Transit began this visual analysis by assessing the visual character and visual quality of the landscape, and then considering how typical viewers may respond to what they see around them. The EIS *Technical Analysis Methodologies* report describes the visual analysis methods in more detail, including how Sound Transit adapted the FHWA and WSDOT guidelines for visual analysis. FHWA guidelines provide a generally accepted methodology for preparing visual assessments for linear transportation projects and are appropriate for use on this project.

Visual character refers to identifiable visual information, including visual elements and major environmental features.

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

Viewer Response reflects viewer exposure and viewer sensitivity. *Viewer Exposure* refers to where viewers are and how long they are typically there, including highway users and people in the surrounding neighborhoods. *Viewer Sensitivity* refers to how viewers perceive the environment and what they find important. Viewer sensitivity can be affected by what the viewer is doing; the visual context; and the values, expectations, and the interests they may have. For each viewshed and potential viewer group, viewer sensitivity is rated as high, average, or low. High represents viewers who highly value a particular view, and low represents viewers who do not regard the visual setting as important to their activities. For example, residential viewers are typically rated as having high sensitivity. An average sensitivity rating reflects the experience of people who view the visual context as a secondary feature of other activities. For example, these could be persons at work or shopping who may value a pleasant environment but are not at a specific location for the purpose of enjoying the scenery. Drivers and vehicle occupants passing through an area would be less sensitive to the visual context because they are focusing on features other than the surrounding landscape and generally have an average to low sensitivity.



Path: K:\gis\3164_soundtransit\5543164021_NCorrPh2\Ph06Ta0604_TranspoAnalysis\Template_8x11_1Tilemod.mxd

Data Sources: (King County, Snohomish County, WSDOT, Sound Transit)

Legend

- Viewshed Lines
- Viewpoints

Figure 4.5-1
Viewsheds and Viewpoint Locations

Lynnwood Link Extension

Based on these visual quality considerations, different levels of visual quality have been assigned to describe the viewsheds in the corridor:

High Visual Quality describes views with vivid, memorable, distinctive features in a landscape with compositional harmony or that fit between elements of the landscape that is free from encroaching elements.

Medium Visual Quality describes views with a unity or compositional harmony between elements of the landscape that produce a pleasing overall impression in which encroaching elements are minor and do not substantially alter the perception of the landscape as a unit. These views lack vivid, memorable features and are generally characterized as common or ordinary.

Low Visual Quality describes views that lack a dominant visual character in which there is a low level of fit between disparate elements. In some cases, these views appear disorganized with features that seem out of place, or are views with some compositional harmony but include eyesore elements that can dominate one's perception.

The visual quality of an area can directly affect viewer sensitivity. In an area with low visual quality, it is unlikely that any viewers will have a high level of sensitivity. In an area with high visual quality, such as a spectacular view, a person who does not regularly see the view may still place a high value on the view.

Appendix G includes photographs from viewpoints within each viewshed. Appendix I-4.5 has more detailed descriptions of the viewsheds and their defining characteristics.

Segment A, Viewshed 1—NE 92nd Street to NE 115th Street

Viewshed 1 includes the Northgate area of Seattle. Major features include the Northgate Mall, surrounding multistory buildings with residences and businesses, and the North Seattle Community College campus and I-5 to the west. This section of I-5 is generally about 20 feet higher than the surrounding area, and it has moderately dense vegetation along portions of the freeway. There are also linear stands of trees and shrubs along the corridor. Viewers include drivers and occupants of vehicles on I-5 and local arterials, shoppers in retail areas, occupants of office buildings, and residential occupants of multistory buildings on both sides of the corridor. Visual quality is medium to low for all viewer groups. Urban uses provide some compositional harmony of similar building scale and moderately dense landscaping that depict a similar street-level character over most of the area, as illustrated in Viewpoints 1, 2, and 3.

Segment A, Viewshed 2—NE 115th Street to NE 133rd Street

Viewshed 2 has single-family residential areas on both sides of I-5, along with churches. A park is on the west side of the freeway, and there are continuous noise

walls along the side of the freeway. The overpass at NE 117th Street and freeway signs can be seen from adjacent residences and streets. There is limited vegetation along I-5 with moderately dense vegetation east of the noise walls. The visual quality of views from the residential area is medium due to the similar building scale and moderately dense landscaping that provide a homogenous street-level character and buffers the highway from views, as illustrated in Viewpoints 4, 5, and 6. The visual character of I-5 is low due to the framing of the highway by noise walls that provide little visual interest.

Segment A, Viewshed 3—NE 133rd Street to NE 152nd Street

Viewshed 3 includes 5th Avenue NE and the Jackson Park Golf Course to the east, with a single-family residential area and private school campus on the west side. The freeway interchange at NE 145th Street is bounded by residential areas to the north and east. This section of I-5 has dense trees and vegetation along both sides of the freeway. Residents and golf course users are highly sensitive to changes in the landscape. The visual quality of the golf course is medium to high due to the unity and compositional harmony of a landscaped setting and mature vegetation that buffers views of encroaching features such as I-5. Residential areas are of medium visual quality due to their homogenous character. The visual character of I-5 is generally medium due to the framing of the highway by dense vegetation on both sides. The view from southbound vehicles from NE 155th Street to NE 145th Street includes Mount Rainier as a distinctive and memorable element in the distance and has medium to high visual quality. The visual character of this area is illustrated in Viewpoints 7 through 13.

Segment A, Viewshed 4—NE 152nd Street to NE 178th Street

Viewshed 4 has single-family residential neighborhoods on both sides of I-5. Churches and institutional uses are also in the area. Ridgecrest Park is on the east side of I-5 and is partially screened from the freeway by a row of trees. Three parks on the west side of I-5 (Twin Ponds Park, James Keough Park, and Ronald Bog Park) do not have views extending to the east side of I-5. King County Metro's North Transit Base and King County's Solid Waste Transfer Station are on the west side of the freeway. The visual quality of the residential area is medium due to the visual unity of its homogenous character and moderately dense landscaping that buffers views of I-5. With vegetation framing both sides of I-5, the visual character of the freeway is moderate. There is a WSDOT beautification area located southeast of the NE 175th Street interchange.

Segment A, Viewshed 5—NE 178th Street to NE 190th Street

Viewshed 5 has single-family residential uses on both sides of I-5, along with churches and other uses such as the Shoreline Conference Center and Shoreline Stadium and a Seattle City Light transmission line corridor. This section of I-5 is

bordered by noise walls, with varied vegetation. Residential areas in this viewshed have medium visual quality due to its unity of character and the buffering of the freeway by noise walls and vegetation. Viewers from the Shoreline Conference Center and the Shoreline Stadium are likely to have a low level of sensitivity because of their focus on other activities and the generally low visual quality of the area due to the variety of urban forms. Drivers and occupants of vehicles on I-5 are likely to be of average sensitivity in viewing the medium visual quality of the highway corridor framed by moderately dense vegetation on both sides. There is a WSDOT beautification area south of NE 180th Street.

Segment B, Viewshed 6—NE 190th Street to NE 205th Street (244th Street SW, SR 104)

This area has single-family residential use on both sides of I-5, as well as North City Park and the closed North City Elementary School. These land uses are separated from I-5 by a mature forest beautification area that was originally acquired by WSDOT under the Highway Beautification Act of 1965. This section of I-5 has high visual quality because of the frame of heavy vegetation on both sides. The residential areas have medium quality views and are buffered from the freeway by noise walls, topography, and distance.

Segment B, Viewshed 7—NE 205th Street (244th Street SW) to Mountlake Terrace Transit Center (232nd Street SW)

Viewshed 7 covers an area where I-5 widens for an interchange and median. This viewshed has low visual quality because the complex freeway lanes, interchange ramps, and the parking structure of the Mountlake Terrace Transit Center dominate the view and provide little visual interest, as shown in Viewpoint 25. The Nile Golf Course is west of I-5, with residential areas located north of 236th Street SW on both sides of I-5. Both of these areas have high visual quality and few views of I-5 because of buffering vegetation. The commercial and office area on the east side of the freeway has medium visual quality due to unity of design and is buffered from views of I-5 by a wooded area along McAleer Creek adjacent to I-5. North of the commercial area is a vacant former school site.

Segment B, Viewshed 8—232nd Street SW to 220th Street SW

Viewshed 8 is along I-5 in an area where the freeway has high visual quality for southbound traffic due to very dense vegetation on high steep slopes that border the highway on both sides. For northbound vehicles visual quality is medium to high because of the encroachment of roadway crossings and the pedestrian overpass to the existing median transit stop. The surrounding single-family residences along both sides of I-5 are at the top of steep wooded slopes and have medium visual quality due to unity of character. These residences are buffered from views of I-5 by topography, noise walls, and vegetation, although the residences on 227th Street SW

are in a valley with noise walls that partly screen views of I-5. On the west side of I-5 from about 233rd Street SW to just south of 228th Street SW, a highway beautification area extends along the top of a densely vegetated slope.

Segment B, Viewshed 9—220th Street SW to 212th Street SW

Viewshed 9 is along a section of I-5 that is bordered by moderate to dense vegetation on either side with medium visual quality. The bordering neighborhoods are mostly residential, are generally below the elevation of I-5, and have medium visual quality due to unity of character. These neighborhoods are buffered from I-5 by topography, noise walls, and vegetation. Offices and a residential complex are on the west side of I-5 between 220th Street SW and 216th Street SW with low visual quality due to a variety of uses, large building profiles, and design features.

Segment C, Viewshed 10—212th Street SW to 40th Avenue West

Viewshed 10 has varied landscapes as the alternative routes move away from I-5 to the Lynnwood Transit Center.

Northbound of I-5, between 212th Street SW and 52nd Avenue West, there is high visual quality with vivid distant views of the Cascade Mountain peaks, and northbound and southbound views framed by moderately dense vegetation. West of I-5 is a residential area with a large open space and a lake that has medium visual quality due to the blend of open space and residential uses.

52nd Avenue West to the west of I-5 is characterized by a residential neighborhood on the south side with medium visual quality due to a unity of features. The industrial uses to the east of 52nd Avenue West are not a visual intrusion due to the low profile of buildings, and landscaping and parking areas adjacent to the street.

Scriber Creek Park on the east side of Cedar Valley Road approaching 200th Street SW has high visual quality due to the diversity of lawn areas, wetlands, and trails and the unifying homogeneous dense vegetation throughout the area. This vegetation also buffers the park from the street and adjacent urban development.

The areas on both sides of 200th Street SW west of Cedar Valley Road include multifamily buildings and offices, transitioning to commercial uses east of 46th Avenue West. The multifamily residential neighborhood has medium visual quality due to a unity of bulk, design, and landscaping elements that provide compatible features. The commercial areas east of 46th Avenue West, which is dominated by industrial uses, has low visual quality due to the variety of building forms, and the lack of visual harmony among multiple building styles and other features.

The Lynnwood Transit Center occupies a 29-acre site with several large park-and-ride lots. The transit center is bounded to the west by a large tract with wetlands and Scriber Creek. The visual quality of the transit center is moderately low due to the

predominance of parking lots despite landscaping features and the adjacent open space area.

The 44th Avenue West corridor south of 200th Street SW includes commercial development and the Lynnwood Transit Center on the south side and a variety of commercial development on the north side. The dominant visual image is wide streets, large parking lots, signs, and strip shopping centers. The visual quality for viewers within the commercial area is medium to low due to lack of unity. The visual quality for occupants of vehicles traveling north on the arterial is generally low because of the multiple overcrossings by I-5 and the Interurban Trail, the freeway on-ramps and adjacent parking lots, frequent signs, and strip malls with little visual interest.

The Interurban Trail crosses 52nd Avenue West and runs northeast toward the Lynnwood Transit Center, with the Scriber Creek wetlands and the Lynnwood Transit Center to the north, before it continues to cross 44th Avenue West on an overpass near I-5. The trail is bounded by moderate to dense vegetation and has a medium visual quality due to the unity of vegetation cover along the corridor.

4.5.2 Long-Term Impacts

The discussion below describes the potential visual changes that could occur with the light rail alternatives compared to the No Build Alternative, and qualitatively assesses the level of visual change and the resulting visual quality for each viewshed. In addition to the visual assessments in this section, Sound Transit has developed visual simulations that are based on photographs of existing views from locations throughout the project corridor; these simulations are provided in Appendix G, Visual Simulations and Illustrations.

No Build Alternative

Under the No Build Alternative, the visual quality of the project corridor would stay the same as discussed above under Section 4.5.1, Affected Environment.

Light Rail Alternatives

The Lynnwood Link Extension would result in changes in the visual environment of varying degrees throughout the project corridor, as discussed in more detail in the following subsections. The project would incorporate the following features:

- On the east side of I-5 where there are currently noise walls along the proposed alternative routes, the project would move the walls farther east, increase their height in some locations, and place the light rail guideway on the freeway side of the wall. Areas with slopes may need new retaining walls as well as relocated or new noise walls.
- New noise walls would also be needed to mitigate some noise impacts.

- Exterior lighting at stations and park-and-ride lots would be designed to minimize height and use source shielding to avoid luminaries (bulbs) that would be directly visible from residential areas, streets, and highways. Shielding would also limit spillover light and glare in residential areas.
- For the entire Lynnwood Link Extension, Sound Transit would develop design criteria featuring a consistent architectural theme for elevated elements and stations. These criteria would be developed with input from the local jurisdictions and WSDOT.
- Sound Transit would adhere to the cities' design standards in station areas, if applicable, to promote visual unity in these areas.

Changes in visual quality can result when existing features are removed or when features such as walls, stations, elevated guideways, or larger structures are added. When mature vegetation framing the roadway is removed, viewers may perceive the highway corridor as wider and more prominent, and it can change the visual context. For views from adjacent residential areas, vegetation can help enhance the intactness and unity of views of neighborhoods and buffer them from the transportation corridor.

The factors leading to changes in visual quality by location are described in Table 4.5-1. Visual simulations in Appendix G illustrate existing views and projected future views with the alternatives.

Visual impacts are rated as low, medium, or high. The following criteria are used to characterize the degree of visual quality change from existing conditions in terms of changes in the elements of vividness, intactness, and unity and viewer sensitivity.

- **High change** would introduce visually prominent features that alter the visual character of the area. High changes can also occur when an alternative removes dense mature vegetation that contributes to high or moderately high visual quality. A high degree of change is more likely in an area with high visual quality.
- **Medium change** would alter visual features but not in a way that would be perceived as intrusive or incompatible by most viewers. A medium change can result from the removal of vegetation that may make previously screened or buffered features more visible or prominent.
- **Low change** generally includes relatively minor new features or relatively minor alteration of existing features such as vegetation cover. In some cases, physically prominent new features might result in a low change in visual quality if the existing visual context already has low visual quality.

Impacts by Alternative

Table 4.5-1 summarizes the potential visual changes by segment and alternative. Visual simulations in Appendix G, Visual Simulations and Illustrations, show existing views and computer-generated simulations illustrate what the alternatives would look like if they were constructed.

Figures 4.5-2 through 4.5-6 indicate areas where the alternatives would involve high, medium, or low changes to visual quality.

4.5.3 Construction Impacts

Construction impacts would vary by location and the types of construction needed for the different light rail facilities. Construction effects would be temporary but could still last for several years, and they could involve the fastest degree of visual change for the project. Site clearing and demolition can remove mature trees, ground cover, and existing structures and affect either a linear corridor or a larger site. Other sources of visual effects include construction staging areas, detours or temporary roadways, lighting, signage, heavy equipment, trailers, fences, temporary noise shielding, scaffolding, cranes, relocation of noise walls, and material storage.

Typically, visual impacts of construction occur in the same areas affected by long-term impacts, but construction has more visual clutter and little visual unity given the variety of construction activities, equipment, and stored materials that would change throughout the construction period. The construction and staging areas would lack visual cohesion and have low visual quality compared with the existing conditions or the expected visual character after construction.

Construction of the light rail facilities at-grade or associated with retaining walls would have similar temporary visual impacts related to vegetation clearing; exposing and moving soils; constructing retaining walls; and installing tracks, an overhead catenary system, and other project features. Elevated portions of the alternative routes would involve less clearing and grading. Columns and guideway sections would be constructed in various ways, ranging from being cast into forms or lifted into place with cranes. Construction access would likely be from I-5 but adjacent roadways might be used. Light and glare impacts on adjacent areas could occur when nighttime construction is scheduled, which is most likely to take place where construction activities would disrupt I-5 traffic.

Table 4.5-1. Summary of Potential Visual Quality Impacts of the Light Rail Alternatives

Viewshed	Existing Visual Quality	Viewer Sensitivity	Changes in Landscape Elements Resulting in Visual Impacts	Visual Impact
1. Northgate (NE 92nd Street to NE 115th Street)	Low	Average	**All Alternatives:** • The elevation of I-5 and the topography already limits visibility, and the elevated structure would have little or no change in appearance or visual quality. • Views of Northgate Mall from I-5 would not be impaired. • Few areas with mature dense vegetation would be removed, although some landscaping would be removed along 1st Avenue NE to NE 115th Street. • The elevated structure would not affect any vivid and memorable features or views. • Elevated structures would partly encroach on views from residential neighborhoods to the east.	**I-5** Low **Retail/Office** Low
2. NE 115th Street to NE 133rd Street	**I-5** Low **Residential** Medium	**I-5** Average **Residential** High	**Alternative A1 (at-grade/elevated with no station at NE 130th Street):** • The noise wall would be relocated to the east. • Displaced homes and higher noise walls south of NE 123rd Street affects the unity of views from nearby residences to the east. • Buildings removed and noise walls relocated between NE 123rd Street and NE 130th Street, altering visual elements for residential areas to the east. • Loss of dense vegetation north of NE 130th Street, affecting unity of views both from I-5 and neighborhoods to the east. • Views from residential neighborhoods to the west not affected.	**I-5** Low to Medium **Residential** Low to Medium (Mostly within 1 block from corridor)
			Alternatives A5, A10 (at-grade alternatives with station at NE 130th Street): • Similar impacts to Alternative A1.	
			Alternative A3 (mostly elevated with no station at NE 130th Street): • Elevated guideway and overhead catenary south of and at NE 130th Street would reduce intactness and unity of views from I-5 and the residential neighborhood to the east. • Removed homes and vegetation would increase prominence of highway corridor and affect visual unity for neighborhoods to the east, which currently have views of existing large trees and other landscaping.	**I-5** Low **Residential** High (Mostly within 1 block from corridor)
			Alternatives A7, A11 (mostly elevated with NE 130th Street Station): • Similar to Alternative A3 except the station at NE 130th Street would be more prominent. • Views of surface parking would be similar to the existing park-and-ride, but could be partly screened from the view of residences by landscaping.	**I-5** Medium to High **Residential** High (Mostly within 1 block from corridor)

Table 4.5-1. Summary of Potential Visual Quality Impacts of the Light Rail Alternatives

Viewshed	Existing Visual Quality	Viewer Sensitivity	Changes in Landscape Elements Resulting in Visual Impacts	Visual Impact
3. NE 133rd Street to NE 152nd Street	**I-5 Northbound** Medium **I-5 Southbound** Medium to High **Residential** Medium **Golf Course** Medium	**I-5** Average **Residential** High **Golf Course** High	**At-grade Alternatives A1, A10 (alternatives with NE 145th Street Station):** • Elevated guideway and overhead catenary would intrude into views from some residential neighborhoods, reducing intactness and unity; the affected residential areas are mostly on the east side of the freeway. • Elevated guideway above the grade of I-5 travel lanes south of NE 145th Street would alter the character of a heavily vegetated transportation corridor. • Elevated guideway, elevated NE 145th Street Station, and parking garage would not block views of Mount Rainier from I-5 southbound, but would eliminate existing mature trees, intrude into views from the residential areas to the east, and alter the scale of visual elements, reducing visual unity. • The elevated guideway and station would be partially seen in the westerly view from Jackson Park Golf Course, but would not change the park's overall internal visual character or unity. • North of NE 145th Street, removed residences and vegetation would alter the visual characteristics for areas between the highway and the residential neighborhood.	**I-5** Medium to High **Residential** High (Mostly within 1 block from corridor) **Golf Course** Medium
			Alternative A5 (without station at NE 145th Street): • There would be similar visual impacts for the elevated guideway for Alternative A1 but lower effects near NE 145th Street because there would be no station.	Same as A1, A10 except: **Residential** Medium
			Elevated Alternatives A3, A11 (with station at NE 145th Street): • The guideway and overhead catenary would be higher and intrude into views more than Alternative A1, affecting visual intactness and unity for views from neighborhoods on both sides of I-5 and from the highway. • Effects of the NE 145th Street Station would be similar to the NE 145th Street Station Option 1, but different residential areas would be affected by the garage. • The higher guideway and station would be more prominent in views from much of Jackson Park Golf Course than Alternative A1, with greater effects on westerly views from the golf course. • No impact to views of Mount Rainier from I-5 southbound. • North of NE 145th Street, the elevated guideway would intrude on views and reduce the visual unity of the residential neighborhood to the east. • The higher elevated structure would be visible and perceived as a visual intrusion from the residences and school west of I-5 despite existing vegetation screening. **Elevated Alternative A7 (without station at NE 145th Street):** • Similar visual impacts as Alternative A1 due to the elevated guideway height, but less prominent and less visual intrusion in the vicinity of NE 145th Street because there would be no station or parking garage.	**I-5** High **Golf Course** Medium to High **Residential** Medium (no NE 145th Street Station) to High (with station)

Table 4.5-1. Summary of Potential Visual Quality Impacts of the Light Rail Alternatives

Viewshed	Existing Visual Quality	Viewer Sensitivity	Changes in Landscape Elements Resulting in Visual Impacts	Visual Impact
4. NE 152nd Street to NE 178th Street	**I-5** Medium **Residential** Medium	**I-5** Average **Residential** High	**Alternatives A1, A3, A10, A11 (alternatives without station at NE 155th Street):** • Between NE 152nd and NE 178th streets, light rail facilities on retained fill structures with noise walls would intrude into views from I-5 and reduce visual unity, largely by removing the moderate to dense vegetation along the highway. • In addition to vegetation loss, some homes would be removed, and retaining walls and noise walls 25 to 35 feet high would be built, affecting visual integrity for residential areas to the east. These effects would be greatest between NE 157th and NE 161st streets. • A row of trees along the east side of Ridgecrest Park would be removed, reducing the unity of views from the park. • From Ridgecrest Park to NE 170th Street, the light rail facilities would not be visible from residential areas to the east, but integrity of views from the neighborhood to the highway would be affected by the loss of mature vegetation, and by having noise walls closer. • Five to ten percent of a half-acre WSDOT beautification area southeast of the NE 175th Street interchange would be used by the alternative.	**I-5** Low to Medium **Residential** Medium to High (mostly for residences with direct views) **Ridgecrest Park** Medium to High
			Alternatives A5, A7 (alternatives with station at NE 155th Street): • Similar to Alternative A1, except at the NE 155th Street Station and its garage, which would displace residences and be at a greater scale than surrounding residences. This would affect the visual unity for the residential neighborhood and intrude on views.	**I-5** Low to Medium **Residential** High (mostly for residences with direct views)
5. NE 178th Street to NE 190th Street	**I-5** Medium **I-5** **Residential** Medium	**I-5** Average **Residential** High	**Alternative A1 (at-grade alternative):** • Loss of moderate to heavy vegetation cover and the placement of retaining walls near travel lanes would reduce visual unity and encroach on views for travelers on I-5. • Removal of homes, loss of vegetation along I-5, relocated noise walls, and realignment of 5th Avenue NE would alter visual integrity and unity for residential neighborhoods to the east, mostly where views of noise walls are now buffered by vegetation. • Light rail guideway and station at NE 185th Street would mostly be lower than the residential neighborhood to the west, but parts of the station and its transit facilities would be visible. This change, as well as the removal of some homes, would alter the visual unity of the residential area. • The parking structure on the west side of I-5 would remove vegetation, but would not change the visual context for views from the west given the existing stadium, surface parking, and topography. The parking structure would be partly visible from the north but would not be visible from the residential area to the east. Views from I-5 southbound would be affected by the removal of vegetation and the new structure. • About 20 to 30 percent of a two-thirds-acre WSDOT beautification area south of NE 180th Street would be occupied by light rail facilities.	**I-5** Low to Medium **Residential** Medium

Table 4.5-1. Summary of Potential Visual Quality Impacts of the Light Rail Alternatives

Viewshed	Existing Visual Quality	Viewer Sensitivity	Changes in Landscape Elements Resulting in Visual Impacts	Visual Impact
			Alternatives A5, A10 (at-grade alternatives): • The guideway elements would be similar to Alternative A1 with similar impacts. • The NE 185th Street Station Option 3 (at-grade) would have the at-grade station and platform similar in visibility to Alternative A1, but parking and access features would remove residences and vegetation to the east, covering about a block, with an additional surface parking on the Seattle City Light parcel. These features would alter the visual intactness and unity of the residential neighborhood.	**I-5** Low to Medium **Residential** Medium
			Alternatives A3, A7, A11 (elevated alternatives): • Elevated alternatives would displace existing vegetation along the corridor and introduce a prominent elevated structure into views from I-5, intruding on views and reducing visual unity for the corridor that is now framed by mature vegetation. • Removal of homes, loss of mature vegetation, the elevated structure, and replacement of noise walls would affect visual unity for the first blocks of the adjacent residential neighborhoods to the east and south. • The parking structure east of I-5 would displace homes, remove vegetation, and would be of greater scale than the homes in the neighborhood, affecting visual integrity and unity.	**I-5** Medium **Residential** High (Mostly within 1 block from corridor)
SEGMENT B ALTERNATIVES				
6. NE 190th Street to NE 205th Street (244th Street SW, SR 104)	**I-5** High **Residential** Medium	**I-5** Average **Residential** High	**All Segment B Alternatives:** • The removal of vegetation within existing cut slopes, the placement of retaining walls, and elevated guideways north of NE 201st Street would reduce the visual unity of the existing corridor as viewed from I-5, where some views are now framed by wide areas with mature vegetation. • The at-grade portion of the alignment to about NE 201st Street would partly displace vegetation and set noise walls back farther on the existing cut slope, but this would not alter the visual integrity and unity of adjacent residential neighborhoods to the east. • The elevated guideway north of NE 201st Street would displace some existing mature vegetation. The elevated structure would be prominent in views of the forested areas as well as the interchange.	**I-5** High **Residential** Low

Table 4.5-1. Summary of Potential Visual Quality Impacts of the Light Rail Alternatives

Viewshed	Existing Visual Quality	Viewer Sensitivity	Changes in Landscape Elements Resulting in Visual Impacts	Visual Impact
7. NE 205th Street (244th Street SW) to Mountlake Terrace Transit Center (232nd Street SW)	**I-5** Low **Residential** High **Commercial** Medium **Transit Center** Low	**I-5** Average **Residential** High **Commercial** Average **Transit Center** Low	**Alternatives B1, B2, and B2A:** • The elevated guideway would be in the periphery of views from I-5 in an interchange area. • The elevated structure would be prominent in views from commercial and office areas to the east, but would be largely screened by mature vegetation near McAleer Creek. • Residents to the east would not have views of the facility because of dense vegetation on the steep slope on the west side of the neighborhood. • Views of the elevated structure from the Nile Golf Course west of I-5 would be limited. • The elevated structure would be noticeable but consistent with the scale, character, and visual diversity of the existing transit center.	**I-5** Low to Medium **Residential** Low **Commercial** Low **Transit Center** Low to Medium
			Alternative B4: • The character of the elevated guideway would be similar to Alternatives B1, B2, and B2A, but the guideway would be higher and would cross to the I-5 median south of 236th Street SW. The crossing of northbound lanes would reduce the field of view from I-5, but would be consistent with the visual setting there now. • Visual impacts from viewpoints on either side of I-5 would be similar to other alternatives south of 238th Street SW, but the median alignment would reduce some impacts because it would involve less change to existing views.	**I-5** Low to Medium **Residential** Low **Commercial** Low to Medium **Transit Center** Low
8. 232nd Street SW to 220th Street SW	**I-5 Northbound** Medium to High **I-5 Southbound** High **Residential** Medium	**I-5** Average **Residential** High	**Alternative B1:** • North of the existing transit center, the elevated guideway would be through a forested area on the east side of the highway before crossing over to the I-5 median, affecting the periphery of views from I-5. Remaining vegetation would partly screen the cleared area from views from I-5 or residential areas. • At the crossover to the median, the views from I-5 northbound would be reduced and there would be some loss in the continuity of views, but would remain similar to the existing context with the 236th Street SW overcrossing, the pedestrian bridge to the transit center, freeway ramps, and other varied elements of the existing view. • There would be no impacts to views from residential areas east or west.	**I-5** Medium **Residential** Low
			Alternative B2: • North of the existing transit center, the elevated guideway would be through a forested area on the east side of the highway before crossing over the highway. The clearing of existing dense vegetation on the west side of I-5 would change the forested character of the corridor. The loss of vegetation and the introduction of rail facilities and retaining walls would affect the integrity and unity of views, especially for I-5 southbound. • The project would displace about 40 to 50 percent of a 1.8-acre WSDOT beautification area south of 228th Street SW, and the areas below the tract would also be affected. • The elevated guideway structure over I-5 would constrict northbound and southbound views from the roadway and reduce the perception of corridor continuity, but southbound viewers would be affected more than northbound. • Light rail facilities would not be visible from residential areas east or west.	**I-5** High **Residential** Low

Table 4.5-1. Summary of Potential Visual Quality Impacts of the Light Rail Alternatives

Viewshed	Existing Visual Quality	Viewer Sensitivity	Changes in Landscape Elements Resulting in Visual Impacts	Visual Impact
			Alternative B2A: • Similar effects to Alternative B2, but with an additional station. • The 220th Street SW Station would cross above 220th Street SW but would not be prominent in views from visually sensitive areas such as residences. • The view of the station from the commercial area to the west and northwest would be prominent, but would not affect the visual character of the area featuring an array of commercial and office uses and major transportation facilities.	**I-5** High **Residential** Low **Commercial Area** Medium to the northwest
			Alternative B4: • The guideway and station in the median would cause little change in the character of views from I-5. • The additional pedestrian bridge crossing to the east at the north end of the station would displace some vegetation and alter the perception of the continuity of I-5. The existing context limits the effects of view encroachment because bridges, pedestrian overcrossings, and the transit center already create a visually diverse setting. • The light rail facilities in the median would not be visible from residential areas.	**I-5** Low **Residential** Low
9. 220th Street SW to 212th Street SW	**I-5** Medium **Residential** Medium	**I-5** Average **Residential** High	**Alternatives B1 and B4 (alternatives with I-5 median alignment):** • The elevated guideway in the I-5 median would cause little change in the character of views from I-5; it would displace sparse vegetation in the median but likely would not be perceived by users of I-5 as an encroaching element. • The light rail facilities in the median would not be visible from residential areas.	**I-5** Low **Residential** Low
			Alternatives B2 and B2A: • The light rail facility on the west side of I-5 on retained fill with noise walls would displace moderate to dense vegetation, altering the context of the linear transportation corridor as seen from I-5. This would be an encroaching element at variance with the existing frame of vegetation on both sides of the corridor. • The retaining walls and noise walls would replace dense vegetation in views from residential areas to the west. This would result in a greater degree of perception of encroachment of the transportation corridor on the visual unity of the existing neighborhood, which is generally buffered by vegetation from views of the freeway.	**I-5** Medium **Residential** High (Mostly within 1 block from corridor)

Table 4.5-1. Summary of Potential Visual Quality Impacts of the Light Rail Alternatives

Viewshed	Existing Visual Quality	Viewer Sensitivity	Changes in Landscape Elements Resulting in Visual Impacts	Visual Impact
SEGMENT C ALTERNATIVES				
10. I-5/212th Street SW to 52nd Avenue West	**I-5** Medium **Residential** Medium	**I-5** Average **Residential** High	**Alternatives C1 and C2 (I-5 median):** • Crossing from the median to 52nd Avenue West would partially obscure northbound views of mountain peaks in the distance, but the short duration of obstruction likely would not be perceived as changing the visual context with the almost continuous views of mountain peaks available for several miles. • The light rail facilities would not be prominent from residences or commercial uses on the east side of I-5 due to screening by dense vegetation, but the elevated crossover structure would become prominent for viewers on the west side when aligned with 52nd Avenue West.	**I-5** Medium **Residential** Low
			Alternatives C1 and C2 (west side of I-5): • Some loss of moderate to dense vegetation would occur, changing the visual context. • Loss of dense vegetation would affect views for part of the Hall Lake residential area, and the increased prominence of I-5 and light rail together would affect visual unity for the existing open space and single-family neighborhood. • Residences or commercial uses on the east side of I-5 would be screened by dense vegetation, but the structure crossing over I-5 lanes to 52nd Avenue West would be prominent for residential areas to the west.	**I-5** Medium **Residential** High
West side of 52nd Avenue West	Medium	**Residential** High	**Alternatives C1 and C2 (elevated on the east side of 52nd Avenue West):** • The elevated guideway on the east side of 52nd Avenue West would visually intrude upon the integrity and unity of this residential area.	High
			Alternative C3 (along I-5 to Lynnwood Park-and-Ride): • No light rail facilities would be in this area; therefore, there are no visual quality impacts.	N/A
East side of 52nd Avenue West	Medium to Low	**Commercial** Low	**Alternatives C1 and C2 (elevated on the east side of 52nd Avenue West):** • The elevated guideway on the east side of 52nd Avenue West would be taller and more prominent than the existing street frontage, but impacts would be lower given the lower sensitivity of users in this light industrial area.	Low to Medium
			Alternative C3 (along I-5 to Lynnwood Park-and-Ride): • No impacts.	N/A

Table 4.5-1. Summary of Potential Visual Quality Impacts of the Light Rail Alternatives

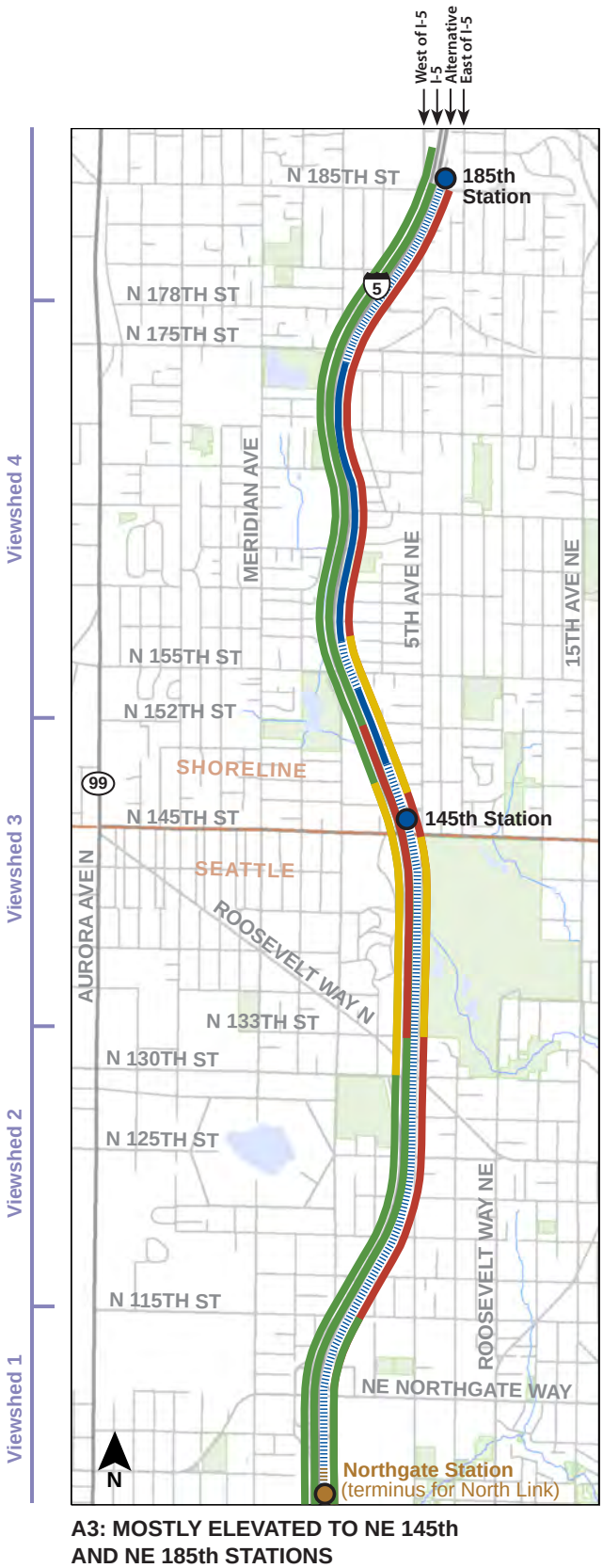
Viewshed	Existing Visual Quality	Viewer Sensitivity	Changes in Landscape Elements Resulting in Visual Impacts	Visual Impact
Scriber Creek Park	Medium	High	**Alternatives C1:** • The elevated guideway would cross along the west side and across the north section of Scriber Creek Park, with loss of mature vegetation and a visual intrusion. This would reduce the existing high visual unity of the park for users. **Alternative C2:** • The elevated guideway in the wetland area immediately south of Scriber Creek Park would result in a loss of mature vegetation and be perceived as visual intrusion and reduced unity of views for trail users at the southern boundary and from the multifamily residential properties north of the park.	High
			Alternative C3: • No impacts.	N/A
200th Street SW Cedar Valley Road to 44th Avenue West	**Multifamily** Medium **Commercial** Medium to Low	**Residential** High **Commercial** Average	**Alternative C1:** • The elevated guideway and station on the south side of 200th Street SW would be larger than existing buildings. It would encroach on the visual integrity and unity of the area, and intrude on views of the streetscape for pedestrians and occupants of vehicles. • The multistory parking garage would replace smaller-scale office buildings. • Visual encroachment would likely be perceived as less approaching 44th Avenue West because of lower visual unity in the commercial area.	**Multifamily** High **Commercial** Medium
			Alternatives C2 and C3: • No impacts.	N/A
Lynnwood Transit Center	Low	Low	**Alternative C1:** • No impacts. **Alternative C2:** • The elevated guideway and station in the middle of the Lynnwood Transit Center, with a parking structure to south, would be prominent features in relation to the low scale of existing transit facilities and parking, but would not alter the integrity and unity of the landscape because of the low visual interest of the parking lots and existing transit center.	N/A Low
			Alternative C3: • Same as Alternative C2.	Low
44th Avenue West corridor	Medium to Low	Average to Low	**Alternative C1** • The elevated guideway extending to 44th Avenue West would be a prominent new element in a diverse landscape but would not be an intrusion due to the low level of visual unity of this area.	Low to Medium
			Alternatives C2 and C3: • The elevated guideway and station with the tail track crossing 44th Avenue West on the general alignment of 202nd Street would add a third crossing over the street, which the City of Lynnwood considers a gateway to the city center; however, it would not change the visual character of the street, which features other prominent transportation infrastructure elements.	Low to Medium

Table 4.5-1. Summary of Potential Visual Quality Impacts of the Light Rail Alternatives

Viewshed	Existing Visual Quality	Viewer Sensitivity	Changes in Landscape Elements Resulting in Visual Impacts	Visual Impact
Interurban Trail	Medium	Average	**Alternatives C1 and C2:** • Light rail facilities would cross over the Interurban Trail on the east side of 52nd Avenue West and would remove some vegetation. In the context of an urban trail with a street crossing to the south, a transit overcrossing to the north, and varied adjacent uses including industrial, vacant, and transit center parking, the effect would be a slight visual intrusion in an area with limited visual unity.	Medium
			Alternative C3: • The elevated guideway would cross the Interurban Trail diagonally near the existing transit center, remove a moderate to dense margin of trees, and add a prominent feature visible to trail users. The guideway would also cross the trail near 44th Avenue West and remove some vegetation that functions as a buffer. • In the context of an urban trail with many street crossings and a transit overcrossing to the north, bounded by varied landscapes including the adjacent transit center parking lot, the additional crossing would be a slight visual intrusion in an area with moderate visual unity.	Medium

N/A = Not applicable

A1, A10: AT-GRADE/ELEVATED TO NE 145th AND NE 185th STATIONS

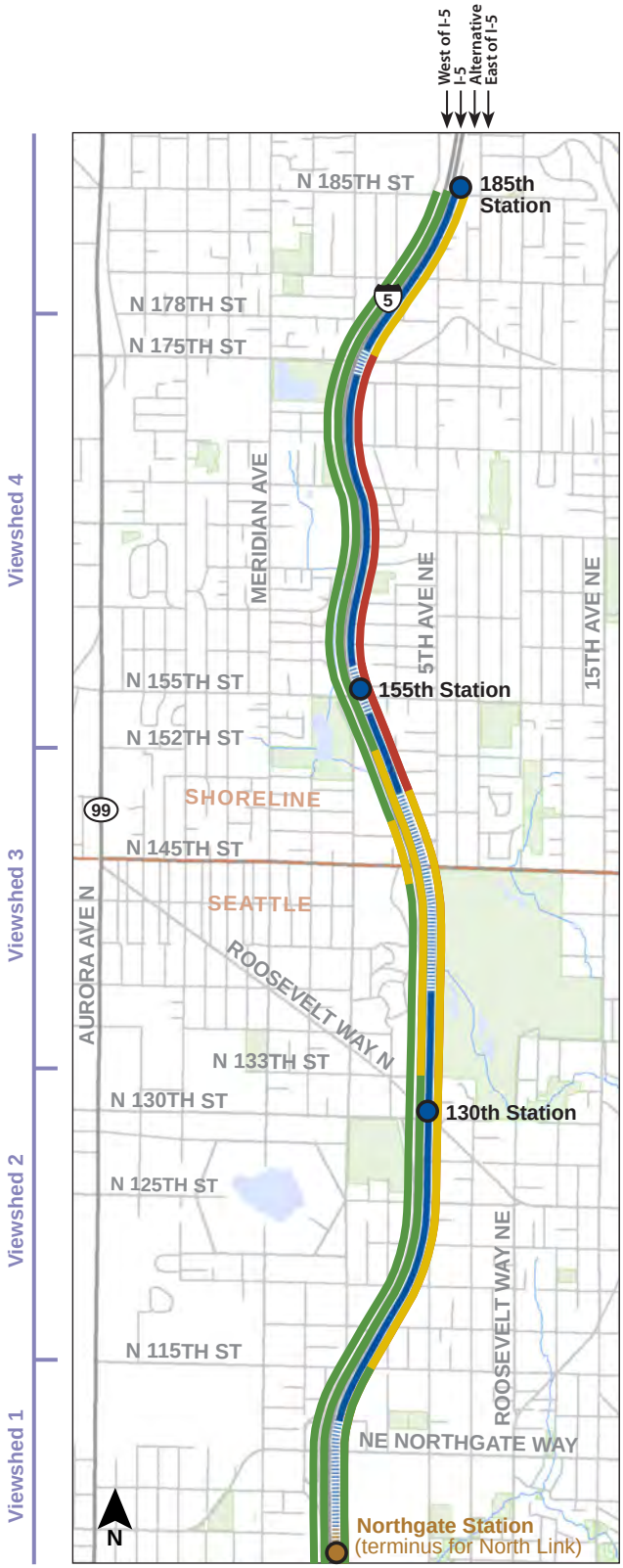


A3: MOSTLY ELEVATED TO NE 145th AND NE 185th STATIONS

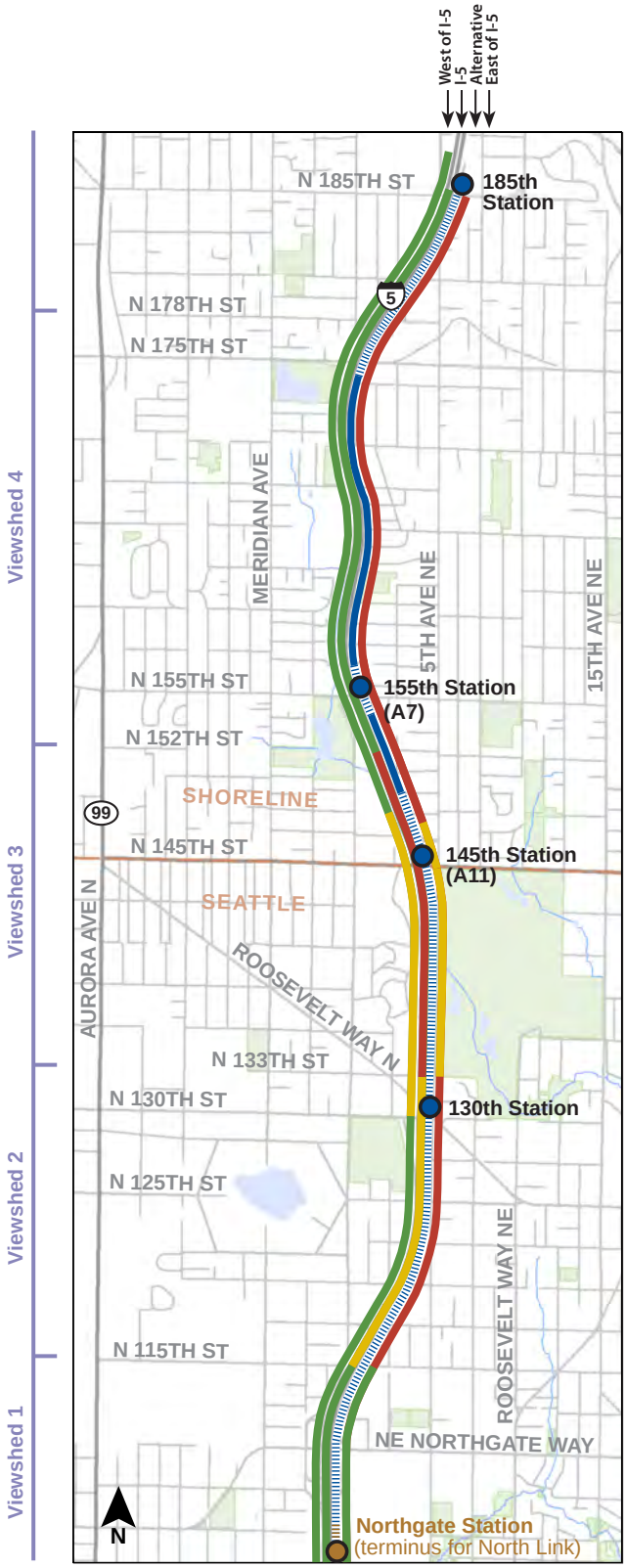
Legend

- Low Visual Impact
- Medium Visual Impact
- High Visual Impact
- Station
- At Grade
- Elevated

Figure 4.5-2
Summary of Visual Impacts
Alternatives A1, A10 and A3



A5: AT-GRADE/ELEVATED WITH NE 130th, NE 155th AND NE 185th STATIONS

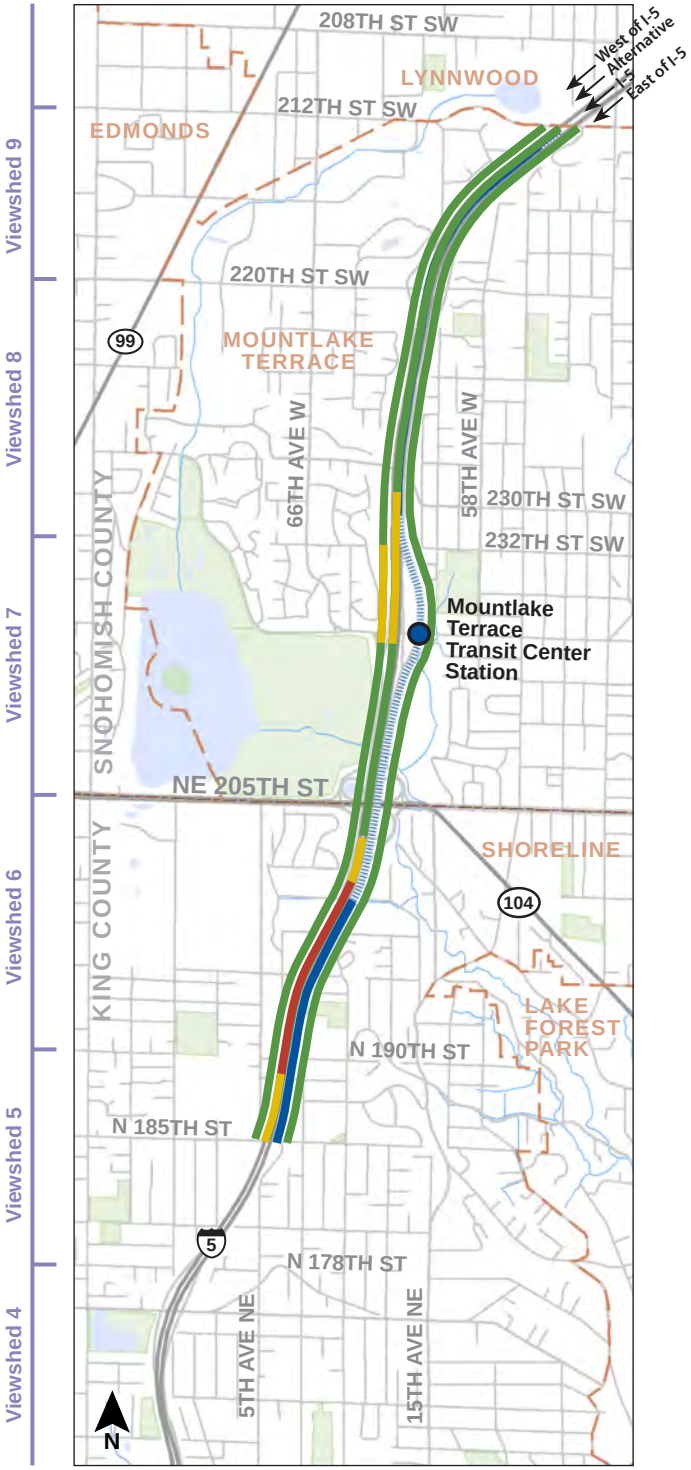


A7, A11: MOSTLY ELEVATED WITH NE 130th, NE 155th AND NE 185th STATIONS

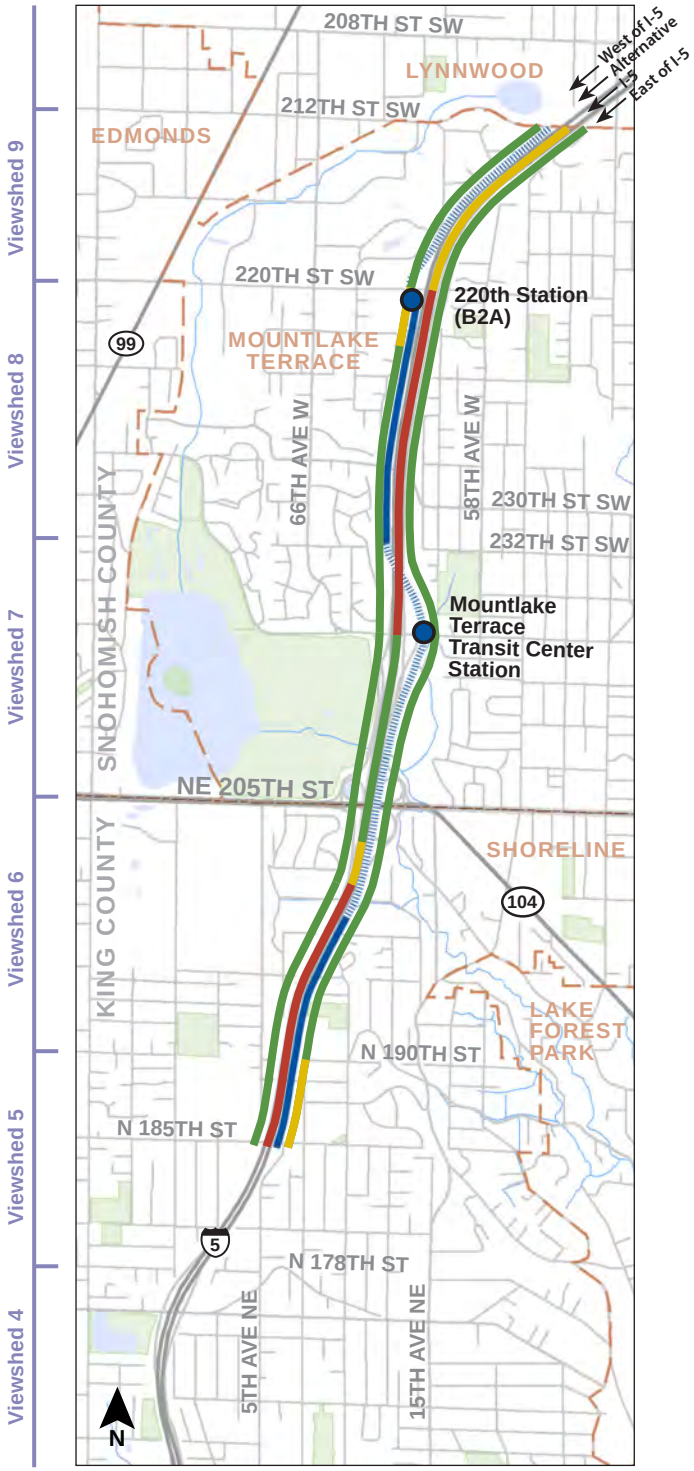
Legend

- Low Visual Impact
- Medium Visual Impact
- High Visual Impact
- Station
- At Grade
- Elevated

Figure 4.5-3
Summary of Visual Impacts
Alternatives A5, A7 and A11



B1: EAST SIDE TO MOUNTLAKE TERRACE TRANSIT CENTER TO MEDIAN

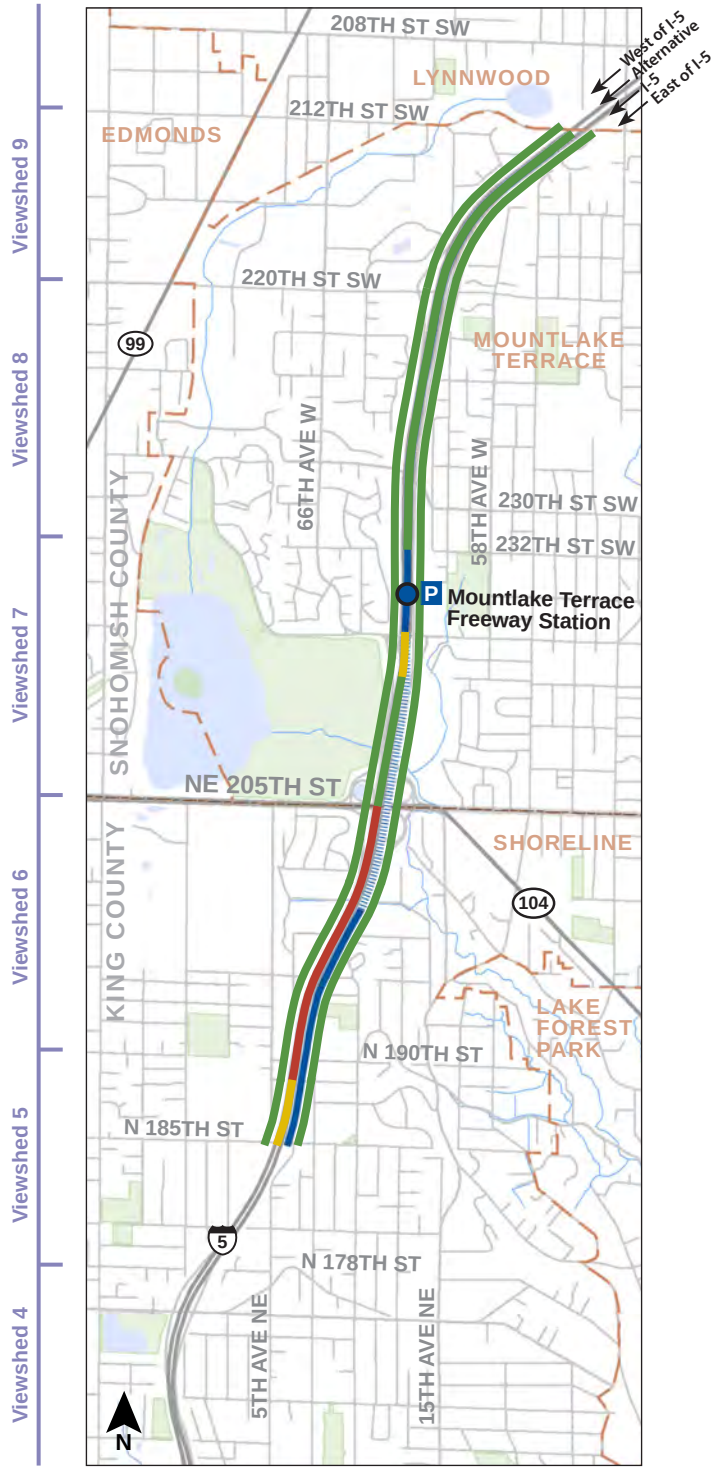


B2, B2A: EAST SIDE TO MOUNTLAKE TERRACE TRANSIT CENTER TO WEST SIDE

Legend

- Low Visual Impact
- Medium Visual Impact
- High Visual Impact
- Station
- At Grade
- Elevated

Figure 4.5-4
Summary of Visual Impacts
Alternatives B1, B2 and B2A



B4: EAST SIDE TO MOUNTLAKE TERRACE FREEWAY STATION TO MEDIAN

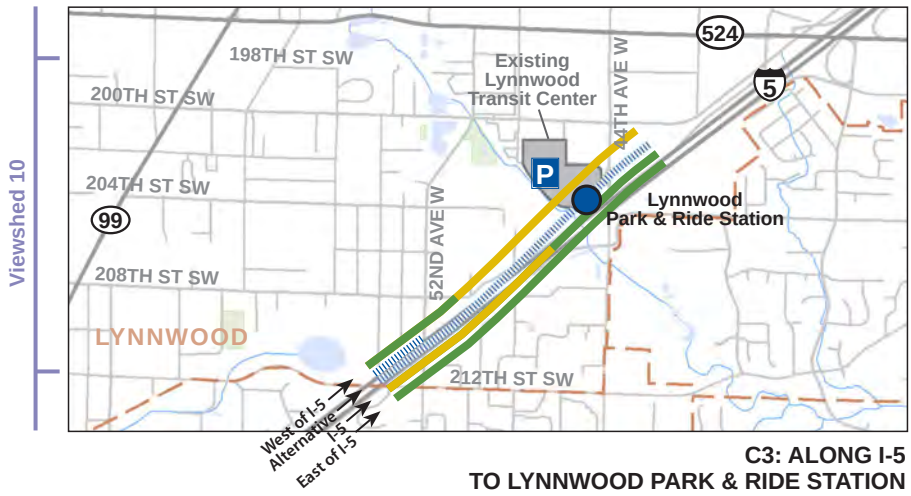
Legend

- Low Visual Impact
- Medium Visual Impact
- High Visual Impact
- Station
- At Grade
- Elevated

Figure 4.5-5
Summary of Visual Impacts
Alternatives B4

C1: 52ND AVE W TO 200TH ST STATION

C2: 52ND AVE W TO LYNNWOOD TRANSIT CENTER STATION



C3: ALONG I-5 TO LYNNWOOD PARK & RIDE STATION

Legend

- Low Visual Impact
- Medium Visual Impact
- High Visual Impact
- Station
- At Grade
- Elevated

Figure 4.5-6
Summary of Visual Impacts
Alternatives C1, C2 and C3

4.5.4 Indirect and Secondary Impacts

Visual impacts for development and/or redevelopment, such as transit-oriented development, might occur in and near stations if accommodated by local jurisdiction comprehensive plans and zoning regulations. Even where specific comprehensive plan and zoning regulations are in place, detailed visual analysis depends on the individual developments. However, when stations have available land and supportive zoning in place, there would be more potential for mixed-use development that supports high-density residential, commercial, and office-related uses. Existing properties could be redeveloped with buildings of a larger scale, but at the same time, larger expanses of parking could be removed. Landscaping and other visual amenities could also be developed as an integrated part of the new developments.

The station area with the highest potential for visual changes resulting from increased development would be at the Lynnwood Transit Center due to the City of Lynnwood's plans and policies that encourage growth. Other areas with development potential are at the Mountlake Terrace Transit Center and the 220th Street SW Station in Mountlake Terrace. The remaining station areas are likely to have lower levels of visual change due to development.

4.5.5 Cumulative Impacts

The construction of I-5 was a major change to the visual environment in the project area, particularly in the neighborhoods that were already in place before the freeway was constructed. The freeway also changed other more natural or rural landscapes. The addition of the light rail alternatives to the project corridor would increase the size and visual prominence of this linear transportation corridor.

While there are no other major new transportation or development projects that run throughout the project area, there are sites where further development is anticipated with or without the project. At Northgate, the Northgate Link Extension is being constructed, and the Northgate Transit Center will be reconstructed. Adopted plans for the Northgate area call for greater mixed-use development throughout the district, and individual redevelopment proposals are expected to replace some of the existing properties with larger-scale, multi-use developments.

The Mountlake Terrace Transit Center and its multistory parking structure was also recently developed. Areas to the south and east of the station could still be redeveloped consistent with the City of Mountlake Terrace's land use plans, with or without the light rail project, but light rail along with other station area developments could represent a high degree of visual change for this area.

The Lynnwood Transit Center and park-and-ride covers areas that were previously undeveloped. While the land in these areas would not be likely to return to an

undeveloped state with or without the light rail project, light rail facilities and transit-oriented developments together could provide a place with more visual unity, public spaces, and other amenities.

The City of Lynnwood is targeting the city center area for increased development and redevelopment activities over time, which would alter existing visual conditions by redeveloping some existing uses. The likely future continuation of the light rail corridor would affect the character of the city center, but also may contribute to its vitality by providing a wider range of transportation options. All alternative alignments likely would displace some existing development when the light rail route extends farther to the north. The existing development, however, is largely automobile-oriented development with large parking lots, and not the higher intensity pedestrian-oriented mixed uses called for in the City Center Plan. All alternatives would provide for improved transportation access and contribute to the City's goal of focusing increased transit on the city center as the major regional urban center and continuing the transition from its existing dominant visual image of wide streets, large parking lots, signs, and strip shopping centers.

If built, the Link Operations and Maintenance Satellite Facility alternative in Lynnwood would alter the existing frontage along 52nd Avenue West, which currently consists of parking with landscaping and low profile structures. Views could be changed by the removal of buildings, by changes to landscaped or vegetated areas, and by the introduction of features such as walls or fencing, maintenance buildings, lighting, overhead catenary, and ramps from the elevated guideway to the facility at ground level.

With Alternatives C1 and C2, the light rail guideway would be elevated along 52nd Avenue NE and would have a high visual impact. Alternative C3 would have a low to moderate visual impact, depending on the viewpoint. If a Lynnwood maintenance facility site were developed along with these alternatives, the visual impact ratings would be similar.

In other projects in the vicinity, the City of Lynnwood's 44th Avenue West, I-5 to 194th Street SW Improvement Project proposes to widen the roadway to seven lanes, with eight lanes just south of 196th Street SW. The project will also include wider sidewalks and landscape features. These improvements are designed to accommodate future growth envisioned for the city center and to create an enhanced pedestrian environment with a boulevard appearance. The cumulative impacts of this project in conjunction with the elevated guideway alternatives that cross the 44th Avenue West corridor are not likely to alter the visual context or visual impacts of the roadway overcrossings.

The City of Lynnwood's 200th Street SW, 64th Avenue West to 40th Avenue West Project would add lanes, wider sidewalks, landscape features, and bicycle facilities to

accommodate future growth envisioned for the city center. This project is unlikely to alter the visual context or increase visual impacts for the light rail alternatives.

4.5.6 Potential Mitigation Measures

Long-Term Impacts

A variety of options may be implemented to mitigate visual impacts of the Lynnwood Link Extension alternatives at various locations, depending on the extent of visual impact and the design of the project. Most of the measures are related to the placement and design of the light rail facilities, or the use of landscaping or other features to help screen or soften views as described below.

- Where Sound Transit may need to acquire property beyond the footprint of the light rail facilities, there may be more opportunities for additional landscaping and buffers to screen views from adjacent neighborhoods.
- Where retaining walls are required, they could include landscaped areas that would soften their appearance on the side facing I-5 and on the side facing adjacent development.
- Where existing public streets would be relocated, the new street could accommodate street trees, landscape buffers, lighting, and other aesthetic features or improvements.
- Stations and park-and-ride facilities could include islands of landscaping within areas of pavement and around their perimeter.
- In areas where the elevated guideway is proposed, Sound Transit could install landscaping between the guideway columns, where clearance would be adequate up to the bottom of the guideway. In most cases under the elevated guideway, plant species selection would be limited to large shrubs and small trees rather than the taller evergreen trees typical of most of the project corridor today.
- Retaining walls, noise walls, or other major structural elements could be designed with visually interesting elements, such as design treatments that incorporate texture, patterns, and color.

Table 4.5-2 indicates locations where these measures are most likely to be feasible and effective.

Sound Transit would replace portions of WSDOT's beautification areas along I-5, originally acquired under the Highway Beautification Act of 1965, that are used on this project. While this may not offset a visual impact in the same location, it could offer opportunities to improve corridor visual conditions in other locations where replacement land is available.

Because the right-of-way along the project corridor is limited, there would be trade-offs between minimizing right-of-way acquisitions or providing landscaping. Sound Transit could begin developing options for visual impact mitigation as the related design elements are identified in the preliminary design. Refinement of mitigation approaches would continue through final design.

Even if larger or faster growing trees or plants are used, it may take 15 to 20 years for the plants to grow large enough to screen large facilities such as the multistory parking garages, elevated structures, or tall retaining walls or noise walls. Replacing some of the sections that currently have mature evergreen trees along the project corridor could require 30 to 50 years of growth.

Table 4.5-2. Locations of Potential Mitigation Measures

Viewshed	Additional landscaping and buffers	Landscaping to screen adjacent residences	Landscape screen for noise and retaining walls	Relocated streets: incorporate aesthetic features	Park-and-ride landscaping	Landscaping between guideway columns	Texture, patterns, and color on walls
1. Northgate (NE 92nd Street to NE 115th Street)	●	●	●			●	●
2. NE 115th Street to NE 133rd Street	●	●	●			●	●
3. NE 133rd Street to NE 152nd Street	●	●	●	●	●	●	●
4. NE 152nd to NE 178th Street	●	●	●	●	●	●	●
5. NE 178th Street to NE 190th Street	●	●	●		●	●	●
6. NE 190th Street to NE 205th Street (244th Street SW, SR 104)	●	●	●	●		●	●
7. NE 205th Street (244th Street SW) to Mountlake Terrace Transit Center (232nd Street SW)	●	●	●	●	●	●	●
8. 232nd Street SW to 220th Street SW	●	●	●			●	●
9. 220th Street SW to 212th Street SW	●	●	●	●	●		●

Table 4.5-2. Locations of Potential Mitigation Measures

Viewshed	Additional landscaping and buffers	Landscaping to screen adjacent residences	Landscape screen for noise and retaining walls	Relocated streets: incorporate aesthetic features	Park-and-ride landscaping	Landscaping between guideway columns	Texture, patterns, and color on walls
10. I-5/212th Street SW to 52nd Avenue West	●	●	●				●
West side of 52nd Avenue West	●	●		●		●	
East side of 52nd Avenue West	●	●				●	
Scriber Creek Park	●	●				●	
200th Street SW Cedar Valley Road to 44th Avenue West	●	●				●	
Lynnwood Transit Center	●				●	●	
44th Avenue West	●					●	
Interurban Trail	●	●				●	

Construction Mitigation

Sound Transit could mitigate construction impacts by restoring the project corridor as construction is completed, rather than waiting until the completion of the entire project.

Shielding light sources used in nighttime construction would lessen the lighting impacts.

Local visual interest could be added to the construction sites by creating viewing areas with project-related information for pedestrians. Sound Transit could design and place construction screens or barriers to limit the visibility of work areas that would intrude on adjacent activities (such as walking or gathering for sports events). This approach would be particularly effective in areas of intense recreational activities such as public open space, community facilities, and recreational areas and trails. Construction barriers could incorporate pedestrian-oriented murals or other displays of graphic interest. These displays could be integrated with public notifications of detours, areas to be closed, and the access routes for the public.

4.6 Air Quality and Greenhouse Gases

This section assesses how the Lynnwood Link Extension would affect regional air quality, including greenhouse gas (GHG) emissions, on a regional scale. It also reviews potential localized air quality impacts at arterial and local street intersections where the alternatives have a higher potential to increase traffic or congestion.

4.6.1 Affected Environment

The project corridor falls within the jurisdiction of the Puget Sound Clean Air Agency (PSCAA) for local air quality regulation.

The topography of the Puget Sound region is characterized by low rolling hills intermingled with a complex maze of interconnected waterways linked to the Pacific Ocean through the Sound. The region has a mild climate with cool summers and mild, wet, and cloudy winters.

Air Quality Standards

Air quality is regulated by federal, state, and local agencies. The air quality analyses for this project followed current guidelines developed by the U.S. Environmental Protection Agency (EPA), the Washington State Department of Ecology (Ecology), PSCAA, and the PSRC.

Under the authority of the Clean Air Act, EPA has identified several air pollutants as pollutants of concern nationwide and has established National Ambient Air Quality Standards (NAAQS). These pollutants, known as criteria pollutants, are carbon monoxide (CO), particulate matter with a diameter of 10 micrometers or less (PM_{10}), particulate matter with a diameter of 2.5 micrometers or less ($PM_{2.5}$), ozone (O_3), sulfur dioxide (SO_2), lead (Pb), and nitrogen dioxide (NO_2). The NAAQS specify maximum allowable concentrations for these criteria pollutants. The state of Washington and PSCAA have also adopted these standards; in addition, they have a standard for total suspended particulates (TSP). Table I-4.6-1 in Appendix I-4.6, Air Quality and Greenhouse Gas, summarizes the standards applicable to transportation projects.

GHG emissions are federally regulated for large industrial sources. Federal guidance on how to address GHG emissions in environmental documents for other types of sources is currently being developed; as a result, Sound Transit is analyzing GHG emissions for this project consistent with best practices and its own policies.

Conformity Requirements

Areas that meet the NAAQS for pollutants of concern are deemed *attainment areas;* areas not in compliance with the NAAQS are deemed *nonattainment areas;* and areas that were formerly classified as nonattainment areas but have since demonstrated attainment with the NAAQS are classified as *maintenance areas*. Because the Puget Sound region is a maintenance area for CO, the project must conform to the NAAQS for CO. The region is in an attainment area for all of the other criteria pollutants; therefore, further conformity analysis of criteria pollutants (SO_2, NO_2, O_3, particulates, and Pb) is not required.

The federal Clean Air Act requires states to develop a State Implementation Plan (SIP) for protecting and maintaining air quality in all areas of the state. Proposed transportation projects requiring federal funding or approval must comply with EPA's Transportation Conformity Rule.

Conformity to the SIP and the Transportation Conformity Rule is required both on a regional and project level. A project demonstrates regional conformity if it is included in a conforming regional transportation plan (RTP) and a regional transportation improvement program (RTIP). The Lynnwood Link Extension is currently included in PSRC's RTIP as project RTA-78. A project demonstrates project-level conformity by showing that it would not cause or contribute to any new violation of any NAAQS, increase the frequency or severity of any existing NAAQS violations, or delay timely attainment of the NAAQS.

Pollutants of Concern for this Project

Motor vehicles are the largest contributors of air pollution from transportation projects. The main criteria pollutants emitted from motor vehicles are CO, PM_{10}, $PM_{2.5}$, and the O_3 precursors, volatile organic compounds (VOCs), and oxides of nitrogen (NO_X). GHGs and air toxic emissions are also pollutants of concern. This subsection discusses how the main pollutants of concern affect public health and the environment for this project.

Carbon Monoxide

CO is a colorless and odorless gas that interferes with the transfer of oxygen to the brain. It is emitted almost exclusively from the incomplete combustion of fossil fuels. Prolonged exposure to high levels of CO can cause headaches, drowsiness, loss of equilibrium, or heart disease. CO concentrations can vary greatly over relatively short distances. Relatively high concentrations are typically found near congested intersections, along heavily used roadways carrying slow-moving traffic, and in areas where atmospheric dispersion is inhibited by urban "street canyon"

conditions. Consequently, CO concentrations are predicted on a localized, or microscale, basis.

Particulate Matter

Particulate pollution is composed of solid particles or liquid droplets that are small enough to remain suspended in the air. Of particular concern are those particles that are smaller than, or equal to, 10 micrometers (PM_{10}) and 2.5 micrometers ($PM_{2.5}$). Particulates can include smoke, soot, dust, salts, acids, and metals. Particulate pollution also forms when gases emitted from motor vehicles react in the atmosphere.

When inhaled, these particles can damage the respiratory tract. Particles 2.5 to 10 micrometers in diameter tend to collect in the upper portion of the respiratory system, whereas particles 2.5 micrometers or less in diameter are so tiny that they can penetrate deeper into the lungs and damage lung tissue.

Ozone

O_3 is a colorless toxic gas that enters the bloodstream and interferes with the transfer of oxygen. It also damages plants by inhibiting their growth. Although O_3 is not directly emitted, it forms in the atmosphere through a chemical reaction between reactive VOCs and NO_X. O_3 is also produced from industrial sources and automobile emissions.

Greenhouse Gases

Gases that trap heat in the atmosphere are often referred to as GHGs. These gases are necessary because they keep the planet's surface warmer than it would be otherwise. As their concentrations increase, however, the Earth's temperature rises. Vehicles emit a variety of gases during their operation; some of these are GHGs. The GHGs associated with transportation are water vapor, carbon dioxide (CO_2), methane, and nitrous oxide. Nationally, the transportation sector (including on-road vehicles, construction activities, airplanes, and boats) accounts for almost 30 percent of total domestic CO_2 emissions, but in the state of Washington, it accounts for nearly 50 percent of emissions.

Mobile Source Air Toxic Pollutants

Air toxics are pollutants known or suspected to cause cancer or other serious health effects. Most air toxics originate from human sources, including on-road mobile sources, airplanes, and certain kinds of businesses or industries. There are seven priority mobile source air toxic (MSAT) pollutants: acrolein, benzene, 1,3-butadiene, diesel particulate matter plus diesel exhaust organic gases (diesel PM), formaldehyde, naphthalene, and polycyclic organic matter (POM).

Monitored Air Quality Concentrations and Trends

Regional air pollutant trends have generally followed national patterns over the last 20 years. While the average weekday vehicle miles traveled (VMT) in the Central Puget Sound region has increased from 30 million in 1981 to 80 million in 2009 (PSRC 2010), pollutant emissions associated with transportation sources have decreased. CO is the criteria pollutant most closely tied to transportation. Regionally, the maximum measured CO concentrations have decreased considerably over the past 20 years as a result of greater vehicle fuel efficiency and EPA's national control programs. Other transportation-related pollutants have followed similar but less pronounced trends.

Air quality data were compiled using Ecology and EPA Air Data (EPA 2012) databases for 2011—the latest calendar year for which these data are available. Table 4.6-1 shows the highest recorded ambient air quality levels from representative sites that were monitored for these data and are located within or near the study area. The monitored concentrations for CO do not exceed national and state ambient air quality standards in the study area.

Table 4.6-1. Monitored Ambient Air Quality Levels

Pollutant	Averaging Time	2009 Maximum Concentration	2010 Maximum Concentration	2011 Maximum Concentration	NAAQS
CO	8 hours	1.0 ppm	0.8 ppm	0.9 ppm	9 ppm
	1 hour	1.3 ppm	1.2 ppm	1.0 ppm	35 ppm
O_3	8 hours	0.052 ppm	0.044 ppm	0.046 ppm	0.075 ppm
$PM_{2.5}$	Annual	7.3 µg/m^3	5.8 µg/m^3	5.7 µg/m^3	15 µg/m^3
	24 hours	22.7 µg/m^3	13.7 µg/m^3	16.5 µg/m^3	35 µg/m^3
PM_{10}	24 hours	ND	ND	23 µg/m^3	150 µg/m^3

Sources: http://www.ecy.wa.gov/programs/air/air_monitoring_data/WAQA_Intro_Page.html and http://www.epa.gov/airdata/
Notes: Monitoring location was at 4103 Beacon Avenue South, Seattle, WA.
Values shown correspond to NAAQS time periods.
CO = carbon monoxide
µg/m^3 = micrograms per cubic meter
NAAQS = National Ambient Air Quality Standards
O_3 = ozone
$PM_{2.5}$ = particulate matter with diameter less than or equal to 2.5 micrometers
PM_{10} = particulate matter with diameter less than or equal to 10 micrometers
ppm = parts per million
ND = not detected

4.6.2 Long-Term Regional Operational Impacts

Long-term regional operational impacts have been evaluated for future scenarios in forecast year 2035 for all the alternatives. Regional traffic data were developed using PSRC's travel demand model for a representative project alternative that shows the expected effects of all the light rail alternatives. As discussed in more detail in

Chapter 3, Transportation Impacts and Mitigation, the light rail alternatives have only minor differences in their mode split, travel patterns, and roadway speeds, and they all perform similarly when compared to the No Build Alternative.

Pollutant emission rates for the long term in the region were developed using EPA's Motor Vehicle Emission Simulator (MOVES), model version 2010b.

Criteria Pollutant Emissions

Table 4.6-2 summarizes tailpipe emissions for existing conditions (2011) compared with the No Build Alternative and light rail alternatives in 2035. Vehicle emissions in 2035 would be lower than existing levels as a result of EPA's national control programs. All criteria pollutants under the light rail alternatives would be below existing conditions and below the No Build Alternative pollutant levels in 2035.

Table 4.6-2. Daily Regional Emission Burden Assessment for Forecast Year 2035

Criteria Pollutant	Existing 2011 (kg/day)	No Build Alternative (kg/day)	Light Rail Alternatives (kg/day)	Percent Change from Existing (2011) to No Build Alternative	Percent Change from No Build Alternative to Light Rail Alternatives
VMT	79,435,180	98,870,476	98,545,962	24.47%	-0.33%
CO	250,358	187,727	186,924	-25.02%	-0.43%
$PM_{2.5}$	2,769	901	897	-67.45%	-0.47%
PM_{10}	2,903	967	964	-66.63%	-0.47%
VOCs	9,002	2,246	2,234	-75.05%	-0.52%
NO_X	76,018	18,324	18,267	-75.90%	-0.31%

Source for 2011 conditions: PSRC Travel Demand Model; EPA MOVES model 2010b

Note: kg/day = kilograms per day

VMT = vehicle miles traveled

CO = carbon monoxide

$PM_{2.5}$ = particulate matter with diameter less than or equal to 2.5 micrometers

PM_{10} = particulate matter with diameter less than or equal to 10 micrometers

VOCs = volatile organic compounds

NOx = nitrogen oxides

Mobile Source Air Toxic Emissions

Table 4.6-3 compares 2011 MSAT emissions levels to 2035 levels under the No Build Alternative and light rail alternatives. Emissions in 2035 would be lower than existing levels for all alternatives because of EPA's national control programs, and they would be lower for the light rail alternatives than the No Build Alternative.

Table 4.6-3. Mobile Source Air Toxic Emissions for Forecast Year 2035

Pollutant	Existing 2011 (kg/day)	No Build Alternative (kg/day)	Light Rail Alternatives (kg/day)	Percent Change from Existing (2011) to No Build Alternative	Percent Change from No Build Alternative to Light Rail Alternatives
VMT	79,435,180	98,870,476	98,545,962	24.47%	-0.33%
1-3-Butadiene	37.77	9.39	9.34	-75.14%	-0.53%
Acrolein	23.49	4.43	4.40	-81.14%	-0.68%
Benzene	251.91	71.85	71.48	-71.48%	-0.51%
Formaldehyde	185.99	47.52	47.28	-74.45%	-0.51%
Diesel PM	4,529.59	592.84	589.85	-86.91%	-0.50%
Naphthalene	41.19	9.67	9.62	-76.52%	-0.52%
POM	21.96	3.84	3.82	-82.51%	-0.52%

Note: kg/day = kilograms per day
VMT = vehicle miles traveled
PM = particulate matter
POM = polycyclic organic matter

Greenhouse Gases

GHG emissions are normally presented as the total CO_2 equivalent (CO_{2e}) released. The CO_{2e} emissions take into account the global warming potential of chemical emissions from a source. The analysis of the GHG emission impacts included evaluating the vehicle movements occurring in King, Pierce, Snohomish, and Kitsap counties. Chapter 3, Transportation Impacts and Mitigation, describes how the changes in vehicle movements were determined.

Table 4.6-4 summarizes the total projected GHG emissions for the No Build Alternative and light rail alternatives for projected scenarios in 2035. CO_{2e} emissions are predicted to decrease by 71,905 metric tons annually in the region due to the reduction of VMT, a 0.5 percent reduction.

Table 4.6-4. Greenhouse Gas Emissions in Terms of CO_{2e} for Forecast Year 2035

Emission	No Build Alternative[a]	Light Rail Alternatives[a]
Daily CO_{2e}	37,431	37,235
Daily CO_{2e} reduction	Not applicable	197
Annual CO_{2e} reduction	Not applicable	71,905

[a] Unit of measure is metric tons CO_{2e} emissions per day.

Sound Transit published a *Sustainability Plan* in 2011 that builds on the 2007 Sustainability Initiative. According to the *Sustainability Plan*, Sound Transit will integrate efficient operating practices at existing and new facilities, use energy-saving equipment to reduce energy demand, and maximize intermodal transit connections

to reduce automobile VMT. The implementation of the *Sustainability Plan* will reduce energy consumption and thus GHG emissions during Lynnwood Link Extension operations.

4.6.3 Long-Term Localized Operational Impacts

Long-term localized operational impacts on air quality and GHG emissions were evaluated using the Washington State Intersection Screening Tool (WASIST) to determine worst-case CO concentrations at signalized intersections.

Sound Transit conducted WASIST modeling on the three intersections per project segment with the highest potential CO emissions. Traffic data were used to identify intersections with the highest volume and a LOS of D or worse under the light rail alternatives for forecast year 2035. If one intersection had the highest volume under several of the alternatives, then that intersection was only evaluated under the alternative with the highest volume, representing the highest potential CO concentrations at that intersection. In addition to the forecast year conditions, each evaluated intersection was modeled for existing conditions. None of the modeled intersections would have CO concentrations above the NAAQS in the forecast year.

No Build Alternative

The modeled CO concentrations did not exceed the NAAQS for CO with the No Build Alternative in forecast year 2035, although they increased slightly compared to 2011 due to increased traffic volumes. The results of the WASIST model are presented in Appendix I-4.6.

Long-Term Impacts Common to All Light Rail Alternatives

The modeled CO concentrations did not exceed the NAAQS in forecast year 2035. Modeled Lynnwood Link Extension CO emissions were similar to the No Build Alternative because only slight variations in traffic would occur at the highest-volume intersections. The results of the WASIST model are presented in Appendix I-4.6.

4.6.4 Construction Impacts

Air Quality Pollutants

Construction-related air quality effects would result primarily from emissions from heavy-duty construction equipment (e.g., bulldozers, backhoes, and cranes), diesel-fueled mobile sources (e.g., trucks, brooms, and sweepers), diesel- and gasoline-fueled generators, and on-site and off-site project-related vehicles (e.g., service trucks and pickups).

Fugitive PM_{10} emissions are associated with land clearing, ground excavation, grading, cut-and-fill operations, and structure erection. PM_{10} emissions would vary from day to day, depending on the level of activity, specific operations, and weather conditions. Fugitive PM_{10} emissions from construction activities could be noticeable if uncontrolled. Mud and particulates from trucks may also be of concern if construction trucks are routed through streets near sensitive land uses (e.g., residences, schools, and parks).

Heavy trucks and construction equipment powered by gasoline and diesel engines would also generate $PM_{2.5}$, CO, and NO_x in exhaust emissions. If construction traffic and lane closures increase congestion and reduce the speed of other vehicles in the area, emissions would increase temporarily during delays. The effects would generally be limited to the immediate area in which the congestion occurs.

Some construction phases (particularly those involving paving operations using asphalt) would result in short-term odors, which might be detectable to some people near the site and would be diluted as distance from the site increases.

Greenhouse Gases

The generation of GHG emissions is directly related to the amount of fossil fuel burned. During construction, GHG emissions would be generated by diesel engines used to power most of the construction equipment. Sound Transit estimated GHG emissions during construction by using several sources, including information based on the agency's own projects that are similar in scale and construction methods to the Lynnwood Link Extension. While Table 4.10-3 in Section 4.10, Energy Impacts, estimates overall energy use during construction as well, it is based on a more general method of using general transportation or highway construction costs, and uses broader categories of factors to reach an energy estimate.

For this air quality analysis, Sound Transit estimated the minimum and maximum construction-related GHG emissions for two representative alternatives from each segment (Table 4.6-5).

Table 4.6-5. Estimated Construction Greenhouse Gas Emissions

Description	Segment A	Segment B	Segment C	Total
GHG emissions (metric tons of CO_{2e})	30,264 to 32,279	18,492 to 20,365	10,349 to 11,997	59,105 to 64,641

Note: Segment A used Alternatives A5 (low) and A11 (high). Segment B used Alternatives B4 (low) and B2 (high). Segment C used Alternatives C3, Option 1 (low) and C3, Option 2 (high).

The low estimate for the alternatives with the least construction-related GHG emissions is the sum of Alternatives A5, B4, and C3 Option 1. The high estimate for the alternatives with the highest construction-related GHG emissions is the sum of Alternatives A11, B2A, and C3 Option 2.

Conformity Determination

In the Puget Sound region, PSRC determines regional conformity by including a project in the Metropolitan Transportation Plan (MTP) and the RTIP. The Lynnwood Link Extension is identified and described in the region's MTP, VISION 2040, *Transportation 2040*, and in the 2013-2016 RTIP (PSRC 2012). It is designated in PSRC's RTIP as project RTA-78.

In addition to the long-term localized operational impacts (2035), Sound Transit predicted localized worst-case CO concentrations from the Lynnwood Link Extension for initial operations (2023) and the long-range RTP analysis year (2040) to demonstrate project-level CO conformity. The project corridor is in an attainment area for all the other criteria pollutants (including PM_{10} and $PM_{2.5}$); therefore, further analysis of the other criteria pollutants is not required. Based on the results of the localized CO analysis presented in Appendix I-4.6, the Lynnwood Link Extension would not cause or exacerbate an exceedance of the NAAQS for CO, and it would meet the project-level conformity requirements of the Clean Air Act.

4.6.5 Indirect and Secondary Impacts

The traffic analyses for the Lynnwood Link Extension considered the long-term traffic forecasted to operate within the study area. Indirect air quality benefits would occur because the project would help to reduce future traffic volumes and levels of congestion within the study area compared to the No Build Alternative, as well as reduce traffic-related air pollutant and GHG emissions. Negative indirect air quality effects would be unlikely.

Producing and disposing of materials needed to build the project will release GHGs, which would be an indirect effect of the project. However, at this time, there is no accurate and standardized methodology for calculating the embodied and lifecycle emissions from transportation projects.

4.6.6 Cumulative Impacts

The air quality analysis for the project considers the long-term cumulative effects of air pollutant emissions from all traffic forecasted to operate within the project area, given future population and employment growth. Therefore, the air quality and GHG emissions analysis generally includes the cumulative effects of the project and other traffic growth that would occur regionally and locally, with or without the Lynnwood Link Extension. However, localized planned projects may affect traffic, such as Sound Transit's Link Operations and Maintenance Satellite Facility alternative in Lynnwood. There would be a low potential for traffic growth from that facility, in part because existing traffic generators would be displaced. The analyses for the Lynnwood Link Extension did not find potential elements that would cause an exceedance of the NAAQS for CO; therefore, it is expected that the

satellite maintenance facility would also not result in an exceedance. Construction air quality impacts and GHG emissions would be higher with both projects combined, but they would not create localized air quality standard exceedances, and they would both employ mitigation measures and best practices to minimize their impacts.

4.6.7 Potential Mitigation Measures

Operational Mitigation

Because no adverse air quality impacts are expected, no mitigation measures would be necessary.

Construction Mitigation

Consistent with PSCAA requirements, Sound Transit would use best management practices to prevent and reduce fugitive dust resulting from construction activities. The following mitigation measures could be used, as necessary, and in accordance with standard practice to control PM_{10}, $PM_{2.5}$, and emissions of CO and NO_x during construction. Several of these measures would also reduce GHG emissions:

- Spray exposed soil with a dust control agent, such as water, as necessary to reduce emissions of PM_{10} and deposition of particulate matter.
- Cover all transported loads of soils and wet materials before transport, or provide adequate freeboard (i.e., space from the top of the material to the top of the truck) to reduce PM_{10} and deposition of particulates during transport.
- Provide wheel washes to reduce dust and mud that would be carried off site by vehicles and to decrease particulate matter on area roadways.
- Remove the dust and mud that are deposited on paved, public roads.
- Route and schedule high volumes of construction traffic, where practicable, to reduce additional congestion during peak travel periods and reduce emissions of CO, NO_x, and CO_{2e}.
- Require appropriate emission-control devices on all construction equipment powered by gasoline or diesel fuel to reduce CO and NO_x emissions in vehicular exhaust.
- Use well-maintained heavy equipment to reduce CO and NO_x emissions, which may also reduce GHG emissions.
- Cover, install mulch, or plant vegetation as soon as practicable after grading to reduce windblown particulate in the area.
- Encourage contractors to employ emission-reduction technologies and practices for both on-road and off-road equipment and vehicles (e.g., retrofit equipment with diesel control technology and/or use ultra-low sulfur diesel).

- Implement construction truck-idling restriction (e.g., no longer than 5 minutes).
- Locate construction equipment and truck staging zones away from sensitive receptors, as practicable, and in consideration of other factors such as noise.

All mitigation measures must comply with local regulations governing air quality, including those for controlling fugitive dust during construction.

4.7 Noise and Vibration

This section describes the project's noise and vibration effects during construction and operation and the mitigation measures Sound Transit would implement to address impacts. For more information and reference sources, see the *Noise and Vibration Technical Report*.

4.7.1 Background and Criteria

Noise and vibration are caused by waves of energy being transmitted through a material such as air or the ground. Noise, which is unwanted sound, includes vibrations that can be detected by the ear. Groundborne vibration differs from airborne noise in that it consists of energy transmitted through the earth rather than the air.

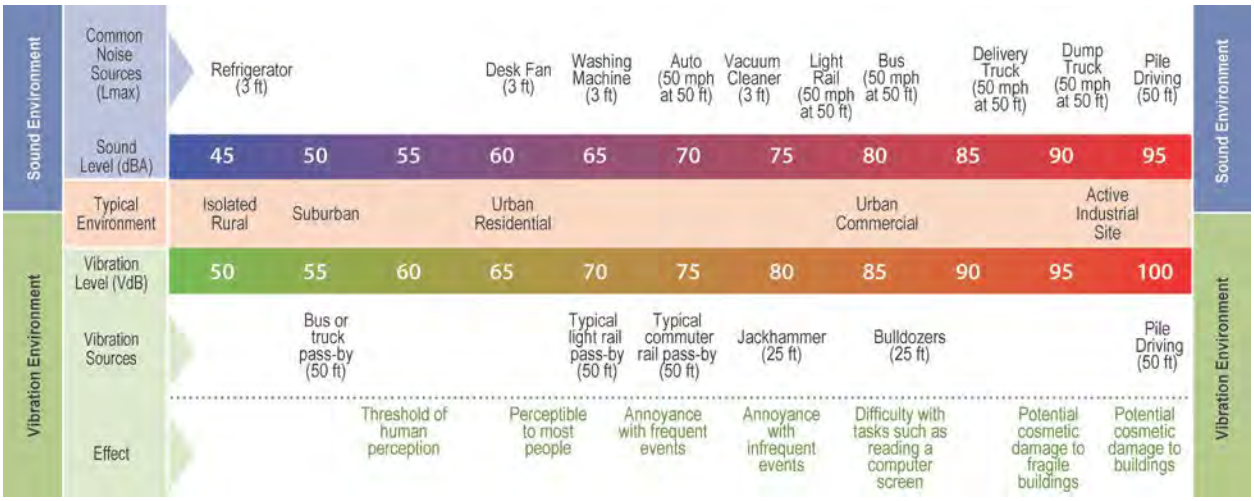
Sound Transit evaluates noise and vibration impacts for transit projects according to the FTA *Transit Noise and Vibration Impact Assessment* guidance manual (FTA 2006). FTA's standards for noise and vibration impacts are based on several decades of studying community reaction to environmental noise and vibration exposure (FTA 2006). The FTA manual categorizes land uses based on their sensitivity to noise or vibration.

Noise

Environmental noise is composed of many frequencies, each occurring simultaneously at its own sound pressure level. The range of magnitude, from the faintest to the loudest sound the ear can hear, is so large that sound pressure is expressed on a logarithmic scale in units called decibels (dB). The commonly used frequency weighting of environmental noise is A-weighting (dBA), which is a measure of how an average person hears changes in sound levels; people can typically detect a 2 dBA change in sound levels. The human ear perceives a 10 dBA change in sound level as a doubling of loudness. However, adding two sounds of the same loudness together does not double the decibel value.

A common noise descriptor for environmental noise is the equivalent sound level (Leq). Leq is a measure of total noise, a summation of all sounds, during a period of time and averaged over that period of time. Leq measured over a 1-hour period is the hourly Leq [Leq(h)]. The day/night noise level (Ldn) describes the cumulative 24-hour exposure to sound, with a penalty applied to noise exposure between 10 pm

and 7 am. Lmax is the maximum noise level during an event. Ldn is used by the EPA and FTA to evaluate noise levels in residential areas. Typical sound and vibration levels experienced in urban environments are shown in Figure 4.7-1.



Sources: EPA 1971, 1974; FTA 2006

Figure 4.7-1
Typical Sound and Vibration Levels

Noise from rail transit operations is generated from the interaction of wheels and rails, warning devices, motive power, rail substructure vibration, and the operation of traction power substations. The interaction between steel wheels and rails generates four different types of rail transit noise depending on track work: (1) noise generated by passing trains on the track, (2) wheel squeal on a tightly curved track (common for a curve radius of less than 600 feet and possible for a curve radius between 600 and 1,000 feet), (3) noise generated from wheel flanging caused by the centrifugal force from an unbalanced car body, and (4) noise generated on special trackway sections, such as at crossovers or turnouts. Warning bells are another source of rail transit noise; bells are sounded when trains enter or leave the stations.

The level at which project noise (called project noise exposure) creates an impact varies, depending on the existing (pre-project) noise environment and on the type of land use that is affected. Future noise exposure is the combination of existing noise exposure and the additional noise exposure caused by a project. Many land uses are not noise-sensitive. FTA guidance categorizes noise-sensitive land uses as shown in Table 4.7-1.

The noise impact criteria for transit operations are shown by category on Figure 4.7-2. There are no Category 1 properties in the study area; residential noise impacts (Category 2, measured in Ldn) are shown on the left side of the graph and institutional noise impacts (Category 3, measured in Leq[h]) are shown on the right. The graph shows, for example, that if the existing noise level in a residential area is

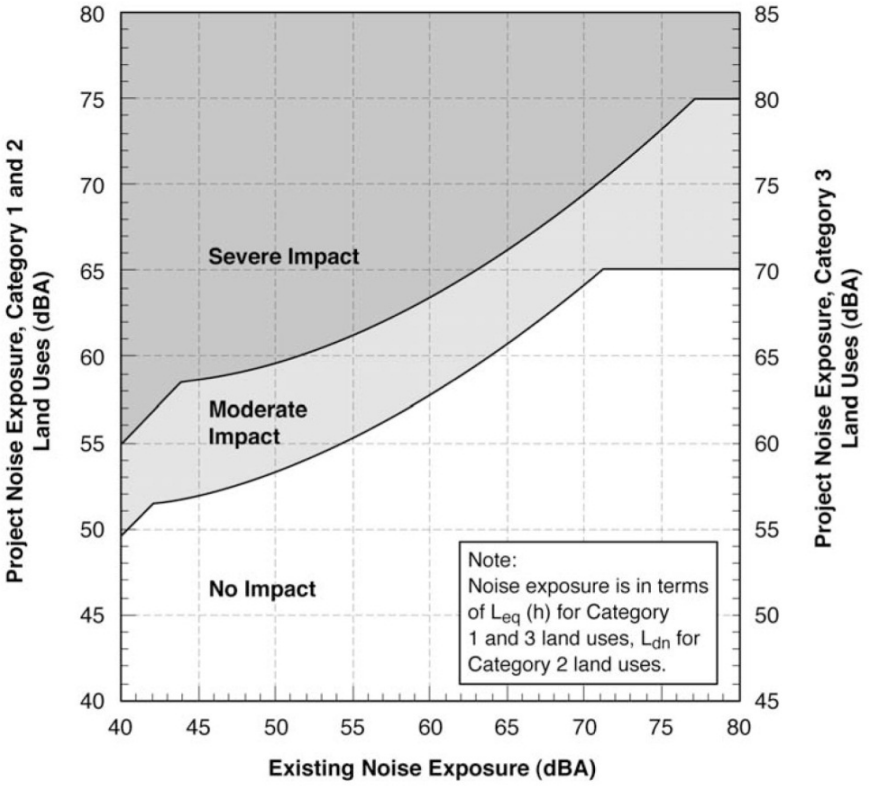
60 dBA Ldn, then a project that generates less than 58 dBA Ldn will not have an effect. If the project generates between 58 and 63 dBA Ldn, it will cause a moderate impact, and if it generates more than 63 dBA Ldn, it will cause a severe impact. Above the severe impact criteria, most people would be highly annoyed by the noise.

Table 4.7-1. FTA Land Use Categories for Noise Impact Analysis

Category	Metric	Land Use Description
1	Leq(h)[a] (dBA)	Tracts of land where quiet is an essential element in their intended purpose. This category includes lands set aside for serenity and quiet, land uses such as outdoor amphitheaters and concert pavilions, and National Historic Landmarks with substantial outdoor use.
2	Ldn (dBA)	Residences and buildings where people normally sleep. This category includes homes, hospitals, and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.
3	Leq(h)[a] (dBA)	Institutional land uses with primary daytime and evening use. This category includes schools, libraries, and churches where it is important to consider interference with such activities as speech, meditation, and concentration on reading material. Buildings with interior spaces where quiet is important, such as medical offices, conference rooms, recording studios, and concert halls, fall into this category. It also includes places for meditation or study associated with cemeteries, monuments, and museums. Certain historical sites, parks, and recreational facilities are also included. However, parks are not noise-sensitive if they feature active recreation or sporting facilities.

[a] Leq for the noisiest hour of transit-related activity during hours of noise sensitivity.

Source: FTA 2006



Source: FTA 2006

Figure 4.7-2
FTA Transit Project Noise Exposure Impact Criteria

FTA requires that mitigation be considered for both moderate and severe impacts. Sound Transit's policy is generally to mitigate both moderate and severe impacts to meet applicable FTA, state, and local noise criteria using a prioritized approach to measures beginning with source treatment, to treatments in the noise path, and then sound insulation as the last option.

FTA guidance is to follow FHWA noise assessment procedures and abatement criteria when the project is a joint FTA and FHWA project, the transit operations are adjacent to or on the highway and highway noise dominates the transit noise over the 24-hour day. The FHWA methods consider only the loudest-hour Leq for all traffic noise sources, including transit operating on the highway or adjacent guideway. An FHWA criterion of 67 dBA Leq(h) would apply for the FTA Category 2 and 3 noise-sensitive land uses in the project corridor. The FHWA noise abatement criteria are not used for impact analysis for the Lynnwood Link Extension because the project does not meet the conditions for its use; however, the FHWA criteria are considered in the mitigation analysis when the project would alter existing noise barriers.

FTA has general guidance on construction noise assessment that considers the nature and duration of the construction as well as local community factors. Local noise regulations apply to construction noise and operational noise from stationary sources, such as park-and-rides and traction power substations. Jurisdictions in the corridor have adopted noise control ordinances based on the Washington State Noise Control Ordinance (WAC 173-60). The ordinance includes property-line noise limits (Table 4.7-2), but does not apply to transportation sources operating in public rights-of-way. The *Noise and Vibration Technical Report* discusses the requirements of the individual local ordinances.

Table 4.7-2. Washington State Noise Limits

	Maximum Allowable Sound Level (dBA)		
Property Usage	**Residential**	**Commercial**	**Industrial**
Residential	55	57	60
Commercial	57	60	65
Industrial	60	65	70

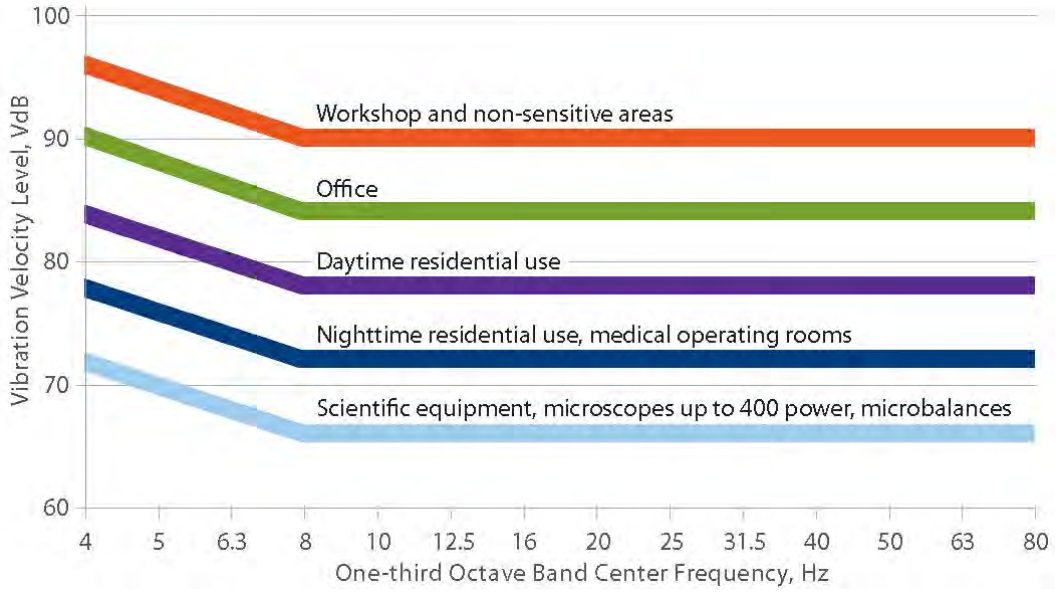
Source: WAC Chapter 173-60-040; excludes transportation sources on public right-of-way.
Note: Local noise ordinances can include different noise limits than state law.

Vibration

The FTA groundborne vibration impact criteria are based on land use and train passage frequency. Vibration is an oscillatory (back-and-forth) motion that is often characterized by the velocity of the back-and-forth motions (measured in inches per second) and their frequency. Root-mean-square characterizes the average vibration velocity over time and may be reported on a logarithmic scale as vibration decibels

(VdB), which is a good indicator of how people perceive vibration. Groundborne vibration generally occurs within a frequency range between approximately 1 and 200 hertz (Hz). Typical vibration levels experienced in urban environments are shown in Figure 4.7-1.

Rail transit vibration is generated by motion at the wheel and rail interface, and is affected by rail condition or roughness, track geometry, transit vehicle suspension, train speed, rail substructure type and geometry, special trackwork, and soil conditions. Vibration from a passing train can move through the ground and transfer this motion to a building's foundation. This kind of vibration does not damage buildings but can be annoying to building occupants. The FTA has adopted detailed vibration analysis criteria that consider the frequency (Hz) and velocity (VdB) of the back-and-forth motions of vibration. Figure 4.7-3 includes the detailed vibration impact criteria for land uses found within the project corridor (FTA 2006).



Source: FTA 2006

Figure 4.7-3
FTA Detailed Vibration Analysis Impact Criteria

Short-term impacts due to construction vibration are evaluated for their potential to cause cosmetic damage to nearby structures; however, the vibration levels are temporary and do not require an analysis according to the uses inside the structures. The majority of buildings along the alignment are non-engineered timber and masonry buildings, which are more susceptible to vibration damage. However, most construction processes involve vibration well below the levels that could cause building damage, even if vibrations are felt.

4.7.2 Affected Environment

To provide a baseline for comparing future project-generated noise and vibration levels, Sound Transit measured noise levels at 54 locations, and took vibration propagation measurements at eight locations, as shown in Figures 4.7-4a and 4.7-4b.

Traffic on I-5 is the dominant noise source and traffic on local streets is the dominant vibration source in the corridor. Existing noise walls reduce the freeway noise reaching neighboring residential areas through several areas of the corridor, particularly in Segment A in Seattle and Shoreline. While land use in the corridor is largely suburban, sound levels were typical of urban residential environments because of the proximity to I-5.

The majority of the corridor includes single- and multifamily residential uses. Non-residential noise-sensitive uses in the corridor include schools and churches.

4.7.3 Long-Term Impacts

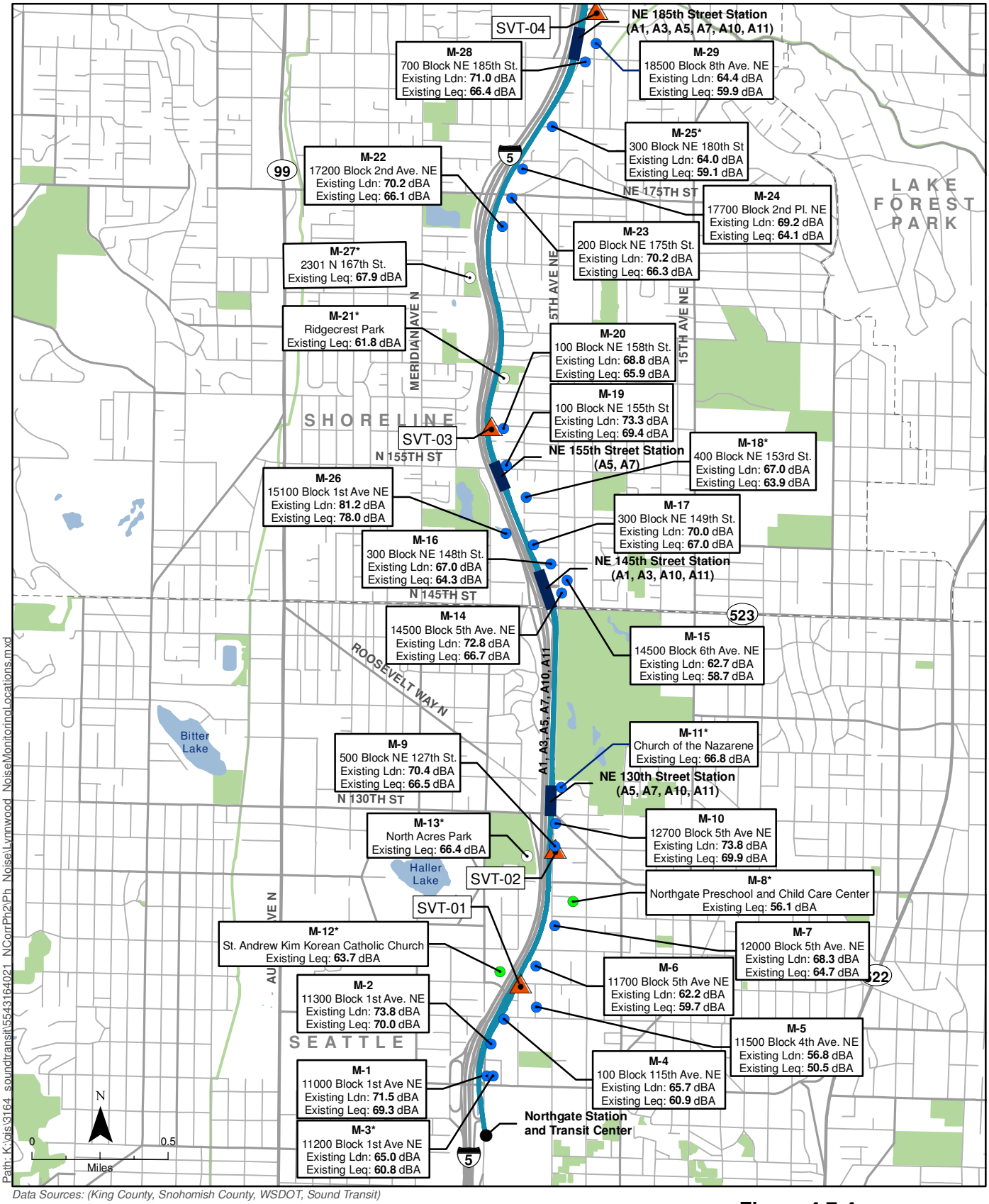
The noise impact analysis includes the effects of train operation, curves and rail squeal, warning bells for trains entering or leaving stations, the effects of crossover switches, and the need to relocate existing highway noise walls to accommodate light rail. The alternatives do not include any at-grade crossings; therefore, warning devices would only be used for trains entering and leaving stations.

No Build Alternative

Noise in the corridor would continue to be dominated by I-5 and would not be affected by the construction of a new transit project.

Segment A: Seattle to Shoreline

The alternatives in Segment A would incorporate mitigation treatments to avoid moderate-to-severe rail noise impacts at approximately 183 to 367 properties along their alignments. Mitigation would also be needed near the NE 185th Street Station to avoid noise impacts to an additional 9 to 17 residences. Noise from the park-and-ride would not exceed the FTA impact criteria, but would exceed noise limits under city or state codes before mitigation is applied. The elevated alternatives (A3, A7, and A11) would have the highest levels of noise impacts and require the most mitigation. Vibration levels before mitigation would affect between 2 and 14 properties, with more properties affected by the mostly at-grade alternatives (Table 4.7-3 and Figures 4.7-5a through 4.7-5d). Properties that are assumed to be acquired were not counted as having noise or vibration impacts in Table 4.7-3.



Data Sources: (King County, Snohomish County, WSDOT, Sound Transit)

Noise Monitor Locations

- FTA Land-use Category 2
- FTA Land-use Category 3
- General Ambient Noise Location
- Surface Vibration Test Location

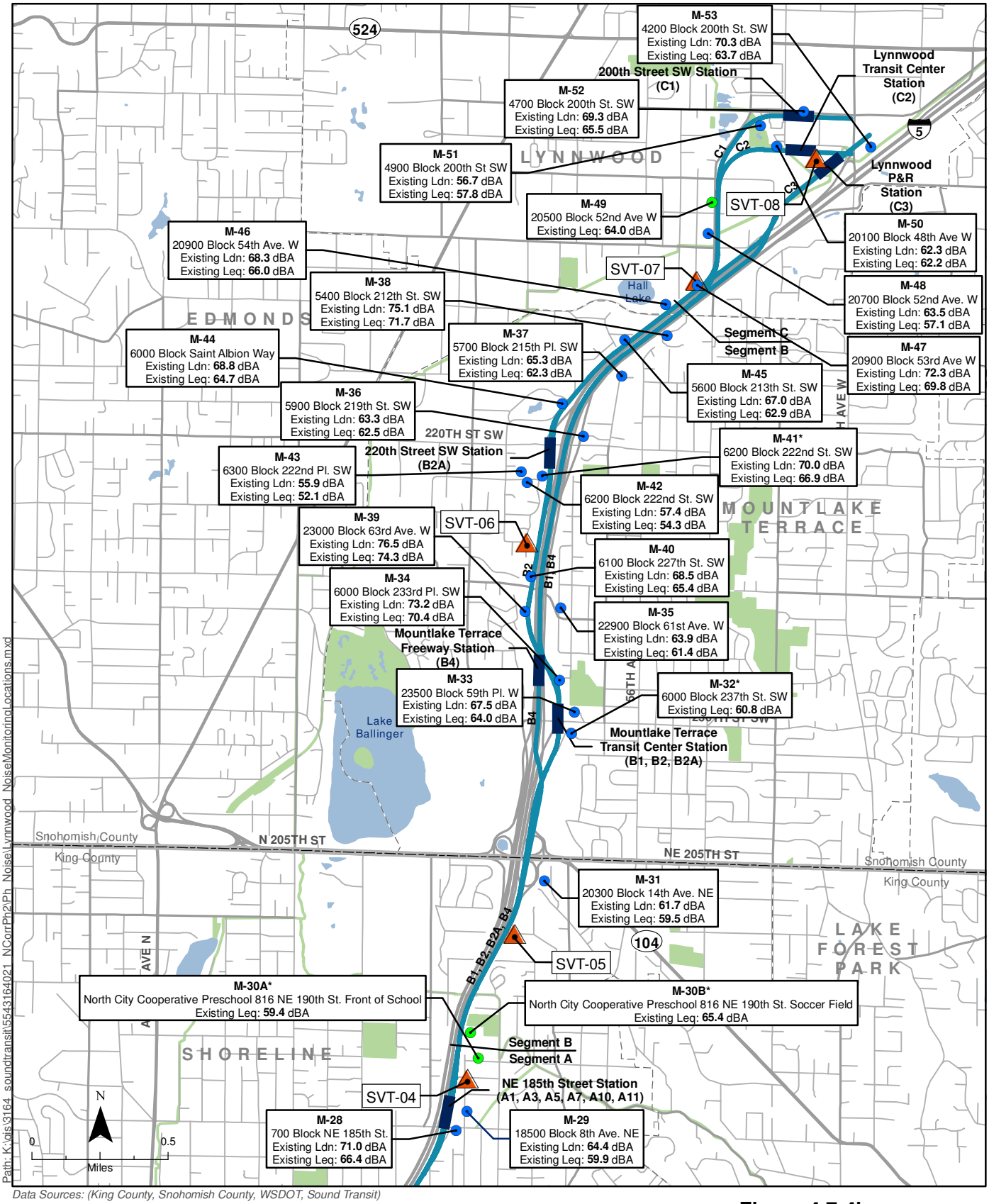
- Light Rail Alternatives
- Station Location
- Roadway
- Local Street

- City Boundary
- County Boundary
- Waterbody

Notes: - Ldn values for residences and hotels only.
- Noise Monitor Locations displayed with an asterisk (M-32*) are short term monitoring sites.

Figure 4.7-4a
Noise Monitor and Surface Vibration Test Locations
Segment A

Lynnwood Link Extension



Data Sources: (King County, Snohomish County, WSDOT, Sound Transit)

Noise Monitor Locations

- FTA Land-use Category 2
- FTA Land-use Category 3
- General Ambient Noise Location
- Surface Vibration Test Location

- Light Rail Alternatives
- Station Location
- Roadway
- Local Street
- City Boundary
- County Boundary
- Waterbody

Notes: - Ldn values for residences and hotels only.
- Noise Monitor Locations displayed with an asterisk (M-32*) are short term monitoring sites.

Figure 4.7-4b
Noise Monitor and Surface Vibration Test Locations Segments B and C

Lynnwood Link Extension

Table 4.7-3. Number of Properties with Projected Noise and Vibration Impacts in Segment A (Before/After Mitigation) [a]

Alternative	Moderate Noise Impacts	Severe Noise Impacts	Park-and-Ride Impacts	Total Noise Impacts	Vibration Impacts
A1	134/0	49/0	15/0	198/0	8/0
A3	146/0	211/0	9/0	366/0	2/0
A5	119/0	107/0	18/0	244/0	14/0
A7	165/0	202/0	15/0	382/0	3/0
A10	107/0	112/0	12/0	231/0	13/0
A11	146/0	206/0	9/0	361/0	2/0

[a] Noise impacts that are not eliminated through source and path treatments (such as noise walls on the ground or noise barriers on the light rail guideway) may be eligible for sound insulation. Sound insulation is anticipated to be offered for between 4 and 13 properties.

For all alternatives, the project would remove, relocate, and replace existing noise walls along I-5 within Segment A. The replacement noise-reduction treatments would be designed to provide at least as much noise reduction as the walls being removed. WSDOT policy would require the noise walls to address traffic noise levels projected through 2035. With the mostly at-grade alternatives, Sound Transit would need to replace nearly all of the existing noise walls, while the elevated alternatives could potentially leave some in place. With the at-grade alternatives, the replacement walls would be east of their current locations and at the edge of or outside the guideway, which would help reduce rail noise and traffic noise from reaching the residents. For the elevated alternatives, some existing noise walls along I-5 could be maintained in place where they do not conflict with the construction of the elevated guideway; other noise walls would be replaced. Ground-level freeway noise walls would not reduce transit noise from an elevated structure; therefore, the elevated structures would still need their own noise barriers when noise levels exceed criteria at nearby properties.

Curves within Segment A have more than a 1,000-foot radius; therefore, no wheel squeal is anticipated in Segment A, but all of the Segment A alternatives have crossover switches, which are an additional source of wheel-track noise.

Alternative A1: At-grade/Elevated with NE 145th and NE 185th Stations

Alternative A1 would need to mitigate transit noise impacts for 198 single- and multifamily residences. Most of the impacts would occur between Northgate Way and NE 117th Street and in sections where the guideway is elevated, such as near NE 145th Street, NE 155th Street, and NE 175th Street. Mitigation would also address noise impacts for 15 residences near the NE 185th Street Station due to buses accessing the station. Vibration impacts would require mitigation at eight single- and multifamily residences near the tracks.

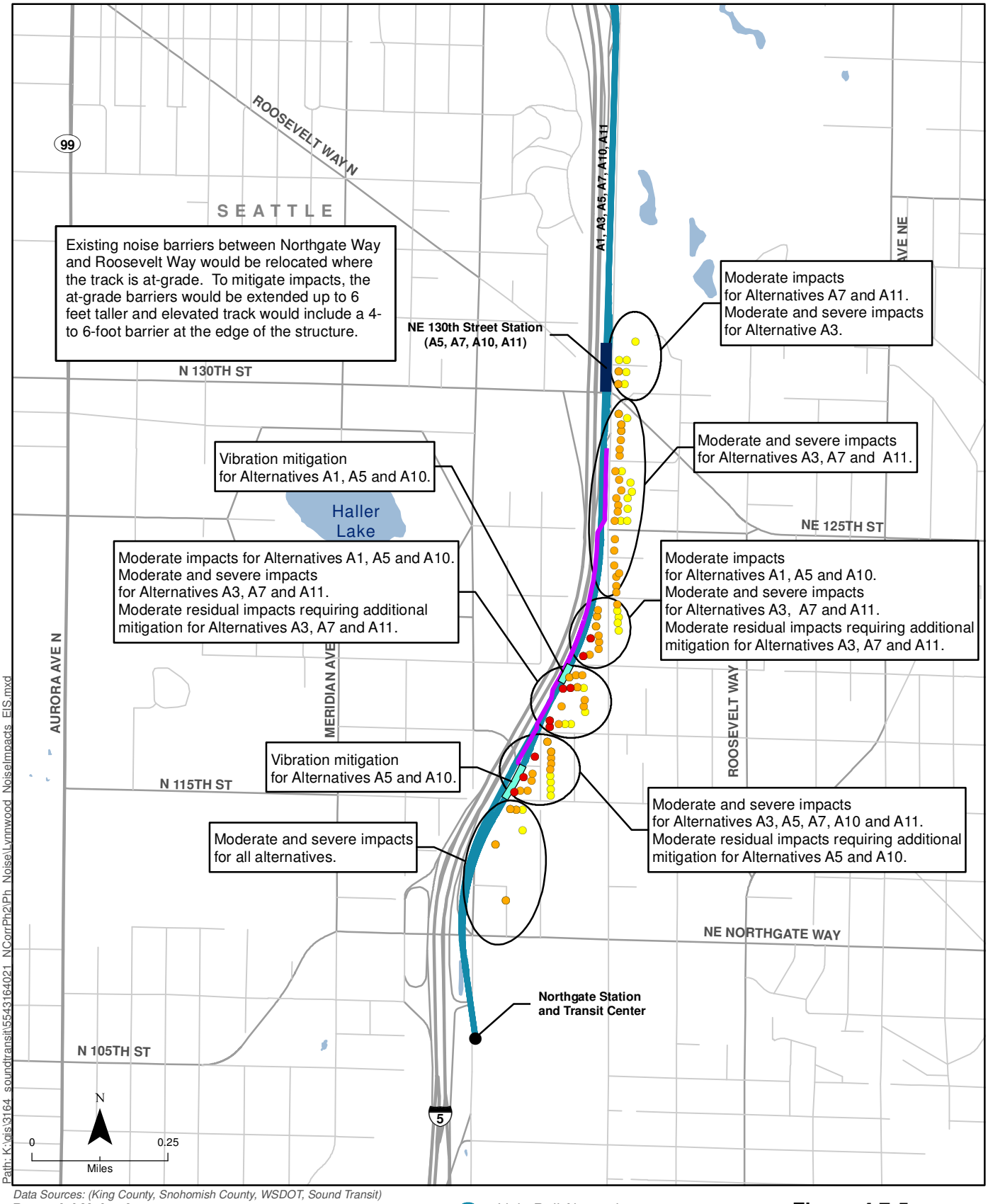
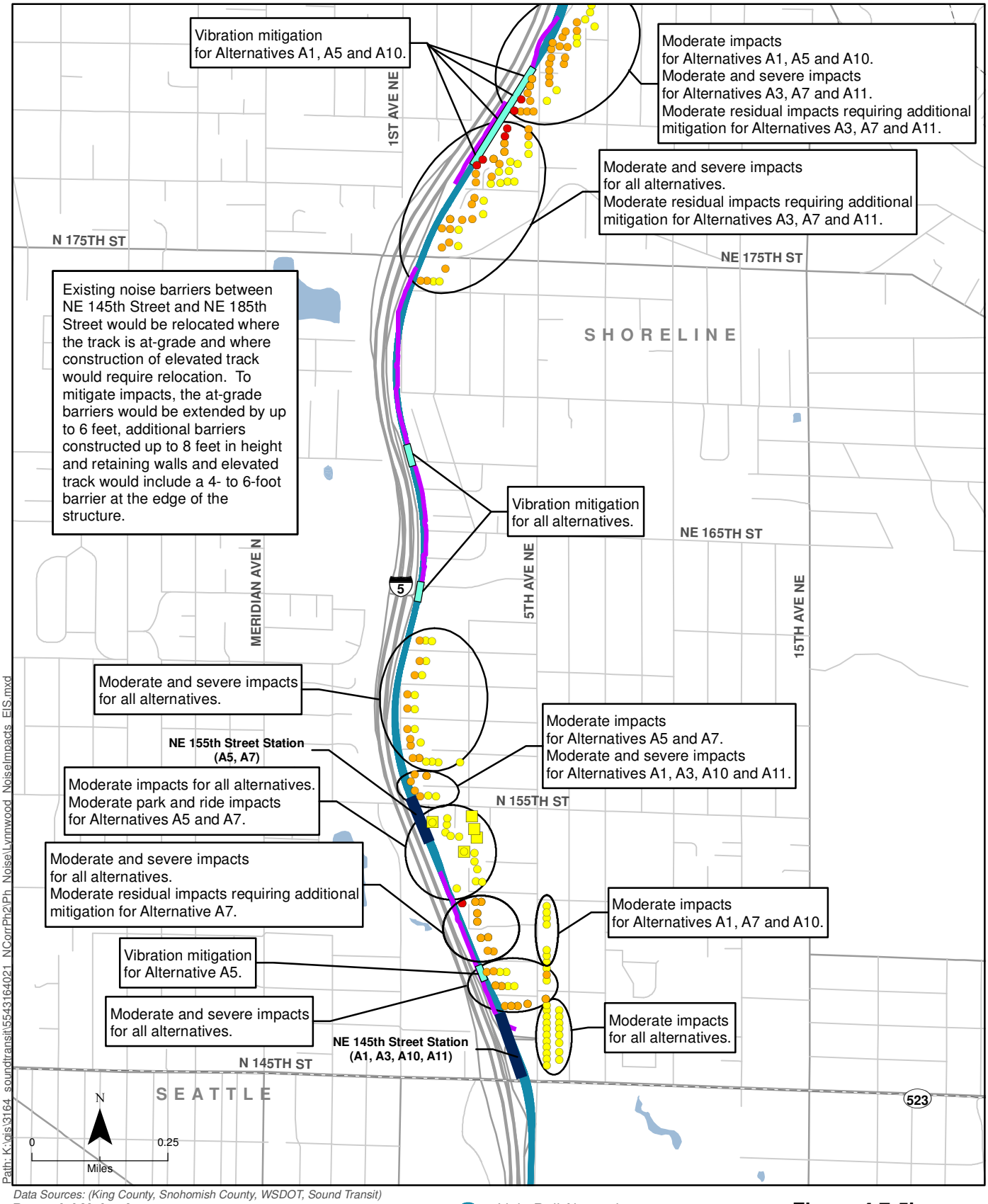


Figure 4.7-5a
Potential Noise and Vibration Impacts

Lynnwood Link Extension



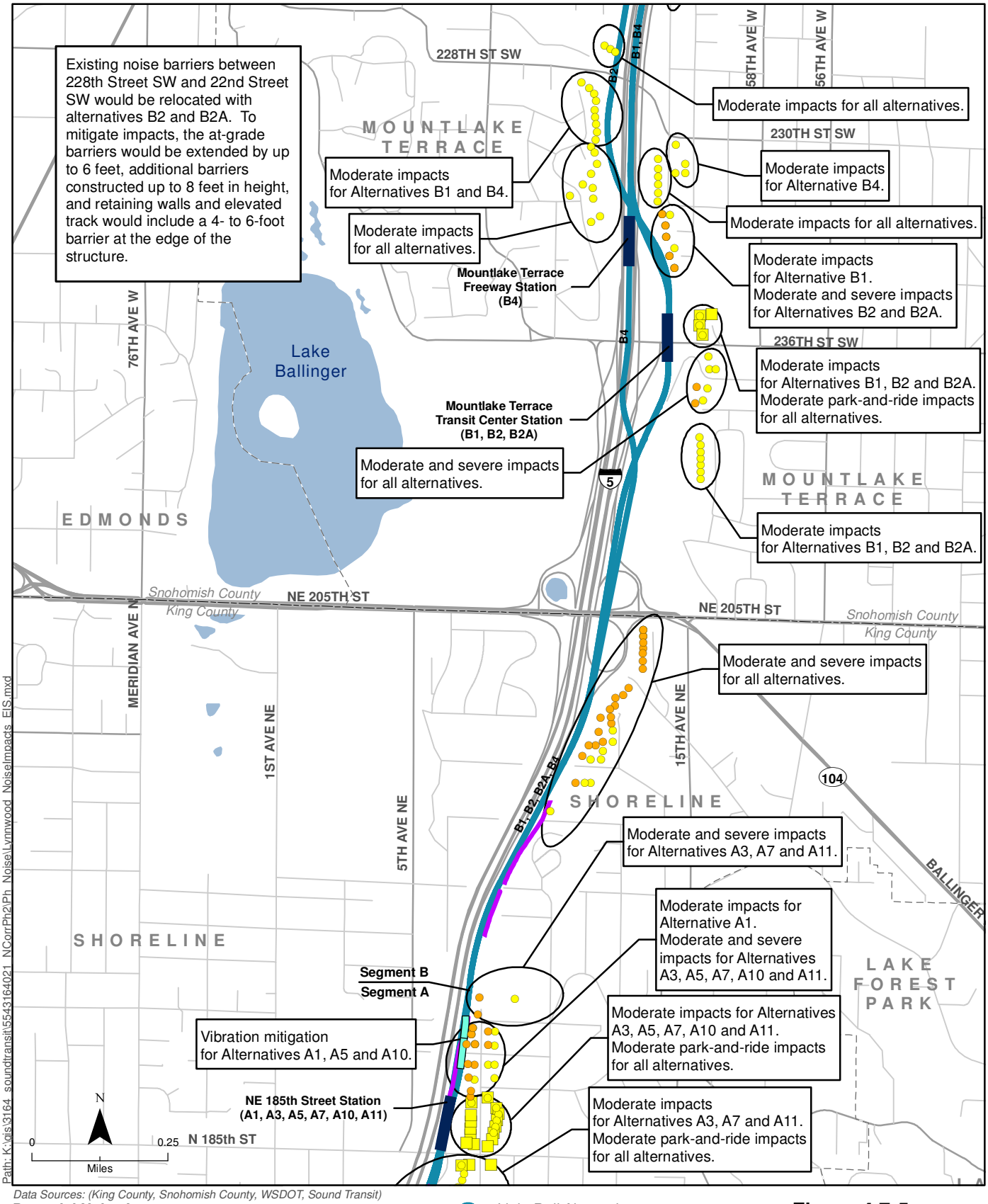
Data Sources: (King County, Snohomish County, WSDOT, Sound Transit)

Potential Noise Impacts

- Moderate Noise Impact Requiring Mitigation
- Park-and-Ride Moderate Noise Impact Requiring Mitigation
- Severe Noise Impact Requiring Mitigation
- Moderate Residual Noise Impact Requiring Additional Mitigation (sound insulation)
- Vibration Impact and Mitigation Area
- Light Rail Alternatives
- Station Location
- Roadway
- Local Street
- Waterbody
- Existing Noise Wall

Figure 4.7-5b
Potential Noise and Vibration Impacts

Lynnwood Link Extension



Data Sources: (King County, Snohomish County, WSDOT, Sound Transit)

Potential Noise Impacts

- Moderate Noise Impact Requiring Mitigation
- Park-and-Ride Moderate Noise Impact Requiring Mitigation
- Severe Noise Impact Requiring Mitigation
- Moderate Residual Noise Impact Requiring Additional Mitigation (sound insulation)
- Vibration Impact and Mitigation Area

- Light Rail Alternatives
- Station Location
- Roadway
- Local Street
- Waterbody
- Existing Noise Wall

Figure 4.7-5c
Potential Noise and Vibration Impacts

Lynnwood Link Extension

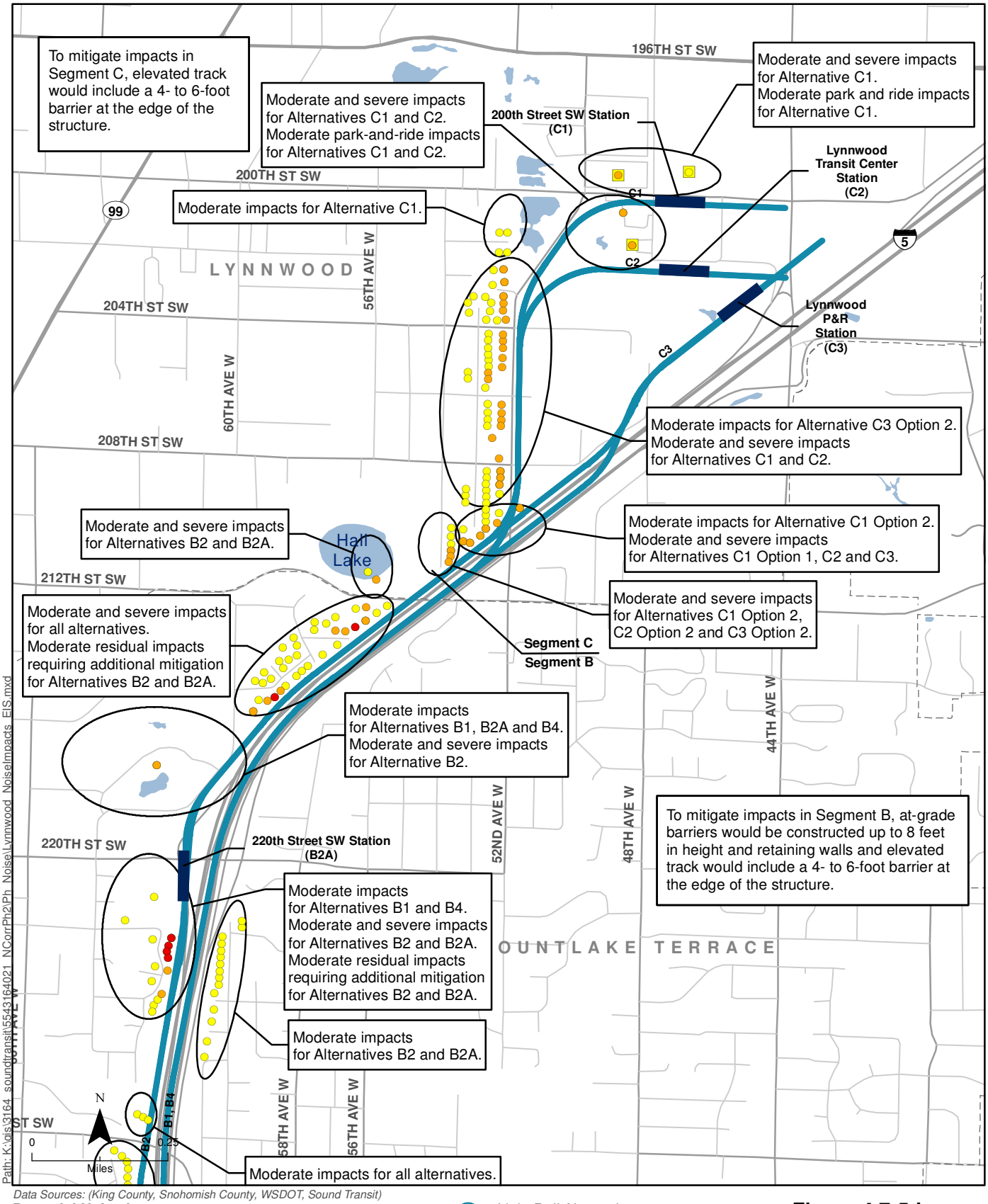


Figure 4.7-5d
Potential Noise and Vibration Impacts

Lynnwood Link Extension

Alternative A3: Mostly Elevated with NE 145th and NE 185th Stations

Alternative A3 would need to mitigate noise impacts at 366 properties, including single- and multifamily residences, and two churches—the Latvian Evangelical Lutheran Church located at 11710 3rd Avenue NE and the North Seattle Church of the Nazarene (13130 5th Avenue NE). Nine residences near the NE 185th Street Station park-and-ride would also experience noise impacts. In Alternative A3, the longer stretches of guideway with elevated sections are the primary reason that its impacts are higher compared to the mostly at-grade Alternative A1, which already has the benefit of noise walls along at-grade sections to reduce transit noise. Alternative A3 would have fewer vibration impacts to mitigate than Alternative A1 because the mostly elevated guideway would transfer less vibration energy into the ground.

Alternative A5: At-grade/Elevated with NE 130th, NE 155th, and NE 185th Stations

Alternative A5 would need to mitigate noise impacts at 242 single- and multifamily residences and one church—the True Jesus Church/Resurrection Fellowship Church of God located at 225 NE 152nd Street. Park-and-ride noise at 18 residences near the NE 155th Street and the NE 185th Street stations would require mitigation. Alternative A5 would have more severe impacts to mitigate than Alternative A1 in the area between NE Northgate Way and NE 117th Street because at NE 117th Street the alignment would be closer to residences than with Alternative A1. Impacts would also be greater at NE 145th Street without the station because train speeds would be higher and more nearby residential properties would remain in place. Fewer impacts would occur between NE 149th Street and NE 156th Street because train speeds would be lower near the NE 155th Street Station. Without mitigation, vibration could affect 13 single- and multifamily residences that are near the guideway.

Alternative A7: Mostly Elevated with NE 130th, NE 155th, and NE 185th Stations

Noise impacts requiring mitigation would affect 378 properties, which is similar to Alternative A3, and includes park-and-ride noise impacts to 15 residences near the NE 155th Street NE and 185th Street stations. Fewer noise impacts would occur in the vicinity of NE 155th Street, but more impacts would be experienced between NE 145th Street and NE 151st Street due to differences in speed and alignment and the number of residential properties near the station sites. Alternative A7 would have fewer vibration impacts than Alternative A5 because the mostly elevated guideway would transfer less vibration energy into the ground.

Alternative A10: At-grade/Elevated with NE 130th, NE 145th, and NE 185th Stations

The transit noise impacts requiring mitigation would be similar to Alternative A5 with slightly fewer impacts between NE 145th Street and NE 151st Street. Mitigation would be required to reduce impacts at 232 single- and multifamily residences, including park-and-ride noise impacts at 12 residences near the NE 185th Street Station. Vibration impacts would require mitigation at several single- and multifamily residences.

Alternative A11: Mostly Elevated with NE 130th, NE 145th, and NE 185th Stations

Transit noise impacts with Alternative A11 would require mitigation for about 361 properties, similar to Alternative A3, including park-and-ride noise impacts to nine residences near the NE 185th Street Station. Alternative A11 would have fewer vibration impacts than Alternative A10 because the mostly elevated guideway would transfer less vibration energy into the ground.

Segment B: Shoreline to Mountlake Terrace

Each of the alternatives in Segment B would incorporate noise reduction features to avoid 125 to 173 moderate-to-severe rail noise impacts (Table 4.7-4 and previous Figures 4.7-5a through 4.7-5d). Mitigation would also be needed near the Mountlake Terrace Transit Center to avoid noise impacts to an additional four residences. No vibration impacts would occur in Segment B.

In addition to rail noise, each Segment B alternative includes a park-and-ride at Mountlake Terrace, where noise limits are governed by state code, as previously shown in Table 4.7-2. While noise from the park-and-rides would not exceed the FTA impact criteria, before mitigation is applied, noise levels at four residences adjacent to the park-and-ride would exceed noise limits under state code.

Table 4.7-4. Number of Properties with Noise and Vibration Impacts in Segment B (Before/After Mitigation)[a]

Alternative	Moderate Noise Impacts	Severe Noise Impacts	Park-and-Ride Impacts	Total Noise Impacts	Vibration Impacts
B1	101/0	30/0	4/0	135/0	0
B2	121/0	52/0	4/0	177/0	0
B2A	119/0	52/0	4/0	175/0	0
B4	89/0	36/0	4/0	129/0	0

[a] Noise impacts that are not eliminated through source and path treatments (such as noise walls on the ground or noise barrier on the light rail guideway) may be eligible for sound insulation. Sound insulation may be needed for two properties with Alternatives B2 and B2A.

Alternative B1: East Side to Mountlake Terrace Transit Center to Median

Transit noise levels would require mitigation to avoid affecting about 135 single- and multifamily residences, including park-and-ride noise impacts to four residences near the Mountlake Terrace Transit Center. By following the I-5 median for the majority of Segment B, much of the guideway would be relatively distant from noise-sensitive uses. The curves north and south of the Mountlake Terrace Transit Center are unlikely to generate wheel squeal given Sound Transit's operating and track-and-vehicle maintenance programs.

Alternatives B2 and B2A: East Side to Mountlake Terrace Transit Center to West Side

Transit noise would need mitigation to avoid affecting about 191 properties, including single- and multifamily residences along the guideway and Mountlake Terrace Preschool. Park-and-ride noise would require mitigation to avoid affecting four residences near the Mountlake Terrace Transit Center. (There would be no noise impacts related to Alternative B2A's 220th Street SW Station and park-and-ride.) Alternative B2 would have more noise impacts than Alternative B1 because the alignment would travel closer to residences along the west side of I-5, and Alternative B2 would need to remove, relocate, and replace some existing noise walls along I-5. Two gradual curves in the tracks north and south of the Mountlake Terrace Transit Center could generate wheel squeal. Alternative B2A would have 189 noise impacts requiring mitigation; lower train speeds near the 220th Street SW Station would reduce noise impacts at two nearby residences compared to Alternative B2.

Alternative B4: East Side to Mountlake Terrace Freeway Station to Median

Noise impacts would require mitigation for about 129 properties, including four residences near the Mountlake Terrace Transit Center that would have park-and-ride noise impacts. A curve at 236th Street SW could be a source of wheel squeal.

Segment C: Mountlake Terrace to Lynnwood

The alternatives in Segment C have a large range of potential noise impacts, but no vibration impacts would occur because the alternatives are all elevated (Table 4.7-5). As few as six and as many as 238 properties would need noise mitigation for light rail noise impacts.

Segment C includes options for a park-and-ride at 200th Street SW and expansion of the Lynnwood Transit Center. While noise from the park-and-rides would not exceed the FTA impact criteria, noise levels at between zero and 55 multifamily

residential units adjacent to the park-and-rides would exceed the state noise limits before mitigation is applied. With the 200th Street SW park-and-ride option, noise impacts to 55 residential units would require mitigation. Depending on the option selected at the Lynnwood Transit Center, between zero and four residential units would require mitigation.

Table 4.7-5. Number of Properties with Noise and Vibration Impacts in Segment C (Before/After Mitigation)

Alternative	Moderate Noise Impacts	Severe Noise Impacts	Park-and-Ride Impacts	Total Noise Impacts	Vibration Impacts
C1 (Option 1: Median)	125/0	113/0	55/0	293/0	0
C1 (Option 2: West of I-5)	118/0	113/0	55/0	286/0	0
C2 (Option 1: Median)	50/0	62/0	4/0	116/0	0
C2 (Option 2: West of I-5)	41/0	64/0	4/0	109/0	0
C3 (Option 1: Median)	5/0	1/0	0/0	6/0	0
C3 (Option 2: West of I-5)	12/0	8/0	0/0	20/0	0

Alternative C1: 52nd Avenue West to 200th Street SW

Transit noise impacts needing mitigation would occur at 286 to 293 properties, which would include single- and multifamily residences adjacent to the guideway and one church—the River of Life Christian Center at 20830 52nd Avenue West. These impacts include 55 residences where noise from a revised bus facility at the park-and-ride would require mitigation. An 800-foot-radius curve would also occur between Cedar Valley Road and 200th Street SW, which could cause wheel squeal. With Option 2 (west of I-5) for Alternative C1, impacts would occur at an additional seven residences along I-5 compared to Option 1 (median) because it is closer to the homes. Option 2 also includes a curve as the guideway turns from I-5 to 52nd Avenue West, which may generate wheel squeal.

Alternative C2: 52nd Avenue West to Lynnwood Transit Center

Alternative C2 would pass near fewer noise-sensitive properties than Alternative C1, although its initial section along 52nd Avenue West is the same. There are 109 properties that would require mitigation for transit noise, including single- and multifamily residences adjacent to the guideway and one church—the River of Life Christian Center. These impacts include four residences affected by park-and-ride noise. Alternative C2 has the same two options for departing from I-5 as Alternative C1, with Option 2 (west of I-5) having more impacts than Option 1 (median).

Alternative C3: Along I-5 to Lynnwood Park-and-Ride

Alternative C3 would pass near the fewest noise-sensitive properties. About six residences would require mitigation for transit noise. With Option 2 (west of I-5) for Alternative C3, impacts would occur at 20 residences along I-5. Alternative C3 would not have wheel squeal because it does not include any curves of less than 1,000 feet. Alternative C3 would also not have any park-and-ride noise impacts.

4.7.4 Construction Impacts

Construction-related noise would be produced by earthmoving equipment, pneumatic tools, generators, concrete pumps, and similar equipment (Figure 4.7-6). State and local ordinances regulate construction noise, and the contractor would be required to adhere to these regulations. While most construction activity would be completed during daytime hours, activities that would require lane closure of major roadways, including I-5, would be completed at night. The contractor would have to obtain noise permits or variances for any nighttime activities, as required by local ordinance. Construction noise and vibration is evaluated in the *Noise and Vibration Technical Report*.

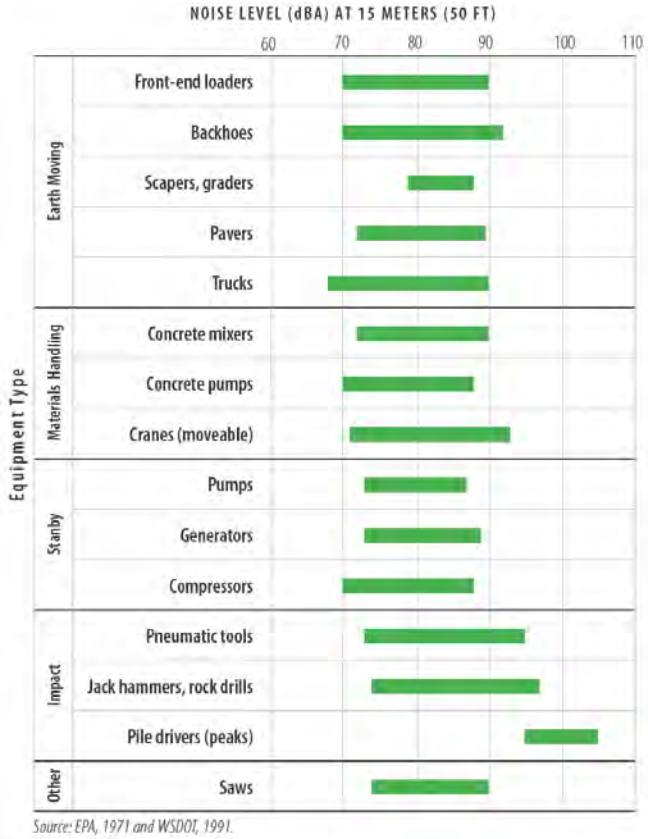


Figure 4.7-6
Typical Construction Equipment Noise Levels

Construction would occur in several phases. During the loudest phases of work, which include demolition, grading, structure erection, and track installation, Leq noise levels would be around 88 dBA at 50 feet from the construction, with shorter work periods reaching 94 dBA.

Common sources of vibration during construction activities include jackhammers, pavement breakers, hoe rams, bulldozers, backhoes, and soil compactors. Pavement breaking and soil compacting would likely produce the highest levels of vibration.

Elevated sections would generally be constructed on drilled-shaft foundations, which generate less noise and vibration than driving piles. Pile driving would not be widespread, but could be required for some foundations and for retaining wall construction. Depending on soil conditions, pile driving can result in high short-term noise and vibration levels and could produce Lmax noise levels reaching 105 dBA at 50 feet and vibration levels reaching a peak-particle velocity of 0.5 inches per second. Pile driving conducted at more than 80 feet from buildings in the corridor would not damage buildings.

Segment A Alternatives

There are a large number of single- and multifamily residences along the Segment A alternatives. At adjacent residences, maximum noise levels exceeding 80 dBA Lmax would occur for only short periods during portions of the day. In locations where the noise walls conflict with the light rail tracks or guideway, replacing the noise walls could generate short periods of construction and increased traffic noise until the new noise walls are in place. Unless the replacement walls can be constructed prior to removal of the existing walls, traffic noise levels would increase temporarily by between approximately 5 and 10 dBA Leq. Each phase of guideway construction would occur over a short period in each area, with construction activities progressing from multiple starting points along the alignment.

Areas requiring considerable demolition, grading, and construction activity would experience the longest periods of disruption. Construction activities and the properties nearest construction would vary depending on factors such as station and park-and-ride layouts and structures. In Segment A, the area that would experience the greatest guideway construction noise is between Northgate Way and North 117th Street. Station construction would produce similar noise levels as guideway construction, but constructing the station would occur over a longer period in the same location. Alternatives A5 and A7 would include the construction of a station and multi-story parking facility at NE 155th Street, which could result in a longer period of construction than alternatives without stations at this location. The NE 185th Street Station options with a parking garage are more complex than options with surface parking and would have longer construction periods. Alternative A1

would reconstruct the NE 185th Street bridge and include construction west of I-5, as well as building the station on the east side of I-5.

Guideway and station construction would not cause vibration damage to adjacent buildings unless vibratory pile driving occurs within 80 feet or vibratory rollers are used within 40 feet of sensitive structures. Vibration could cause annoyance at locations near stations where construction activity would occur over a longer period than for guideway construction.

Segment B Alternatives

Alternatives B1 and B4 follow the median of I-5 for the majority of Segment B; therefore, construction noise with those alternatives would be farther from residences. Activities and noise levels would be similar to Segment A when the distances to the construction are the same. In Segment B, the area south of Ballinger Way would have more potential for guideway construction noise, as would the west side of I-5 in the western alignment for Alternatives B2 and B2A. The types of vibration impacts expected with any of the alternatives would be similar to Segment A.

Segment C Alternatives

In Segment C, all guideway construction would be elevated; therefore, the major noise sources would be associated with foundation, column, and guideway erection rather than grading and retaining wall construction. Alternatives C1 and C2 would cause more construction noise disruption than Alternative C3 because they are closer to residences than Alternative C3. Noise levels and typical vibration impacts would be similar to Segment A.

4.7.5 Indirect and Secondary Impacts

Indirect and secondary effects of the project on noise and vibration could include noise or vibration caused by changes in development or travel patterns influenced by the project.

The project would lessen the future transportation demand on the roadway system compared to the No Build Alternative, but with or without the light rail project, traffic volumes and traffic noise would still be higher than today. As noted in Section 4.7.3, there are areas where existing noise walls would be removed by the project, and, in accordance with FHWA and WSDOT policy, they would need to be replaced by the project. More detailed engineering is needed to confirm the location and scale of replacement noise walls in relation to the light rail facilities.

Sound Transit has calculated transit noise impacts based on existing ambient noise levels, which include existing traffic noise. Some of the mitigation proposed by Sound Transit to address transit noise would also reduce traffic noise.

Transit-oriented development facilitated by the additional transportation options and accessibility provided by the project would generate noise consistent with the land use developed in accordance with local comprehensive plans and zoning regulations.

4.7.6 Cumulative Impacts

Previous projects have introduced noise and vibration sources in the corridor. The greatest existing source of noise in the corridor is I-5 and it will continue to be a major source. Areas that do not have existing or planned noise walls could experience increased traffic noise levels. Similarly, local roads will continue to be a source of noise or vibration in the corridor. Future expansion of I-5 and other transportation facilities envisioned in *Transportation 2040* (PSRC 2010a) may contribute to future noise and vibration in the corridor.

In addition to the facilities envisioned in *Transportation 2040* (PSRC 2010a), the Sound Transit Link Operations and Maintenance Satellite Facility site alternative in Lynnwood could be an additional source of noise or vibration in the area. The facility would remove light industrial and commercial properties and replace them with the light rail guideway, surface tracks, and buildings, which could generate localized noise and vibration impacts in their vicinity. These features would be farther from residences, the closest sensitive receptors, than would some of the Segment C light rail alternatives. However, in accordance with Sound Transit environmental policy, severe and moderate impacts would be mitigated for both projects, and no cumulative effects would be expected.

The Edmonds School District's master plan includes developing a bus base in the same area. A large fleet of buses deployed from that site could cause higher noise levels for the area.

Other long-range plans or programs being considered through 2040 include tolling on I-5, which could have the potential to alter freeway volumes and speeds and related noise levels. Finally, some areas such as in Lynnwood or Mountlake Terrace may redevelop based on current local plans. This could place more residential units or other noise-sensitive properties near the freeway or near the light rail project. Lynnwood Link Extension would be designed to avoid or mitigate noise impacts on existing noise-sensitive properties, but developers would need to consider light rail operations and ambient noise levels in the planning and design of future projects.

Because Sound Transit is mitigating all noise and vibration impacts (as defined by exceeding applicable FTA, state, or local criteria) created by the project, the project would not increase cumulative noise or vibration impacts, considering other current or future actions in the project area.

4.7.7 Potential Mitigation Measures

Depending on the combination of segment alternatives selected, the project would cause noise impacts at 333 to 851 locations and vibration impacts at 2 to 13 locations. These impacts would be mitigated by incorporating appropriate mitigation measures as part of the project. Sound Transit's policy is to mitigate light rail transit noise that would otherwise result in moderate or severe impacts.

When source mitigation measures, noise walls, or sound barriers are infeasible or not entirely effective at reducing noise levels below the FTA impact criteria, then residential sound insulation would be evaluated and offered at properties where the existing building does not already achieve a sufficient exterior-to-interior reduction of noise levels. However, many newer buildings have good interior noise reduction and additional sound insulation might not be helpful.

All curves of less than 1,000-foot radius would be designed to accommodate a track lubrication system that would be installed should wheel squeal occur during operation. Sound Transit would install lubrication systems for all curves having less than a 600-foot radius.

Vibration impacts would be mitigated by design measures that reduce the amount of vibration energy transferred from passing trains into the ground. The use of a tire-derived aggregate (shredded tires) in a layer below the track ballast is an effective measure to reduce vibration transfer; other measures, such as ballast mats or resiliently supported track, are also available. Specific vibration isolation designs would be determined during final design.

During final design, all impacts and mitigation measures will be reviewed for verification. If it is discovered that the mitigation can be achieved by less costly means or if detailed analysis shows no impact, the mitigation measure may be eliminated.

Segment A Alternatives

In Segment A, most of the at-grade alignments near residential areas would be protected by noise walls that are relocated from their existing locations along I-5 to outside of the track alignment as part of the project design. In locations where noise impacts would continue behind the relocated walls, the heights of the walls could be increased by 4 to 6 feet to provide additional noise reduction to mitigate the noise impacts.

The existing or relocated at-grade traffic noise walls would not block noise from the elevated guideway, and mitigation would still be needed on the guideway. The majority of noise impacts from light rail operating on an elevated structure could be mitigated by incorporating a 4-foot-tall to 8-foot-tall barrier at the edge of the structure facing the noise-sensitive uses.

Mitigation would reduce the intensity of all impacts, including impacts on non-residential uses. Insulation is anticipated to be provided at up to 13 residences with Alternatives A3, A5, A7, A10, or A11, which would mitigate all interior noise impacts from the project. All vibration impacts would be mitigated by incorporating noise reduction measures in several locations within Segment A.

Mitigation for impacts from buses and cars operating in the NE 155th Street and NE 185th Street park-and-rides could include installing noise barriers along the edge of the facility, providing sound insulation, or revising the design of the facility to move access driveways and bus loading areas farther from residences.

Segment B Alternatives

In Segment B, at-grade noise walls could reduce impacts on adjacent receivers for at-grade sections of the alignment. Walls would range in height from 4 feet above retaining walls that would be built as part of the project, at least 8 feet above track height. While Alternative B2 would have the most walls and the largest walls along the west side of I-5, Alternatives B1 and B4 also would generate a limited number of noise impacts from operation in the median that could be eliminated with 4-foot to 6-foot walls along the track.

For elevated sections of the alignment, any existing or relocated at-grade noise walls would not block noise from the elevated guideway, and mitigation would still be needed on the guideway. Noise impacts from light rail operating on an elevated structure could be eliminated by incorporating a 4-foot-tall to 6-foot-tall barrier at the edge of the structure. Mitigation would reduce noise levels at all nearby land uses, including those where levels would already be below the impact criteria. Insulation is anticipated to be offered at an estimated five residences for Alternative B2 and six residences for Alternative B2A.

Mitigation, such as a noise wall along the eastern edge of the facility, would mitigate impacts from vehicles in the Mountlake Terrace Station park-and-ride.

Segment C Alternatives

In Segment C, all alternatives would be on an elevated structure. Noise impacts could be mitigated by incorporating a 4-foot-tall to 6-foot-tall barrier at the edge of the structure.

Mitigation for impacts from buses and passenger vehicles operating within the park-and-ride could include sound insulation or operational changes. For the 200th Street SW Station option, sound insulation is the only practical mitigation option. Mitigation of noise impacts resulting from changes to bus access at the Lynnwood Transit Center could include installing sound insulation or revising the design for bus access.

Construction

Construction noise and vibration impacts can be reduced with operational methods and scheduling, equipment choice, and acoustical treatments. In locations where existing noise walls will require relocation, the relocation would be completed as early in the construction process as practical so that the relocated walls would reduce noise from the ongoing construction activities. When required, Sound Transit or its contractor would seek the appropriate noise variance from the local jurisdiction. Noise control mitigation to meet local regulatory requirements, noise ordinances, and permit or variance conditions would be required. These measures could include:

- Install construction site noise barrier or wall by noise-sensitive receivers where appropriate.
- Use smart backup alarms during nighttime work that automatically adjust, or lower the alarm level or tone based on the background noise level, or switch off back-up alarms and replace with spotters.
- Use low-noise emission equipment.
- Implement noise-deadening measures for truck loading and operations.
- Monitor and maintain equipment to meet noise limits.
- Use lined or covered storage bins, conveyors, and chutes with sound-deadening material.
- Use acoustic enclosures, shields, or shrouds for equipment and facilities.
- Install high-grade engine exhaust silencers and engine-casing sound insulation.
- Prohibit aboveground jack hammering and impact pile driving during nighttime hours.
- Minimize the use of generators or use whisper quiet generators to power equipment.
- Limit use of public address systems.
- Use movable noise barriers at the source of the construction activity.
- Limit or avoid certain noisy and high vibration activities during nighttime hours.
- Demolish existing structures near vibration-sensitive receptors with methods that do not cause impact forces against the buildings or near them.
- Minimize use of vibratory soil compactors and vibratory hammers near vibration-sensitive receptors.

- Use oscillatory pile-casing techniques where appropriate.
- Avoid using variable-frequency vibratory hammers in dense residential areas, such as around the 130th, 145th, 155th, and 185th Street Stations.
- Avoid nighttime activities involving major vibration sources. People are generally less aware of vibration during waking hours than when lying in bed. Excessive vibration can disturb sleep.
- Avoid conventional vibratory hammers. Conventional vibratory hammers that operate from zero to maximum frequency may cause objectionable vibration and risk cosmetic damage as the hammer sweeps through resonance. An alternative to conventional vibratory pile drivers is a resonance-free vibrator or variable eccentric moment vibrator.

4.8 Ecosystem Resources

An ecosystem is defined by the interaction between plants, animals, microorganisms, and the physical environment in which they live. Ecosystems are made up of living organisms, including humans, and the areas they inhabit. This section addresses the ecosystem components—aquatic species and habitat; vegetation, terrestrial wildlife, and wildlife habitat; and wetlands—in the vicinity of the Lynnwood Link Extension alternatives. The *Ecosystem Resources Technical Report* has detailed background information about the methods, affected environment, species, and impacts discussed in this section.

4.8.1 Affected Environment

The study area for ecosystems includes all species and habitat within 200 feet of the project alternatives or features, as well as areas up to 100 feet upstream and 300 feet downstream of any sites where any of the proposed alignments would cross a stream.

Aquatic Species and Habitat

The aquatic resources in the study area are primarily in urban areas, and most of the aquatic habitats have already been changed by development. While conditions vary from stream to stream, the greatest changes are in areas with the most urban development, including roads, freeways, and urban centers. Flows from some of the smaller streams and headwater reaches are channeled through pipes and ditches, thereby changing the natural flow patterns and processes such as groundwater recharge.

Three stream systems drain the study area: Thornton Creek, McAleer Creek, and Scriber Creek (Figures 4.8-1a through 4.8-1c). All three streams drain to Lake Washington. Many species of native and introduced fish, including species protected under the Endangered Species Act (ESA), inhabit Lake Washington and its tributary streams. These waterways also provide essential fish habitat for federally managed

species; such habitat is protected under the Magnuson-Stevens Fishery Conservation and Management Act. The streams, stream habitats, and fish species that occur in the study area are described in greater detail in the *Ecosystem Resources Technical Report.*

In addition to Thornton Creek, McAleer Creek, and Scriber Creek, the Lynnwood Link Extension study area includes four tributaries to those streams (Table 4.8-1).

Table 4.8-1. Streams in the Lynnwood Link Extension Study Area

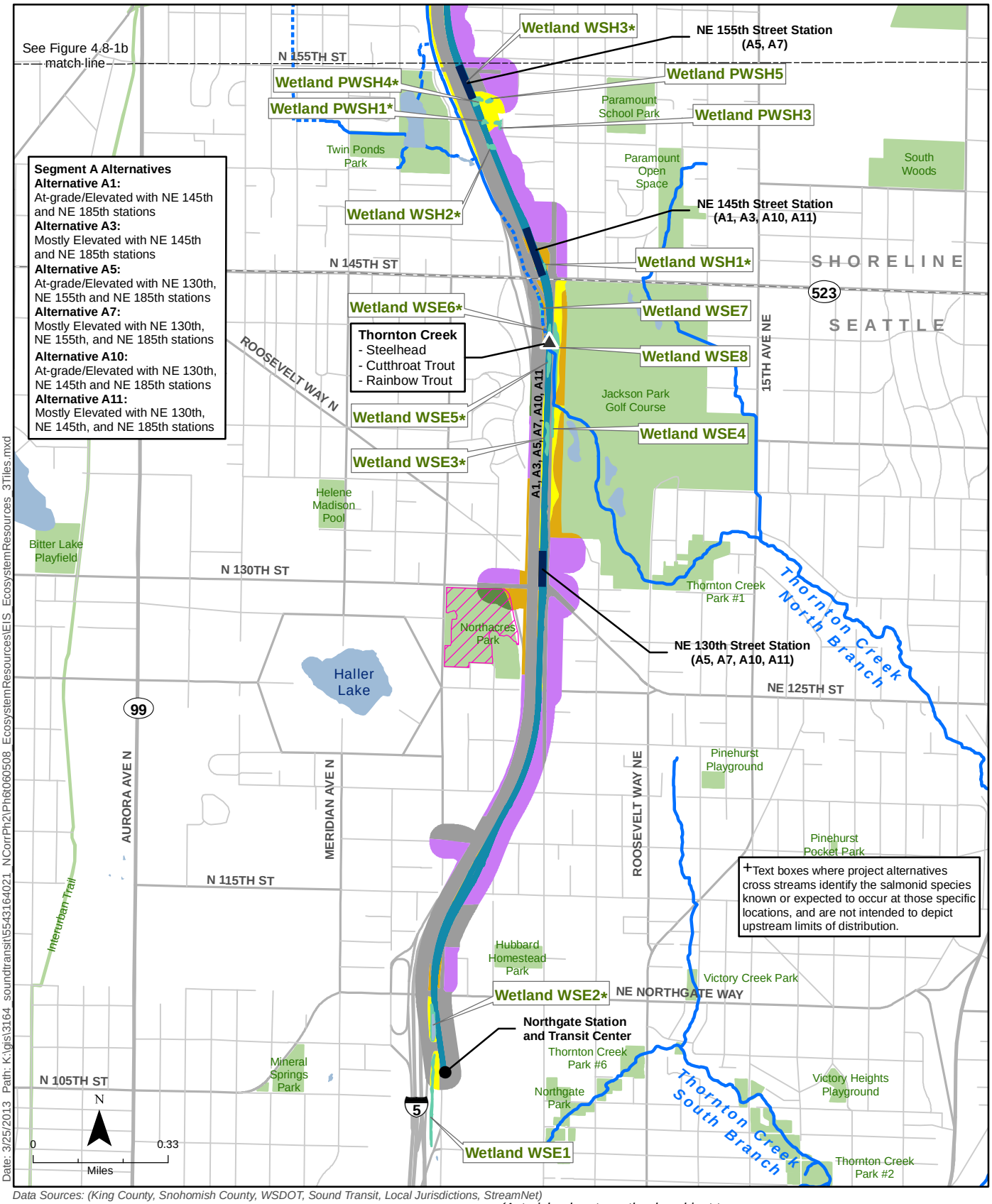
Stream Name [a]	Local Jurisdiction	Local Jurisdiction Stream Classification [b]	Local Jurisdiction Buffer Width (feet) [c]	Fish Species Documented in the Study Area
Thornton Creek, North Branch	Seattle	Type 3	75	Steelhead Cutthroat Trout Rainbow Trout
Thornton Creek Tributary (SSH3)	Shoreline	Piped	10	none
McAleer Creek	Shoreline Mountlake Terrace	Type II Class II	115 100	Coho Salmon Steelhead Cutthroat Trout
McAleer Creek Tributary (SSH2)	Shoreline	Piped	10	none
McAleer Creek Tributary (SMT1)	Mountlake Terrace	Class III	65	none
Scriber Creek	Lynnwood	Category I	100	Coho Salmon Cutthroat Trout
Scriber Creek Tributary (SLY1)	Lynnwood	Category III	35	none

[a] Streams other than Thornton Creek, McAleer Creek, and Scriber Creek are identified with alphanumeric codes: SYYn. S stands for stream; YY = two-letter code for local jurisdiction (SE = Seattle, SH = Shoreline, MT = Mountlake Terrace, LY = Lynnwood); n = sequential identification number.

[b] Seattle Municipal Code 25.09.020 (D5); Shoreline Municipal Code 20.80.470; Mountlake Terrace Municipal Code 16.15.080; Lynnwood Municipal Code 17.10.060

[c] Seattle Municipal Code 25.09.200.A.3.d.1; Shoreline Municipal Code 20.80.480; Mountlake Terrace Municipal Code 16.15.090; Lynnwood Municipal Code 17.10.061

Thornton Creek supports populations of several salmonid fish species, although most are prevented from using stream habitats in the study area because downstream barriers to fish passage are present. The salmonid species most likely to use Thornton Creek stream habitats in the study area are resident cutthroat trout (*Oncorhynchus clarkii*) and rainbow trout (*O. mykiss*). Observers have found steelhead trout (the anadromous or ocean-going form of rainbow trout) in Thornton Creek upstream of the study area, but it is not known whether steelhead spawn there. The quality of Thornton Creek's in-stream habitat and riparian habitat within the study area is low. A tributary (Stream SSH3) that joins Thornton Creek in the study area, originating near Ridgecrest Park east of I-5, is contained within culverts for almost its entire length and is not expected to support fish.



Data Sources: (King County, Snohomish County, WSDOT, Sound Transit, Local Jurisdictions, StreamNet)

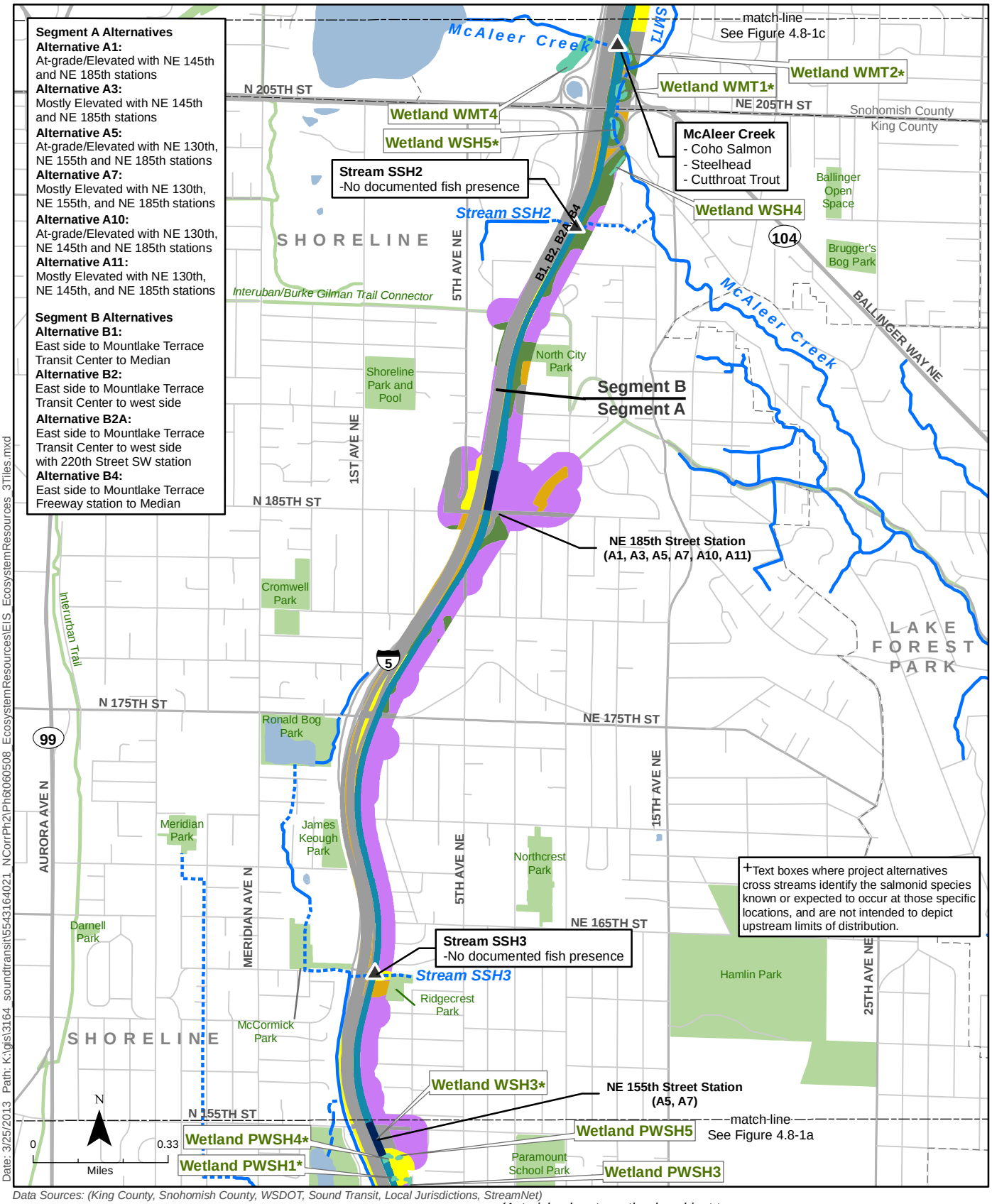
- Light Rail Alternatives
- Station Location
- City Boundary
- County Boundary
- Waterbody
- Park
- WDFW Priority Habitat Area
- Stream Crossing+
- Open Stream
- Piped Stream
- Wetland *(Asterisks denote wetlands subject to potential long-term impacts under one or more of the project alternatives)*

Land Cover Types in the Study Area

- Forest
- Shrub
- Maintained Vegetation
- Residential
- Urban
- Open Water

Figure 4.8-1a
Ecosystem Resources

Lynnwood Link Extension



Data Sources: (King County, Snohomish County, WSDOT, Sound Transit, Local Jurisdictions, StreamNet)

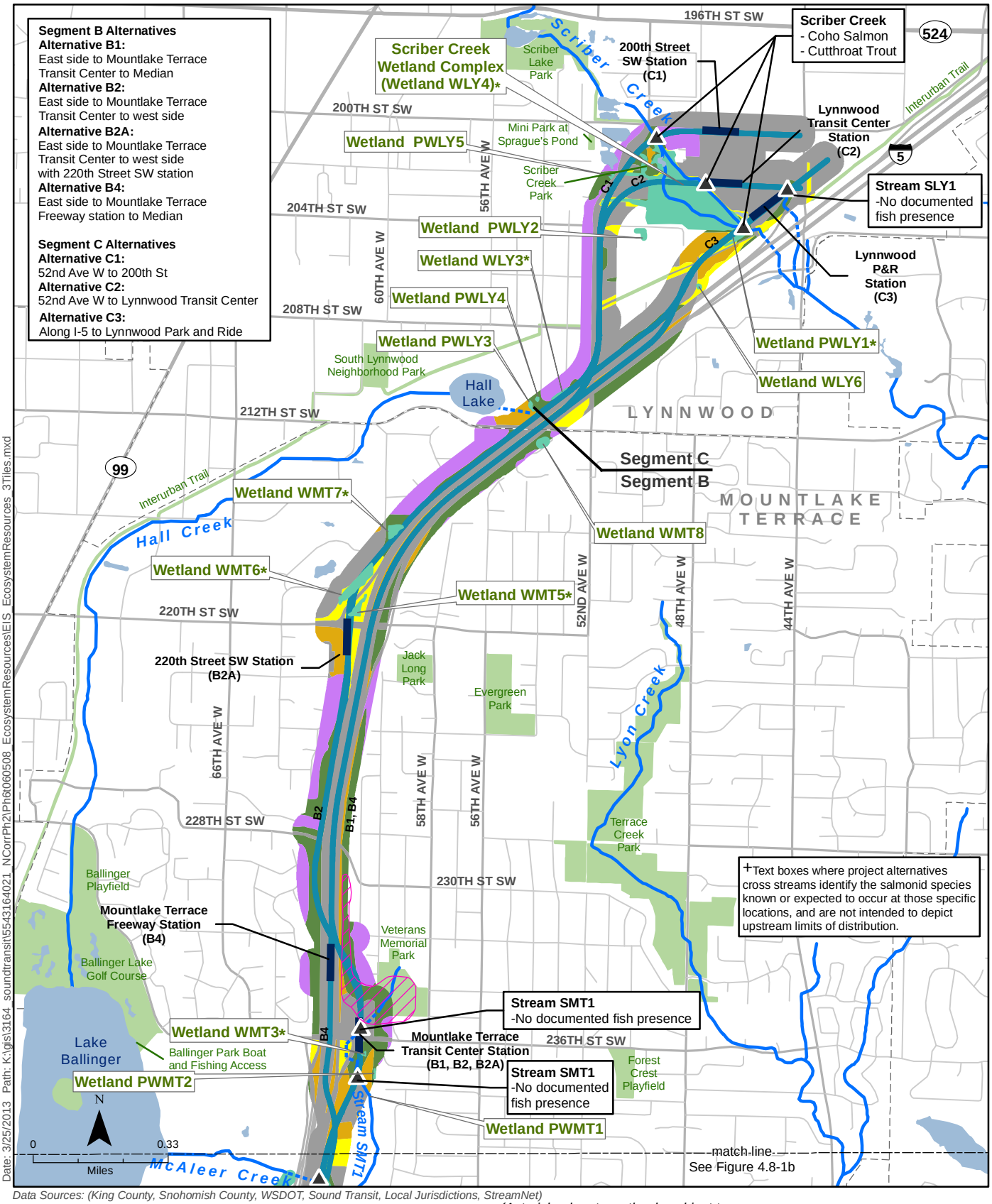
- Light Rail Alternatives
- Station Location
- City Boundary
- County Boundary
- Waterbody
- Park
- WDFW Priority Habitat Area
- Stream Crossing+
- Open Stream
- Piped Stream
- Wetland *(Asterisks denote wetlands subject to potential long-term impacts under one or more of the project alternatives)*

Land Cover Types in the Study Area

- Forest
- Shrub
- Maintained Vegetation
- Residential
- Urban
- Open Water

Figure 4.8-1b
Ecosystem Resources

Lynnwood Link Extension



Data Sources: (King County, Snohomish County, WSDOT, Sound Transit, Local Jurisdictions, StreamNet)

- Light Rail Alternatives
- Station Location
- City Boundary
- County Boundary
- Waterbody
- Park
- WDFW Priority Habitat Area
- Stream Crossing+
- Open Stream
- Piped Stream
- Wetland *(Asterisks denote wetlands subject to potential long-term impacts under one or more of the project alternatives)*

Land Cover Types in the Study Area

- Forest
- Shrub
- Maintained Vegetation
- Residential
- Urban
- Open Water

Figure 4.8-1c
Ecosystem Resources

Lynnwood Link Extension

McAleer Creek supports salmon and trout as far upstream as Lake Ballinger, and parts of the stream provide spawning and rearing habitat for coho salmon (*O. kisutch*). Observers have seen steelhead and cutthroat trout spawning in McAleer Creek downstream of the study area. The creek's habitat quality varies by location, and several sections are separated by culverts. Immediately downstream of the study area, the in-stream habitat is poor, but riparian (or streamside) habitat quality where the stream has an open channel is generally good, with forest canopy that provides shade and woody debris for the channel complexity.

Two tributaries meet McAleer Creek in the study area. One tributary (Stream SSH2) passes under I-5 south of SR 104 and is entirely within culverts in the study area. The other (Stream SMT1), which originates in Veterans Memorial Park in Mountlake Terrace, is partly within culverts and joins McAleer Creek near I-5. Both tributaries flow only intermittently. Based on the presence of human-created barriers to fish passage, neither tributary is known to support fish, but the basin sizes, channel widths, and stream gradients have the potential to support fish.

In Scriber Creek, coho salmon have been observed upstream of the study area and cutthroat trout use stream habitats as far upstream as Scriber Lake Park. Spawning habitat quality in the study area is generally poor; however, some side channels may provide suitable rearing habitat. An intermittent tributary (Stream SLY1) flows south along the eastern edge of the Lynnwood Transit Center and under I-5 to join Scriber Creek southeast of I-5. For most of its length the tributary is contained within culverts or ditches. Most of its water comes from urban runoff, and the habitat quality is generally poor. Based on the presence of human-created barriers to fish passage, the tributary is not currently known to support fish, but based on its basin size, channel width, and stream gradient, it may have the potential to support fish.

Four aquatic species that have federal or state listing status, or that are candidates for listing, might use habitats in the study area:

- Chinook salmon (*O. tshawytscha*) is listed as threatened under the ESA and is a state candidate species.
- Steelhead trout is listed as threatened under the ESA.
- Coastal-Puget Sound bull trout (*Salvelinus confluentus*) is listed as threatened under the ESA and is a state candidate species.
- River lamprey (*Lampetra ayresii*) is a state candidate species.

Of these species, only steelhead trout is known to occur in the study area, but river lampreys are also likely. Based on the lack of suitable habitat and the presence of fish passage barriers downstream of the study area, neither Chinook salmon nor bull trout is expected to use habitat in any streams in the study area.

Vegetation, Terrestrial Wildlife, and Wildlife Habitat

The study area has a mix of urban and more natural vegetation types. Table 4.8-2 identifies the six land cover types in the study area and describes the amount of area covered by each type. The geographic distribution of these cover types is shown in Figures 4.8-1a through 4.8-1c.

Table 4.8-2. Land Cover Types in the Lynnwood Link Extension Study Area

Land Cover Type	Description	Acres in Study Area
Forest	Areas dominated by evergreen conifers, deciduous broadleaf trees, or a mixture of both, generally greater than 20 feet tall. Canopy cover variable but typically greater than 40 percent. Understories include shrubs, forbs, and/or grasses.	88
Shrub	Areas dominated by native or non-native shrubs. May include trees (particularly red alder) singly or in patches.	58
Maintained Vegetation	Typically, exotic grasses or annuals, such as mown grasses and other low vegetation, most of which are rarely allowed to go to seed. Includes stormwater detention areas.	61
Residential Areas	Houses and yards, including lawns, ornamental plantings, and pruned trees. Tree and shrub canopy cover generally less than 30 percent. Moderate to high levels of human disturbance. Snags, woody debris, and other natural structures are essentially non-existent.	170
Urban Areas	Roadways, parking lots, and other areas dominated by impervious surfaces. Little or no vegetation present.	306
Open Water	Areas of ponding, including natural lakes, streams, and stormwater ponds. All open water in the study area is fresh water.	< 1
Total Area		**683**

No ESA-listed or state-listed threatened or endangered plant or wildlife species are known or expected to occur in the study area, but several state-listed sensitive species and candidate species may use habitats in the study area. The state lists bald eagle (*Haliaeetus leucocephalus*) and peregrine falcon (*Falco peregrinus*) as sensitive species, and the candidate species are Townsend's big-eared bat (*Corynorhinus townsendii*), western toad (*Anaxyrus boreas*), pileated woodpecker (*Dryocopus pileatus*), and Vaux's swift (*Chaetura vauxi*). There are no documented observations of any of these species in the study area, although biologists conducting field reviews observed evidence of pileated woodpecker activity in some wooded areas within and adjacent to the study area.

Wetlands

Sound Transit identified 35 wetlands in the study area (see Figures 4.8-1a through 4.8-1c; individual wetlands are described in the *Ecosystem Resources Technical Report*). Of these, 24 were identified during field surveys within the field reconnaissance survey area and 11 were identified outside of the field reconnaissance survey area via existing documentation and public vantage points. All the wetlands are in areas where the natural environment has been altered by urban development. Many are within maintained rights-of-way where they receive stormwater runoff from pipes, ditches, or overland flow, but groundwater, precipitation, and nearby streams also provide a

source of water. With one exception, all of the wetlands in the study area have relatively low quality ratings (Category III or IV), indicating moderate to low levels of wetland function and moderate to high levels of disturbance. The exception is a Category II wetland associated with Scriber Creek. This large wetland/stream complex located near the Lynnwood Transit Center provides multiple water quantity, water quality, and habitat functions. Most of the wetlands in the study area are small (less than 0.5 acre), but a few are larger, including the 17-acre wetland associated with Scriber Creek.

4.8.2 Long-Term Impacts

Construction and operation of the Lynnwood Link Extension could have long-term impacts on ecosystem resources. For aquatic species and habitat, such impacts may include permanent loss or degradation of in-stream or riparian habitat, altered hydrology, water quality degradation, or changes in habitat connectivity (e.g., fish passage). Construction of at-grade or elevated guideways near streams would preclude the development of mature forest habitat in those areas, reducing the potential for the recruitment of large woody debris to nearby streams. Long-term impacts on vegetation, wildlife, and wildlife habitat may include permanent loss or degradation of terrestrial habitat (including habitat connectivity); disturbance due to increased human access, noise, and light; or contributions to the spread of noxious or invasive plant species. Wetlands and buffers in the study area may also experience permanent loss or degradation.

Under any of the light rail alternatives, construction and operation of guideways, stations, and ancillary features would not be expected to have any direct effects on in-stream habitat. With one possible exception, all construction would occur outside of the ordinary high water mark of all streams, and the guideways would be elevated at all open stream crossings. This possible exception is Scriber Creek; within the Scriber Creek wetland complex, the stream lacks a defined channel and it is not possible to determine the exact location of the ordinary high water mark. No impacts on fish passage are anticipated because no new culverts would be added in fish-bearing streams, and existing culverts in fish-bearing streams would not be extended.

Stormwater from all project-related impervious surfaces would receive appropriate flow control and treatment where required. The light rail alternatives would be designed to meet standards of the applicable jurisdictions, which must comply with the Washington State Department of Ecology (Ecology) *Stormwater Management Manual for Western Washington*. Based on the analysis for water resources (Section 4.9, Water Resources), none of the light rail alternatives would degrade water quality compared to existing conditions. It is possible, however, that discharges from detention facilities could result in increased water velocities and durations in

receiving waters, potentially reducing the availability of forage and displacing juvenile salmonids from cover.

In most of the study area, the long-term effects of project construction and operation on vegetation and wildlife habitat would be minimal, based on the quality of existing habitat in most portions of the study area[1]. Currently, the predominant types of land cover in the project footprint for any of the light rail alternatives are Urban Areas, Residential Areas, and Maintained Vegetation. Little or no vegetation is present in areas classified as Urban. The vegetation that is present in all three types of land cover is highly modified from predevelopment conditions and dominated in many areas by invasive species. In addition, habitat in these areas occurs along roads and other areas with low value for wildlife. Based on the existing high levels of noise and vehicle traffic on I-5, as well as human activity associated with residential and commercial development in the study area, wildlife that use habitats adjacent to the light rail alternatives are likely accustomed to noise and human activity. The potential is therefore low for any of the light rail alternatives to cause disturbance due to increased human access, noise, and light.

For this analysis, the amount of Forest cover affected by each light rail alternative is used to indicate the potential for long-term adverse effects on vegetation and wildlife. Construction of project features would have a greater likelihood of reducing the habitat quality of forested areas than other cover types. Clearing trees, snags, and understory vegetation would result in the loss of nesting and foraging sites for many species of birds, as well as reduced availability of hiding cover for small mammals. The introduction of cleared areas through patches of contiguous forest cover would fragment the forested habitat. Project construction in some areas classified as Shrub would also diminish the structural and biotic diversity associated with the variety of plant and wildlife species previously present in the cleared areas. The areas where the potential for adverse effects would be greatest are those dominated by native species. These areas generally occur near patches of Forest land cover. For example, most areas dominated by native shrub species in the Scriber Creek wetland complex occur near areas of Forest cover. Alternatives that affect a greater amount of Forest cover would also affect a greater amount of native Shrub cover.

The light rail alternatives would have direct, long-term impacts on wetlands where the project footprint crosses wetlands or buffers. Indirect, long-term impacts might also occur due to construction and operation activities, such as modification of vegetation, partial shading, water quality degradation, and alteration of wetland hydrology sources.

[1] Section 4.5 (Visual and Aesthetic Resources) identifies changes in visual quality in some areas due to the loss of dense vegetation cover. Note that these visual impacts would not equate to adverse effects on ecosystem resources because the current habitat value of the affected areas is low. Although changes to low-value habitat may be noticeable to human observers, the impact of such changes on ecosystem functions would be minimal.

This impact assessment is based on the information obtained from overlaying the conceptual designs for the light rail alternatives onto ecosystem resource base maps and applying an additional buffer (10 to 12 feet) along portions of the alignment to account for other features such as noise walls and retaining walls. Not all areas within this analytical buffer would be subject to long-term impacts; some areas would be unaffected under the light rail alternatives or subject to temporary impacts during construction. The acreage values resulting from this analytical approach provide a reasonable indication of the nature and magnitude of potential impacts and reflect differences among alternatives. To provide a conservatively high estimate of impacts, all impacts within these areas are considered to be long term for this analysis. No long-term-impacts are anticipated outside of these areas.

Some of the areas identified as long-term impacts occur where the guideway and other features would be elevated, spanning areas of vegetation and other resources. Although construction of elevated structures can minimize the amount of permanent ground disturbance, the amount of water and sunlight available to the vegetation underneath might still be reduced. Because the elevated guideway structures would be relatively narrow (about 30 feet wide) and more than 15 feet above the ground surface in most places, shading and other impacts on vegetation would likely be minimal. As learned from the Sound Transit Central Link project, herbaceous plants and shrubs are generally able to grow beneath narrow guideways that are at least 15 feet above the ground (Sound Transit 2011d).

Figures 4.8-1a through 4.8-1c depict the locations of potential long-term impacts of the light rail alternatives on aquatic resources, vegetation, wildlife, and wetlands; Table 4.8-3 summarizes these impacts. Although individual wetlands and other resource areas would be adversely affected by project construction and operation under the light rail alternatives, these effects would be offset through the implementation of compensatory mitigation as required by federal, state, and local regulatory agencies.

Table 4.8-3. Summary of Potential Long-Term Impacts on Aquatic Resources, Vegetation and Wildlife, and Wetlands by Segment Alternative

Segment/Alternative	Aquatic Resources[a, b] (acres)	Vegetation / Wildlife[c] (acres)	Wetlands Wetland / Buffer (acres)	Wetlands Affected[b]
Segment A: Seattle to Shoreline				
Alternative A1: At-grade/ Elevated with NE 145th and NE 185th Stations	SSH3 (<0.1) North Branch Thornton Creek (0.6)	2	0.7 / 0.8	WSE2, WSE3, WSE5, WSE6, WSH1, WSH2, WSH3, PWSH1, PWSH4
Alternative A3: Mostly Elevated with NE 145th and NE 185th Stations	SSH3 (<0.1) North Branch Thornton Creek (0.6)	1	0.7 / 0.7	

Table 4.8-3. Summary of Potential Long-Term Impacts on Aquatic Resources, Vegetation and Wildlife, and Wetlands by Segment Alternative

Segment/Alternative	Aquatic Resources[a, b] (acres)	Vegetation / Wildlife[c] (acres)	Wetlands Wetland / Buffer (acres)	Wetlands Affected[b]
Alternative A5: At-grade/Elevated with NE 130th, NE 155th, and NE 185th Stations	SSH3 (<0.1) North Branch Thornton Creek (0.6)	2	0.7 / 1.2	WSE2, WSE3, WSE5, WSE6, WSH1, WSH2, WSH3, PWSH1, PWSH4
Alternative A7: Mostly Elevated with NE 130th, NE 155th, and NE 185th Stations	SSH3 (<0.1) North Branch Thornton Creek (0.6)	1	0.7 / 1.2	
Alternative A10: At-grade/Elevated with NE 130th, NE 145th, and NE 185th Stations	SSH3 (<0.1) North Branch Thornton Creek (0.6)	2	0.7 / 0.7	
Alternative A11: Mostly Elevated with NE 130th, NE 145th, and NE 185th Stations	SSH3 (<0.1) North Branch Thornton Creek (0.6)	2	0.7 / 0.7	
Segment B: Shoreline to Mountlake Terrace				
Alternative B1: East Side to Mountlake Terrace Transit Center to Median	McAleer Creek (0.6) SMT1 (0.6) SSH2 (<0.1)	5	<0.1 / 0.6	WMT3
Alternative B2: East Side to Mountlake Terrace Transit Center to West Side	McAleer Creek (0.6) SMT1 (0.6) SSH2 (<0.1)	11	0.5 / 1.3	WMT3, WMT5, WMT6, WMT7
Alternative B2A: East Side to Mountlake Terrace Transit Center to West Side with Optional 220th Street SW Station	McAleer Creek (0.6) SMT1 (0.6) SSH2 (<0.1)	11	1.7 / 0.9	WMT3, WMT5, WMT6, WMT7
Alternative B4: East Side to Mountlake Terrace Freeway Station to Median	McAleer Creek (1.0) SSH2 (<0.1)	3	0.1 / 0.7	WSH5, WMT1, WMT2
Segment C: Mountlake Terrace to Lynnwood				
Alternative C1: 52nd Avenue West to 200th Street SW (Option 1—Median)	Scriber Creek (0.3)	1	<0.1 / 0.5	WLY4
Alternative C1: 52nd Avenue West to 200th Street SW (Option 2—West of I-5)	Scriber Creek (0.3)	1	<0.1 / 0.9	WLY3, WLY4
Alternative C2: 52nd Avenue West to Lynnwood Transit Center (Option 1—Median)	Scriber Creek (N/A)[d] SLY1 (0.1)	<1	0.9 / 0.5	WLY4
Alternative C2: 52nd Avenue West to Lynnwood Transit Center (Option 2—West of I-5)	Scriber Creek (N/A)[d] SLY1 (0.1)	1	1.0 / 0.9	WLY3, WLY4
Alternative C3: Along I-5 to Lynnwood Park-and-Ride (Option 1—Median)	Scriber Creek (N/A)[d] SLY1 (0.1)	1	0.2 / 0.5	WLY4, PWLY1

Table 4.8-3. Summary of Potential Long-Term Impacts on Aquatic Resources, Vegetation and Wildlife, and Wetlands by Segment Alternative

Segment/Alternative	Aquatic Resources[a, b] (acres)	Vegetation / Wildlife[c] (acres)	Wetlands Wetland / Buffer (acres)	Wetlands Affected[b]
Alternative C3: Along I-5 to Lynnwood Park-and-Ride (Option 2—West of I-5)	Scriber Creek (N/A)[d] SLY1 (0.1)	2	0.2 / 1.0	WLY3, WLY4, PWLY1

[a] The potential for adverse effects on aquatic resources is indicated by the acres of project footprint within each local jurisdiction's regulatory buffer area for specified streams.

[b] Streams (other than Thornton Creek, McAleer Creek, and Scriber Creek), wetlands, and potential wetlands (i.e., wetlands outside of the field reconnaissance survey area that were identified via existing documentation and from public vantage points) are identified with alphanumeric codes: SYYn and WYYn. S stands for stream and W stands for wetland; YY = two-letter code for local jurisdiction (SE = Seattle, SH = Shoreline, MT = Mountlake Terrace, LY = Lynnwood); n = sequential identification number.

[c] For the reasons identified in the discussion of long-term effects above, the potential for adverse effects on vegetation and wildlife is indicated by the acres of project footprint that overlap with areas classified as Forest land cover.

[d] N/A = Not applicable. The portions of Scriber Creek that would be crossed by Alternatives C2 and C3 are within the wetland complex and have no defined channel. As such, no buffers could be applied to these streams for GIS analysis. Stream buffer impacts are described qualitatively in the accompanying text. The *Ecosystem Resources Technical Report* provides additional detail.

No Build Alternative

The No Build Alternative would not have any direct long-term impacts on ecosystem resources. Conversely, implementing the No Build Alternative would not have beneficial effects over the long term. The potential environmental benefits that would not be realized under the No Build Alternative include reduced motor vehicle traffic in the region; possible improvements for past impacts or poorly functioning environmental features along the corridor that have degraded wetlands, streams, and regulatory buffers; as well as more concentrated residential and commercial development in planned growth centers. Land development in areas away from such centers could contribute to the degradation or loss of high-value habitat or wetlands in outlying and rural areas.

Segment A Alternatives

All six alternatives for Segment A would cross the North Branch of Thornton Creek and Stream SSH3 at the same locations and would, therefore, affect equal amounts of the streams' regulatory buffers (see Table 4.8-3). Based on the condition of the riparian habitat in both buffers (and the fact that Stream SSH3 is entirely within culverts in the area of impact), the potential for adverse effects would be minimal.

Similarly, the six alternatives would affect similar amounts of Forest cover, ranging between 1 and 2 acres. All affected areas would be immediately adjacent to the I-5 corridor. Therefore, impacts on these areas would not be expected to result in adverse effects on vegetation or wildlife resources in the study area.

All six Segment A alternatives have the potential to affect nine wetlands (Wetlands WSE2, WSE3, WSE5, WSE6, WSH1, WSH2, WSH3, PWSH1, and PWSH4), totaling 0.7 acre. Most affected wetland and buffer areas are within the WSDOT

right-of-way; they are degraded, vegetated by invasive species, and disconnected to other habitats by roadways and development.

Segment B Alternatives

Alternatives B1, B2, and B2A would cross a piped portion of the main stem of McAleer Creek at the same location immediately east of I-5 and would affect approximately equal amounts of the regulatory buffer for that stream and its two tributaries in the study area. Alternative B4 would cross an open segment of McAleer Creek where it exits the culvert under I-5 and would affect more of the stream's buffer than the other alternatives. Alternative B4 would not affect Stream SMT1 or any of its buffer areas, however, because the alternative would enter the I-5 median south of the existing Mountlake Terrace Park-and-Ride.

Alternatives B2 and B2A would affect approximately 11 acres of Forest cover (including some in a location that the Washington Department of Fish and Wildlife [WDFW] has identified as a priority habitat area) compared to 5 acres under Alternative B1. Alternative B4 would affect only 3 acres of Forest cover because it would enter the I-5 median south of the Mountlake Terrace Freeway Station and avoid the forested habitat to the north. Potential adverse effects of alignments in forested areas under these alternatives would include habitat loss and an increased risk of introducing or spreading invasive species. As noted in the general discussion of long-term impacts above, the risk of disturbance to wildlife due to increased human access, noise, and light would be low because the affected areas currently have high noise levels and low habitat value. The risk of introducing or spreading invasive species would be minimized by replanting and by implementing best management practices (BMPs) during project construction to avoid, reduce, and control new infestations of noxious weeds.

Of all the Segment B alternatives, Alternative B1 would affect wetlands and associated buffers the least, followed by Alternative B4 because both are largely in the freeway median. Alternative B2A would have the most wetland and buffer impacts. Most impacts would occur along the edges of wetlands and buffers, except for Alternatives B2 and B2A. Alternative B2 would cross over much of the second largest wetland in the study area (Wetland WMT6). The 220th Street SW Station under Alternative B2A would affect Wetlands WMT5 and WMT6 in their entirety. Alternative B1 would affect one wetland (Wetland WMT3); Alternative B4 would affect three wetlands (WSH5, WMT1, and WMT2); and Alternatives B2 and B2A would affect four wetlands (WMT3, WMT5, WMT6, and WMT7). All of the Segment B impacts are to lower quality wetlands. Alternative B2A would affect most of one of these wetlands, which increases the relative level of impact.

Segment C Alternatives

Although the Segment C alternatives and options would cross the Scriber Creek wetland complex at different locations, their impacts on Forest and Shrub cover would be similar. Under all three alternatives, habitats in the Scriber Creek wetland complex would be spanned by elevated guideways, minimizing the potential for adverse effects. Option 2 of Alternative C3 would affect more Forest cover than the other alternatives and options. Most of the affected area would consist of a strip of Forest along I-5 east of 52nd Avenue West. The current habitat value of this strip is limited by its narrow, linear shape and its location between I-5 and adjacent commercial development.

Scriber Creek, the Scriber Creek wetland complex (Wetland WLY4, a Category II wetland), and associated buffers would be affected by all of the Segment C alternatives (Table 4.8-3). Alternative C1 would have the least impact, crossing a small portion along the northern edge. Alternative C2 (both Options 1 and 2) would have the greatest impact, crossing through the middle of Wetland WLY4 where Scriber Creek lacks a defined channel. Impacts to the wetland complex could adversely affect juvenile salmonids that rear and overwinter in wetland habitats adjacent to Scriber Creek. Alternative C3 would also affect Wetland PWLY1. For each of the Segment C alternatives, Option 2 would have greater impact on wetlands than Option 1 because Option 2 would affect a small (less than 0.1 acre) portion of Wetland WLY3. Under any of the Segment C alternatives, the amount of stream or stream buffer affected under Option 1 and Option 2 would be the same. Under all three alternatives, long-term ground alteration to the wetlands would be minimized by the use of elevated guideway in which only piers would be constructed in the wetland.

4.8.3 Construction Impacts

Construction impacts would be temporary and limited to the period during and immediately following project construction. The conceptual level of design and the footprints of the light rail alternatives include some assumptions and buffers for construction activities and staging areas (some of which are assumed to be located within the project's footprint and are therefore identified as permanent impacts). Although detailed construction limits are not defined at this early phase in the project design, potential construction limits have been estimated near streams, stream buffers, wetlands, and wetland buffers. These consist of areas where temporary impacts could extend beyond the analytical buffer defined for the analysis of long-term impacts. Additional staging areas could be identified later by the contractor, if needed.

For aquatic species and habitat, earthwork and equipment associated with project construction could introduce sediment and contaminants (e.g., fuel or hydraulic fluids) to streams downstream of the project. Within each project segment, aquatic

resources would be at risk during construction based on the total amount of ground-disturbing activity within each basin. Construction work within stream buffers would have the highest risk of delivering sediment and pollutants to those streams. Estimated construction impacts on stream buffers are summarized in Table 4.8-4. Under all light rail alternatives, the potential for adverse effects on aquatic species and habitat would be minimized by ensuring that work conditions and activities comply with the required project permits, and by implementing BMPs designed to avoid or minimize the delivery of construction-related sediment and contaminants to streams.

Table 4.8-4. Summary of Potential Construction Impacts on Aquatic Resources and Wetlands by Segment Alternative

Segment/Alternative	Aquatic Resources[a] (acres)	Wetlands Wetland / Buffer (acres)	Wetlands Affected
Segment A: Seattle to Shoreline			
Alternative A1	0.0	0.0	See Table 4.8-3 for permanent impacts, which include construction.
Alternative A3	0.0	0.0	
Alternative A5	0.0	0.0	
Alternative A7	0.0	0.0	
Alternative A10	0.0	0.0	
Alternative A11	0.0	0.0	
Segment B: Shoreline to Mountlake Terrace			
Alternative B1	McAleer Creek (0.4) SMT1 (0.2)	<0.1 / 0.4	WSH5, WMT3
Alternative B2	McAleer Creek (0.4) SMT1 (0.2)	0.2 / 0.6	WSH5, WMT3, WMT5, WMT6
Alternative B2A	McAleer Creek (0.4) SMT1 (0.2)	<0.1 / 0.4	WSH5, WMT3
Alternative B4	0.0	0.0	-
Segment C: Mountlake Terrace to Lynnwood			
Alternative C1 (with Option 1)	Scriber Creek (0.1)	<0.1 / 0.2	WLY4
Alternative C1: (with Option 2)	Scriber Creek (0.1)	<0.1 / 0.2	WLY4
Alternative C2: (with Option 1)	Scriber Creek (N/A) SLY1 (<0.1)	0.3 / 0.1	WLY4
Alternative C2: (with Option 2)	Scriber Creek (N/A) SLY1 (<0.1)	0.3 / 0.1	WLY4
Alternative C3: (with Option 1)	Scriber Creek (N/A) SLY1 (<0.1)	0.1 / 0.2	WLY4, PWLY1
Alternative C3: (with Option 2)	Scriber Creek (N/A) SLY1 (<0.1)	0.1 / 0.2	WLY4, PWLY1

[a]The potential for construction-related effects on aquatic resources is indicated by the estimated construction area within each local jurisdiction's regulatory buffer area for specified streams. The *Ecosystem Resources Technical Report* provides additional detail (see Appendix D).

The use of artificial lighting in association with nighttime construction could affect fish in study area streams. Changes in nighttime light conditions may alter migratory behavior or affect predation rates on juvenile salmonids.

For vegetation and wildlife, Sound Transit assumes that the temporary construction impacts on habitat under each alternative would be proportionate to the amount estimated for long-term impacts. In other words, alternatives with greater amounts of long-term impacts would likewise be expected to have greater amounts of temporary impacts. Vegetation and wildlife habitat would be temporarily affected by clearing for the project's permanent facilities as well as for access roads and equipment storage areas. Wildlife species near the project corridor could be affected by noise, vibration, dust, dirt, light, and the clearing and grubbing of the landscape along the alignment. As with the long-term impacts described in Section 4.8.2, there would be a low risk of disturbance to wildlife from human access, noise, and light during construction because the affected areas currently have high noise levels and low habitat value.

Wetlands could incur temporary loss, or wetlands and buffers could be degraded by construction-related activities, such as vegetation clearing and temporary site grading and filling for access. Estimated construction impacts on wetlands and wetland buffers are summarized in Table 4.8-4.

Temporary construction impacts on the function of wetlands could occur for all light rail alternatives. Wetland functions could be affected by soil compaction, accidental spills of hazardous substances, noise and human-caused disturbance, potential increase of sediment input, and introduction of invasive species.

4.8.4 Indirect and Secondary Impacts

Under any of the light rail alternatives, the potential for development near stations to adversely affect ecosystem resources would be limited by several factors. All proposed stations would be located in areas that are already densely developed. Any new development in these areas would be subject to review under local Critical Areas Ordinances. This review would trigger the implementation of mitigation measures and practices aimed at avoiding or minimizing the potential for adverse effects on wetlands, aquatic species and habitat, and other natural resources such as fish and wildlife habitat conservation areas.

Indirect impacts also include potential interference with possible future habitat restoration projects. For example, the presence of guideways, stations, or other facilities near streams could affect the potential replacement of existing fish passage barriers by limiting options for locations and types of fish-passable crossing structures. In most locations, the potential for construction of the light rail alternatives to interfere with possible future fish habitat restoration projects would be minimal because project features would be designed and located to avoid streams. However, it is possible that construction of an elevated guideway for Alternatives B1, B2, or B2A could limit options for future habitat restoration projects at the crossing of Stream SMT1. The

design of any future stream habitat restoration projects at that location could be complicated by the presence of support columns for the elevated guideway.

4.8.5 Cumulative Impacts

Past actions and development have greatly changed the landscape in the study area and surrounding vicinity. Present and reasonably foreseeable future actions, including other transportation or infrastructure projects and other planned or pending land use actions or developments in the project vicinity, could contribute to cumulative impacts on ecosystem resources in the study area. Not all reasonably foreseeable actions have the potential to result in adverse effects on the environment. For example, WSDOT and WDFW formed a cooperative program in 1991 to inventory and assess fish passage barriers on WSDOT facilities statewide. Culvert replacement and retrofitting projects through that program may improve fish access to streams in the study area. Sound Transit would coordinate its light rail facility design with WSDOT to avoid conflicts with these projects.

Several proposed site development projects could have some effect on ecosystem resources in the study area. These include a site in Mountlake Terrace south of 236th Street SW and the Mountlake Terrace Transit Center that is envisioned by the City of Mountlake Terrace to accommodate higher-density development. The Edmonds School District master plan includes developing a bus base and administration center north of I-5 and east of 52nd Avenue West in Lynnwood. Construction of this facility could affect ecosystem resources such as the Scriber Creek wetland complex. Sound Transit is considering a Link Operations and Maintenance Satellite Facility alternative in the same area. This proposed facility would largely be built on previously developed parcels but a portion would extend into the Scriber Creek wetland complex. The impacts of one or potentially both of these projects may include loss or degradation of vegetation, wildlife habitat, streams, wetlands, and associated buffer areas. These impacts would be both short term (e.g., temporary disturbance during construction) and long term (e.g., conversion of vegetated areas to impervious surface).

The potential would be limited for future projects to adversely affect aquatic species, aquatic habitat, vegetation, wildlife, or wetlands in the study area. Any projects or land use actions would be subject to regulatory review and/or permitting under federal, state, and local regulations. Those review and permitting processes would trigger the implementation of measures to avoid or minimize impacts on ecosystem resources. Such processes would also provide compensatory mitigation for any unavoidable impacts on streams, stream buffers, wetlands, or wetland buffers. If combined with the effects of the Lynnwood Link Extension, there would be higher cumulative effects on ecosystem resources than if the impacts of each project were considered on its own. However, if avoidance and mitigation measures such as

those described below are applied for all projects, the effects would be reduced. Coordination among the project proponents could also help to reduce impacts.

4.8.6 Potential Mitigation Measures

Sound Transit's policy on ecosystem mitigation is to avoid impacts on environmentally sensitive resources as much as possible, and to provide adequate mitigation for unavoidable impacts to ensure no net loss of ecosystem function and acreage as a result of agency projects. Mitigation for ecosystem impacts is based on a hierarchy of avoiding, minimizing, and compensating for unavoidable adverse impacts. The design of the Lynnwood Link Extension incorporates avoidance and minimization techniques.

Further, under any of the light rail alternatives, Sound Transit would comply with standard BMPs and applicable federal, state, and local mitigation requirements during design, construction, and post-construction activities. A summary of BMPs that would be applied to avoid and minimize impacts on ecosystem resources are identified below. Additional details are provided in the *Ecosystem Resources Technical Report*.

Construction Best Management Practices

Sound Transit or its construction contractor would implement construction BMPs that would apply to all work in or around sensitive areas.

Sound Transit or its construction contractor would work within construction limits marked with fencing and signage to prevent unintended impacts on riparian vegetation, wetlands, woodlands, and other sensitive sites outside of the construction limits.

Sound Transit or its construction contractor would develop a temporary erosion and sediment control (TESC) plan that would be implemented and monitored during construction to address potential erosion during construction. Examples of BMPs that would be implemented under the TESC plan include silt fences; protective ground covers such as straw, plastic sheeting, or jute mats; and straw bales in drainage features. BMPs would limit soil compaction in sensitive areas, and temporary work bridges could be used in extremely sensitive areas, such as the Scriber Creek wetland complex.

BMPs would be employed for fish and aquatic habitat protection. If a Hydraulic Project Approval (HPA) is required, all work would comply with the terms and conditions set forth in the HPA issued by WDFW for the project. Seasonal restrictions (i.e., work windows) would apply to work conducted below the ordinary high water mark. If any culverts need to be installed or extended on fish-bearing or potentially fish-bearing streams, design and construction would comply with WAC 220-110-070 regarding fish passage requirements. To reduce the risk of adverse effects on migrating salmonids, Sound Transit would require construction

contractors to direct lighting away from fish-bearing waters and to place hoods or shields on lights, as needed, to minimize the amount of backlight or dispersed light cast toward the water's surface. Any affected streambeds and stream banks would be restored after in-water work.

For water quality protection, the project would obtain a construction stormwater general permit under the National Pollutant Discharge Elimination System (NPDES) permit program to reduce or eliminate stormwater pollution and other impacts on surface waters. The project would also develop a construction stormwater pollution prevention plan that implements BMPs for identifying, reducing, eliminating, or preventing sediment and erosion problems on site. The construction stormwater pollution prevention plan would include a TESC plan; spill prevention, control, and countermeasures plan; concrete containment and disposal plan; dewatering plan; and a fugitive dust plan.

Measures would be implemented before and during project construction to avoid or minimize effects on vegetation and wildlife resources. Examples of these strategies are minimizing vegetation clearing, restoring temporarily affected areas, preparing and implementing a revegetation plan, and implementing construction methods to avoid impacts on migratory birds. In accordance with the Migratory Bird Treaty Act, Sound Transit would consult with the U.S. Fish and Wildlife Service on measures to avoid impacts on migratory birds. Sound Transit would also implement appropriate measures to minimize the risk of introduction and spread of noxious and invasive species, including restoring temporarily disturbed areas immediately following construction in each project segment.

Design and Operation Best Management Practices

Sound Transit would also implement design and operation BMPs for permanent stormwater runoff treatment and flow control. These could include natural or engineered dispersion BMPs; biofiltration BMPs such as vegetated filter strips, biofiltration swales, or ecology embankments; wet-pool BMPs; and infiltration BMPs. The project would route drainage to maintain existing stream basin contributing areas.

Compensatory Mitigation

To the extent that impacts cannot be avoided or adequately minimized through BMPs, Sound Transit would implement additional measures to reduce adverse effects, as well as provide compensatory mitigation measures where adverse effects are unavoidable. Sound Transit has committed to achieving no net loss of wetland functions and wetland areas on a project-wide basis. Long-term impacts on wetlands and wetland buffers would be mitigated through the use of available approved mitigation banks, the King County in-lieu fee program, or project-specific mitigation

developed by Sound Transit. Compensatory mitigation would be implemented in accordance with applicable federal, state, and local requirements and guidelines. Mitigation for unavoidable impacts on other resources (e.g., streams, stream buffers, and wildlife habitat) that are protected under local critical areas ordinances would also be provided in accordance with the requirements of those ordinances. Current potential sites under consideration for project-specific mitigation are described below.

North Seattle Community College Campus

Various opportunities may be present on the North Seattle Community College Campus for wetland restoration and enhancement, although other projects proposed in the vicinity may reduce the area available.

City of Seattle or Seattle Public Utilities Potential Projects

Sound Transit could fund projects identified by Seattle Public Utilities on Seattle-owned property, such as at the confluence of the North Branch and South Branch of Thornton Creek (near 35th Avenue NE and NE 110th Street), or near the South Branch Thornton Creek riparian corridor northeast of NE 103rd Street/5th Avenue NE.

Jackson Park Golf Course/5th Avenue NE

Potential wetland and riparian mitigation could be constructed along the east side of the 5th Avenue NE right-of-way and the Jackson Park Golf Course, particularly along North Branch Thornton Creek.

NE 155th Street Station Vicinity

Wetland creation may be possible south of the new NE 155th Street Station near the proposed stormwater pond in the vicinity of Wetlands PWSH4 and PWSSH5.

Ballinger Lake Golf Course

The City of Mountlake Terrace will be transitioning the Ballinger Lake Golf Course to a passive park/open space, which could create wetland restoration opportunities.

Scriber Creek Wetland Complex (Wetland WLY4)

Wetland and stream mitigation opportunities are present in the Scriber Creek vicinity near the Lynnwood Transit Center on parcels that are under both public and private ownership, including parcels that could be acquired by Sound Transit because they intersect with areas needed for the light rail right-of-way. These mitigation opportunities may include wetland creation, restoration, or enhancement.

4.9 Water Resources

This section discusses how the project would potentially affect water resources. The discussion covers surface water quality, stormwater runoff volumes, drainage systems, shorelines, floodplains, and construction stormwater management.

4.9.1 Affected Environment

The study area for the water resources analysis comprises the stream basins that would be crossed by the project, as shown on Figure 4.9-1.

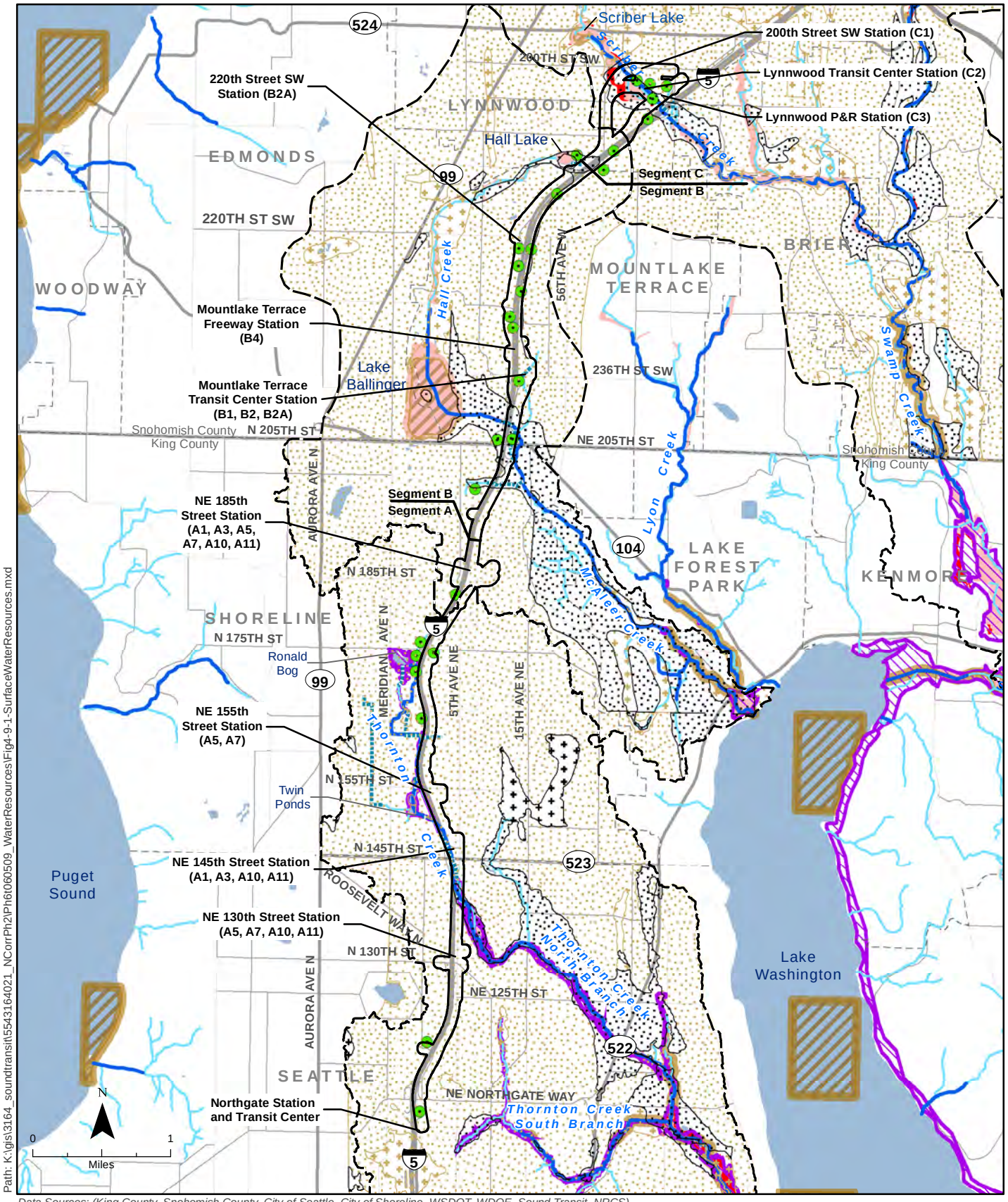
Natural Water Bodies

The surface water in the study area discharges to one of three urban stream basins: Thornton Creek, Lake Ballinger/McAleer Creek, and Swamp Creek—all of which are located in Water Resource Inventory Area (WRIA) 8 (Lake Washington/Cedar/ Sammamish Watershed). In general, the lakes and streams in the study area have been affected by the surrounding urban environment, and all of the streams have reaches that are channelized and/or piped.

Thornton Creek Basin

Most of Segment A would be located in the Thornton Creek Basin, from the southern starting point at Northgate to the northern boundary of the stream basin at approximately NE 185th Street (see Figure 4.9-1). In the study area, the Thornton Creek Basin contains the following water bodies:

- Thornton Creek: The southern part of the study area is near the Thornton Creek South Branch, also known as Maple Leaf Creek. The study area also crosses the Thornton Creek North Branch just south of NE 145th Street, and remains near the North Branch up to about North 176th Street. Thornton Creek collects stormwater from large sections of Shoreline and north Seattle, where the majority of the land is impervious. The creek has several sections in culverts and is on Ecology's 303(d) list of impaired water bodies for non-compliance with temperature, dissolved oxygen, and fecal coliform bacteria standards. However, there is strong public interest in returning the creek to a more natural state and some sections have been restored already, including segments around Northgate Mall.
- Twin Ponds: These created ponds, which together comprise about 4 acres, are located near NE 155th Street in Shoreline to the west of the project. They are not on Ecology's 303(d) list of impaired water bodies.



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Data Sources: (King County, Snohomish County, City of Seattle, City of Shoreline, WSDOT, WDOE, Sound Transit, NRCS)

- Project Area
- City Boundary
- County Boundary
- Study Area Stream Basin
- Waterbody
- Fish Presence
- Open Stream
- Piped Stream
- Ecology 303(d) Listed Waterbody
- Existing Stormwater Facility

Floodplain

- 100 Year (Federal)
- 500 Year (Federal)
- City floodplain

Hydrologic Soil Group

- A: High Infiltration
- B: Moderate Infiltration
- C: Low Infiltration
- D: Minimal to No Infiltration

Note: County floodplains lie within the boundaries of the federal floodplain areas. Therefore, county floodplains are not visible on this figure.

Figure 4.9-1
Water Resources
Affected Environment

Lynnwood Link Extension

- Ronald Bog: Ronald Bog is a 7.7-acre pond/wetland complex near NE 175th Street in Shoreline. It is not on Ecology's 303(d) list of impaired water bodies.

Lake Ballinger/McAleer Creek Basin

In the study area, the Lake Ballinger/McAleer Creek Basin contains the following water bodies:

- McAleer Creek: This creek system begins at Hall Lake in Lynnwood, flows south through Hall Creek to Lake Ballinger by way of Edmonds and Mountlake Terrace, and becomes the McAleer Creek West Tributary through Shoreline. The creek is fish-bearing, with multiple piped segments, and has flooding problems near Hall Creek and Lake Ballinger. Part of the creek near Lake Washington is on Ecology's 303(d) list of impaired water bodies for non-compliance with dissolved oxygen and fecal coliform bacteria standards.
- Lake Ballinger: Lake Ballinger is a relatively shallow 104-acre lake near the southern border of Edmonds and Mountlake Terrace. Lake Ballinger's water levels are controlled by an outlet weir, although flooding of homes surrounding Lake Ballinger is a continuing problem during large storm events. Drainage downstream in McAleer Creek is constrained by a 60-inch pipe that is too small to accommodate flows and results in continued flooding problems in the creek during large storms. While the lake is fish-bearing and supports other wildlife, it is on Ecology's 303(d) list for non-compliance with dioxin and polychlorinated biphenyl (PCB) standards.

Swamp Creek Basin

Within the Swamp Creek Basin, only Scriber Creek is in the study area. Scriber Creek begins above Scriber Lake in Lynnwood and flows downstream to a large wetland near the Lynnwood Transit Center, goes under I-5 in a pipe, and then flows through forested wetland to Swamp Creek. Scriber Creek is not on Ecology's 303(d) list of impaired water bodies.

Stormwater Infrastructure

In the study area, most of the surface stormwater is collected by piped municipal systems. The largest system is in the I-5 right-of-way and features pipes and roadside ditches, media filter drains, stormwater ponds, and vaults. The locations of existing water quality and flow control facilities (WSDOT and municipal) in the proposed project vicinity are presented in Figure 4.9-1. A detailed list of the existing facilities is provided in Appendix I-4.9, Water Resources.

Land Use

Next to the proposed project is a mixture of urban residential, commercial, and vegetated areas. The impervious (hard) surfaces along the study area are a fairly even mix of pollution-generating roadway and parking areas, with non-pollution-generating surfaces that typically include roofs and sidewalks. Sound Transit reviewed the existing land cover within 100 feet of the light rail alternatives to establish existing conditions and estimate potential changes in runoff flow volumes and pollutant loads with the project.

Infiltration

Figure 4.9-1 shows the hydrologic soil groups in the study area. The most common group is Type C, which is predominantly till-type soil that has a low infiltration and a high runoff potential. Type C soils are generally not compatible with stormwater management facilities that require surface water to infiltrate, which includes many low impact development (LID) approaches. Other soil groups in the study area are Types A and B, which have high to moderate infiltration potential, respectively, and are generally compatible with many types of LID stormwater facilities. There are also areas of Type D soils, which are typically saturated areas that do not allow percolation of additional surface water. Details regarding soil types and locations within each hydrologic soil group are presented in Appendix I-4.9.

Shorelines

Ecology has delegated authority to regulate designated shorelines in the study area to the Cities of Seattle, Shoreline, Mountlake Terrace, and Lynnwood. Lake Ballinger is the only water body in the study area with a state-designated shoreline, but it is not a shoreline of statewide significance. Around the shoreline of Lake Ballinger and its associated wetlands, the City of Mountlake Terrace requires prior approval and permits for larger development.

Floodplains

Federal floodplains, county flood hazard areas, and city flood hazard areas within the study area are shown on Figure 4.9-1. Thornton Creek, McAleer Creek, and Scriber Creek all have floodplains that extend beyond their banks in the vicinity of the proposed project. In addition to requiring the flood storage and conveyance capacity of the flood zones to be maintained, local governments in the study area generally prohibit certain types of construction and activities in their flood zones, require preservation of wetlands or other natural flood storage features, and require floodproofing for construction. Flood zone designation details for each study area jurisdiction and applicable floodplain regulations are presented in Appendix I-4.9.

4.9.2 Long-Term Impacts

This subsection identifies potential long-term impacts from the project alternatives.

No Build Alternative

Under the No Build Alternative, light rail would not be extended to Lynnwood and the associated changes to the landscape within the study area would be avoided. As a result, there would be no direct impacts from the project.

Impacts Common to the Light Rail Alternatives

The light rail alternatives are all similar in structural components, operational activities, and general alignment locations at the stream basin level. Therefore, each light rail alternative poses similar types of potential risks to water resources, but in some cases in varying degrees.

Through continued project design and development in compliance with stormwater management regulations, Sound Transit would minimize potential risks to water resources. Examples of measures to control risks include minimizing impervious footprints, avoiding the placement of project elements in or near water resources where possible, and installing appropriate surface water management facilities. Sound Transit's *Link Design Criteria Manual* (Sound Transit 2012b) requires stormwater facilities for its projects to conform to the requirements of local jurisdictions.

Chapter 30 of Sound Transit's *Link Design Criteria Manual* emphasizes sustainability measures, including LID as a preferred stormwater management method, if appropriate and feasible. Also, the 2012 Ecology *Stormwater Management Manual for Western Washington* requires LID approaches to stormwater management to the extent feasible. Some areas of the corridor, however, may necessitate other approaches based on site conditions. Additional water resource regulations applicable to the project area and potential stormwater management approaches that could be implemented by the project are discussed in Appendix I-4.9.

Surface Water

The potential risks the project would pose to surface water are summarized in Tables 4.9-1 and 4.9-2 for each project segment. To evaluate these risks, Sound Transit considered:

- Increases in impervious surfaces: Impervious surfaces increase runoff volumes that can escalate flooding and flow frequencies, which in turn can contribute to stream erosion. In addition, impervious areas subject to vehicular traffic and other pollution-generating activities accumulate contaminants that are transported to water bodies by stormwater runoff.
- Proposed BMPs: LID strategies will be considered in addition to water quality and flow control facilities.

- Use of at-grade versus elevated structures: At-grade areas would be slightly wider than the elevated guideway structures and result in more impervious surfaces, pose more risk of direct conflict with municipal stormwater management facilities, and require more alteration of surface grade areas and flow paths.
- Stream crossings: All stream crossings would be elevated, but columns in and around stream buffers can pose a risk to buffer quality.
- Use of the I-5 median: The project would require less vegetation removal if the guideway were placed in the I-5 median.
- Type and size of parking facilities: Some alternatives would add more parking facilities and associated pollution-generating impervious areas than other alternatives. However, most of the proposed parking facilities would be located in areas of existing vehicular use, such as existing roadways and street-side parking. Parking garages also reduce the amount of pollution-generating impervious surfaces compared to surface lots with a similar parking capacity. They would be designed to incorporate stormwater management features.

Given Sound Transit's commitment to design the project to meet the stormwater management requirements of each jurisdiction and to comply with applicable permit requirements, the light rail alternatives are not expected to adversely affect surface waters.

Table 4.9-1. Surface Water: Comparison of Alternatives

Segment/ Alternative	Impervious Increase	Proposed BMPs	At-Grade Portions	Stream Crossings	Additional Considerations
Segment A: Seattle to Shoreline					
Alternative A1	About 30 acres	Detention ponds; infiltration ponds	Highest amount of at-grade portions	Elevated over Thornton Creek crossing south of NE 145th Street	Includes reconstruction of NE 117th Street bridge; largest NE 145th Street Station footprint
Alternative A3	About 27 acres	Same as A1	Lowest amount of at-grade portions	Same as A1	Smallest NE 145th Street Station footprint
Alternative A5	About 30 acres	Same as A1	Highest amount of at-grade portions, NE 130th Street Station at-grade	Same as A1	Includes new parking lot at NE 155th Street Station
Alternative A7	About 27 acres	Same as A1	Lowest amount of at-grade portions	Same as A1	Includes new parking lots at NE 130th and NE 155th Street stations
Alternative A10	About 30 acres	Same as A1	Highest amount of at-grade portions, NE 130th Street Station at-grade	Same as A1	Includes reconstruction of NE 117th Street bridge; largest NE 145th Street Station footprint

Table 4.9-1. Surface Water: Comparison of Alternatives

Segment/ Alternative	Impervious Increase	Proposed BMPs	At-Grade Portions	Stream Crossings	Additional Considerations
Alternative A11	About 30 acres	Same as A1	Lowest amount of at-grade portions	Same as A1	Includes new parking lot at NE 130th Street Station; smallest NE 145th Street Station footprint
Segment B: Shoreline to Mountlake Terrace					
Alternative B1	About 10 acres	Infiltration ponds; infiltration trenches; detention vault	Highest amount of at-grade portions	Elevated over McAleer Creek crossings at NE 205th Street/SR 104 and near 237th Street SW	Makes some use of I-5 median alignment
Alternative B2	About 15 acres	Infiltration ponds	Lowest amount of at-grade portions	Elevated over McAleer Creek crossings at NE 205th Street/SR 104 and near 237th Street SW	None of the alignment would be within existing I-5 median
Alternative B2A	About 20 acres	Same as B2	Lowest amount of at-grade portions	Elevated over McAleer Creek crossings at NE 205th Street/SR 104 and near 237th Street SW	None of the alignment would be within existing I-5 median; includes new parking lot at 220th Street SW Station
Alternative B4	About 10 acres	Same as B1	Highest amount of at-grade portions	Elevated over McAleer Creek crossings at NE 205th Street/ SR 104; avoids crossing near 237th Street SW	Makes the most use of I-5 median alignment, including Mountlake Terrace Freeway Station
Segment C: Mountlake Terrace to Lynnwood					
Alternative C1	About 4 acres	Detention pond; detention vaults	All elevated	Smallest crossing footprint over Scriber Creek and associated buffers	200th Street SW Station would be located on mostly existing impervious surface; Option 2 would add more new impervious surface than Option 1
Alternative C2	About 4 acres	Detention ponds; detention vault	All elevated	Largest crossing footprint over Scriber Creek and associated buffers	Lynnwood Transit Center Station would be located on mostly existing impervious surface; Option 2 would add more new impervious surface than Option 1
Alternative C3	About 4 acres	Detention pond; detention vault	All elevated	Moderate crossing footprint over Scriber Creek and associated buffers	Lynnwood Park-and-Ride Station would potentially remove existing impervious surface; Option 2 would add more new impervious surface than Option 1

Table 4.9-2. Estimated Changes in Impervious Surfaces

Project Segment	Total Existing Impervious (acres)			Total Impervious After Project (acres)		
	PGIS[a]	NPGIS[b]	Total	PGIS[a]	NPGIS[b]	Total
Segment A Alternatives	79	11	90	79 to 82	38	117 to 120
Segment B Alternatives	63	5	68	59 to 63	20 to 23	79 to 86
Segment C Alternatives	37	8	45	34 to 35	13 to 14	47 to 49

[a] PGIS = pollution-generating impervious surfaces

[b] NPGIS = non-pollution-generating impervious surfaces

Impervious Surfaces

The project would add both pollution-generating and non-pollution-generating impervious surfaces in the vicinity of the light rail alternatives. Pollution-generating impervious surfaces include parking areas, bus holding areas, and project-associated roads or road realignments. Non-pollution-generating impervious surfaces include the light rail tracks, guideways, and stations. Table 4.9-2 summarizes the range of impervious surface changes that would result from the different alternatives in Segments A, B, and C compared to existing conditions. A discussion of the impervious surface calculation is presented in Appendix I-4.9, including a table and map depicting estimated changes for individual alternatives.

New pollution-generating impervious surfaces would be similar to existing conditions because most of the proposed road segments and parking lots would be located in areas with similar existing uses. However, non-pollution-generating impervious surfaces would increase compared to existing conditions, mostly as a result of the new guideway covering existing grassy right-of-way areas. The increase would not affect groundwater recharge; groundwater is discussed in Section 4.11, Geology and Soils. In some cases, especially in Segment C, existing pollution-generating segments of I-5 and commercial parking areas would be covered by the elevated sections of light rail. From a surface water standpoint, this would convert some land cover from pollution-generating to non-pollution-generating impervious surface (rainwater would be intercepted by the non-pollution-generating guideway rather than the pollution-generating roadway), as shown in Table 4.9-2.

Shorelines

The proposed project design would not alter any areas within regulated shorelines; therefore, no impacts are expected.

Floodplains

All of the light rail alternatives would use elevated guideways to cross water bodies, and columns would be located outside the stream channel floodway or floodplain when it is possible to span these areas. At the Thornton Creek and McAleer Creek crossings, the project guideway should be able to span the narrow floodplains and floodways without columns being placed within their boundaries; therefore, little or no impacts are expected.

In Segment C, the Scriber Creek floodplain is so wide that the project would likely require placement of elevated guideway columns within the floodplain boundaries. Also, the guideway segments in this area would be wider to accommodate the station at the Lynnwood Transit Center and would be supported by pairs of columns rather than a single column in the center. Alternative C1 would cross the least amount of floodplain; this alternative would cross two separate branches of the Scriber Creek floodplain that are 125 feet wide and 60 feet wide, respectively, and would probably place at least one pair of columns within the 125-foot-wide floodplain segment. Alternative C2 would cross the floodplain almost at its widest location of approximately 925 feet, requiring placement of 7 to 9 pairs of columns within the floodplain. Alternative C3 would cross a moderate width of approximately 350 feet of floodplain, which would place 2 or 3 pairs of columns within the floodplain. Placement of columns within the Scriber Creek floodplain would require a Development Permit from the City of Lynnwood, and the project would need to create additional flood storage to fully compensate for storage removed. No adverse impacts are expected.

4.9.3 Construction Impacts

The potential construction-related risks to water resources would be somewhat similar for all light rail alternatives because construction equipment and techniques would be similar. Construction of alternatives with more at-grade portions (see Table 4.9-1) would have more disturbed ground area, with more areas that would require protective measures. The activities that could affect water resources include:

- Earthwork, stockpiling, and material transport: Soil exposed in sloped excavations or fills is especially susceptible to local erosion until vegetation is established. If exposed soil becomes dry, it can be eroded by wind. Loose soil can be carried by water or wind into adjacent stormwater drains and streams. Construction vehicle tires can carry soil onto roadways, where the soil could be carried into ditches or streams during storms.
- Concrete work and paving: The pH in surface water can be increased to levels harmful to fish and wildlife if runoff comes in contact with process water or slurry from concrete work or curing concrete.

- Storm drainage utility work. Changes to municipal systems can cause water quality problems or flooding during construction.
- Over-water work: Construction at stream-crossing locations can pose a direct risk to water quality through pollutant spills, sediment transport, and/or wind deposition of stockpiled materials.
- Construction machinery: Equipment leaks or spills can affect water quality in nearby water resources. Construction-related pollutants can increase turbidity and affect other water quality parameters, such as pH levels and/or the amount of available oxygen in the water.

The risk of construction-related impacts on water resources would be controlled by complying with the NPDES Construction Stormwater General Permit process, the WDFW Hydraulic Project Approval (as required), and applicable guidance manuals. Sound Transit would develop and implement a Construction Stormwater Pollution Prevention Plan to serve as the overall construction stormwater mitigation plan, which would include each of the following plans (further detail in Appendix I-4.9):

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

Potential BMPs include:

- Minimizing the amount of cleared area at a construction site
- Stabilizing construction entrances and haul roads using quarry spalls
- Washing truck tires at construction entrances, as necessary
- Constructing silt fences downslope from exposed soil
- Protecting catch basins from sediment
- Containing and controlling concrete and hazardous materials on site.
- Installing temporary ditches to route runoff around or through construction sites, with periodic straw bales or rock check dams to slow and settle runoff
- Providing temporary plastic or mulch to cover soil stockpiles and exposed soil
- Using straw wattles to reduce the length of unbroken slopes and minimize runoff concentration
- Using temporary erosion control blankets or mulch on exposed steep slopes to minimize erosion before vegetation is established

- Constructing temporary sedimentation ponds to remove solids from concentrated runoff and dewatering before being discharged
- Conducting vehicle fueling and maintenance activities no closer than 100 feet from a water body or ditch
- Implementation of stream protection measures, as necessary, including diverting stream flow around the construction area and limiting the construction period to the required "work window," a period of the year identified in the HPA when fish would be minimally affected

Through compliance with applicable construction permits and the BMPs the permits would incorporate, none of the light rail alternatives would adversely affect water resources during construction.

4.9.4 Indirect Impacts

Future population in Washington is expected to increase, which would likely increase vehicular traffic and put development pressure on many parts of the state. The proposed project could be expected to shift some future vehicle traffic to light rail and reduce vehicle-related stormwater pollutants. The project could also attract residents and increase density in the urban areas, which could protect undeveloped areas in other portions of the watershed from development. Therefore, the proposed project could indirectly offset some adverse impacts on water resources caused by population increases. The project could also support increased development in station areas, but most of these areas are already urbanized.

4.9.5 Cumulative Impacts

Historically, development in the Puget Sound watershed led to discharges of municipal sewage, stormwater runoff, and industrial wastes into local area surface waters. Logging and land clearing resulted in sedimentation in streams, lakes, and marine water bodies. Pesticides and fertilizers used on landscaped areas and contaminated runoff from impervious surfaces made their way into surface water via stormwater runoff. These past and ongoing actions have resulted in poor water quality in many of the water bodies in the study area. Current regulations target point discharge sources; however, new development or redevelopment is required to bring many existing pollution-generating surfaces up to current standards of runoff control in more populated areas of the Puget Sound watershed. Therefore, going forward, small improvements in water quality are expected to occur over time, with or without the light rail project.

If other projects were constructed within the vicinity of the proposed project and within the same timeframe, the cumulative risk of construction-related impacts on water resources would increase.

There are some locations where other large projects could be developed during a similar timeframe and in the vicinity of the light rail alternatives. If Sound Transit's Link Operations and Maintenance Satellite Facility were located at the Lynnwood site, there is the potential for increased impervious surfaces, fill impacts within the Scriber Creek floodplain, and the loss of adjacent wetland or riparian buffer. However, much of the area that would be occupied by the maintenance facility is already developed, and a redevelopment to current stormwater management standards could help improve some existing water quality management problems.

Other areas that could be developed by other projects include the master-planned Edmonds School District support services center, which would include administrative facilities and a school bus base in Lynnwood on a district-owned site that overlaps with a portion of Sound Transit's maintenance facility alternative in Lynnwood. The school district site is partly developed already, but the development could increase pollution-generating impervious surface in the Scriber Creek Basin. The school district project would control risks to water resources by meeting current stormwater management standards of required construction permits; therefore no cumulative impacts are expected.

4.9.6 Potential Mitigation Measures

As previously discussed, the project would be designed to comply with all federal, state, and local regulations, which would control potential risks to water resources through project planning, design, and the application of required BMPs (see Appendix I-4.9). Measures to minimize long-term impacts include LID stormwater facilities; stormwater flow control using detention or filtration ponds or vaults, or dispersion; and water quality treatment using bioretention, vegetated embankments, or media filter vaults. Measures for construction impacts include compliance with the NPDES permit program, and implementing measures defined for the project through its Construction Stormwater Pollution Prevention Plan. With these risks controlled, as described in sections 4.9.2 and 4.9.3, no operational or construction-related adverse impacts on water resources are expected and no mitigation is required.

Cumulative risks to water resources posed by other projects constructed within the vicinity of the proposed project and within the same timeframe would be mitigated by adhering to applicable regulatory standards, the Ecology NPDES Construction General Permit, and the WDFW Hydraulic Project Approval (as required).

4.10 Energy Impacts

This section discusses the project's use of energy for construction and operation, and the potential for indirect and cumulative changes in energy used for regional transportation. Energy use is often expressed in terms of a standard measure known as the British thermal unit (Btu). At the regional scale, the units are counted in the millions to trillions (mBtu or tBtu, respectively).

4.10.1 Affected Environment

With an annual consumption of 2,037 tBtu, Washington consumes more energy than it produces. Of the 2,037 tBtu consumed in 2010 in the state, roughly 55 percent came from fossil fuels (94.9 tBtu from coal, 295.0 tBtu from natural gas, and 738.7 tBtu from petroleum). Renewable energy was the second highest energy source consumed, at approximately 41 percent (834.9 tBtu), and nuclear energy was third at 4 percent (96.6 tBtu) (EIA 2010a). Although Washington is a net energy consumer, the state is a net electricity exporter, with 23.7 tBtu exported from the state in 2010 (EIA 2010b).

In 2010, transportation was the highest end-use energy consumption sector in the state at roughly 30 percent (612.7 tBtu), followed by industrial at 28 percent (564.9 tBtu), residential at 24 percent (478.8 tBtu), and commercial at 19 percent (380.1 tBtu) (EIA 2010a).

The study area for energy is the four-county Central Puget Sound urbanized area (King, Snohomish, Pierce, and Kitsap counties) and its regional transportation network. According to the PSRC travel demand model, which provided the base transportation data used in this analysis, the majority of regional miles traveled are in passenger cars and light trucks. Public transit accounts for less than 1 percent of the regional miles traveled.

When the region's travel demand estimates for a typical weekday are converted to energy consumption, it shows that the region consumes nearly 436,000 mBtu on a typical weekday for vehicular travel. When transit vehicles are included, this usage increases to about 447,000 mBtu. Just as travel varies throughout the day, energy consumption varies, and as traffic operational speeds decrease during traffic congestion, vehicle fuel economies also generally decrease.

The electricity providers along the project corridor are Seattle City Light, Snohomish County Public Utility District (PUD), and Bonneville Power Administration.

4.10.2 Long-Term Impacts

The proposed project's long-term impacts would involve changes in energy consumption for transportation along roadways, as well as changes in energy use by

the public transit system. Table 4.10-1 shows existing transportation energy consumption and estimated 2035 energy consumption for the No Build Alternative and for the combined Lynnwood Link Extension light rail alternatives by vehicle type. Table 4.10-2 shows similar forecasts by the time of day.

Table 4.10-1. Existing (2011) and 2035 Energy Consumption by Travel Mode (mBtu)

Travel Mode	Existing 2011	No Build 2035	Light Rail 2035	Change from No Build 2035
Automobile	293,928	287,088	285,082	-0.70%
Light Truck	47,354	52,488	52,299	-0.36%
Medium Truck	25,445	38,551	38,445	-0.28%
Heavy Truck	69,233	111,726	111,448	-0.25%
Bus	10,735	10,016	9,977	-0.40%
Heavy Rail	93	138	138	0.00%
Light Rail	263	795	964	21.26%
Weekday Daily Total	***447,051***	***500,802***	***498,353***	***-0.49%***

Table 4.10-2. Existing (2011) and 2035 Energy Consumption by Time of Day (mBtu)

Time Period	Existing 2011	No Build 2035	Light Rail 2035	Decrease from No Build 2035
AM Period	83,459	96,082	94,870	-1.26%
Midday Period	156,791	174,437	174,146	-0.17%
PM Period	98,447	113,484	112,557	-0.82%
Evening Period	68,733	74,581	74,479	-0.14%
Night Period	28,529	31,268	31,223	-0.15%
Weekday Daily Total	***435,960***	***489,853***	***487,274***	***-0.53%***

Note: In Table 4.10-2, transit energy use is not included because data from the National Transit Database are not disseminated down to these five time periods.

AM = 6:00 am – 9:00 am; Midday = 9:00 am – 3:00 pm; PM = 3:00 pm – 6:00 pm; Evening = 6:00 pm – 10:00 pm; Night = 10:00 pm – 6:00 am.

No Build Alternative

The transportation energy consumption forecasts for the No Build Alternative account for other planned transportation projects as well as the increased travel demand based on future land use, population, and employment. These forecasts also take into account predicted changes in vehicle fuel consumption as future vehicles become more efficient. Therefore, while overall miles traveled would increase by nearly 25 percent by 2035, energy consumption for transportation would increase by less than half that, or 12 percent.

Light Rail Alternatives

The travel forecasts combined the Segment A, B, and C light rail alternatives to provide a representative prediction of regional travel. Although the individual light

rail alternatives would have some differences in ridership, the changes in roadway operating conditions and travel by mode at the regional level would be statistically the same regardless of the alternative. The light rail alternatives are expected to primarily shift commuters from automobiles and light trucks to light rail as well as from bus transit to light rail. These shifts in travel mode are expected to occur throughout all periods of the weekday, with the most dramatic shifts occurring in the morning and evening peak periods, which is consistent with the typical work commute times. Energy consumption would decrease by about a half of 1 percent as a result of the mode shift as well as the higher operating speeds on roadways, which improve fuel economies for all vehicle classifications.

During final design, Sound Transit would investigate methods of reducing energy use during light rail operations and construction as part of its *Sustainability Plan* and agency-wide sustainability efforts. Sound Transit adopted a Sustainability Initiative in 2007 that promotes and implements more energy-efficient alternatives compared to past practices. According to the initiative, Sound Transit will integrate efficient operating practices at existing and new facilities, use energy-saving equipment to reduce energy demand, and maximize intermodal transit connections to reduce automobile VMT. Many of these practices have been incorporated into the initial Central Link light rail segment that began operating in 2009. The implementation of the Sustainability Initiative would reduce energy consumption during Lynnwood Link Extension construction and operations.

4.10.3 Construction Impacts

Construction effects are temporary or short-term impacts related to the amount of energy that would be required to build the proposed project.

The Lynnwood Link Extension would collectively be composed of an alternative from each segment (A, B, and C). For each of these three segments, Sound Transit estimated the minimum and maximum construction-related energy consumption for the light rail alternatives. These estimates are summarized in Table 4.10-3.

The low estimate for the alternatives with the least construction-related energy consumption (the sum of Alternatives A5, B4, and C3 Option 1) is 5,208,784 mBtu. The high estimate for the alternatives with the highest construction energy use in each segment (the sum of Alternatives A11, B2A, and C3 Option 2) is 6,911,133 mBtu. The alternatives with the highest construction energy use would consume 28 percent more energy than the alternatives with the least construction energy use.

During final design, Sound Transit would identify and implement sustainability measures consistent with its Sustainability Program, which includes a variety of energy-saving protocols and practices.

Table 4.10-3. Light Rail Alternatives Minimum and Maximum Construction Energy Consumption (mBtu) by Segment

Description	Segment A Minimum (A5)	Segment A Maximum (A11)	Segment B Minimum (B4)	Segment B Maximum (B2A)	Segment C Minimum (C3 Option 1)	Segment C Maximum (C3 Option 2)
Length (Miles):	4.5	4.5	3.0	3.0	0.9	0.9
Number of Stations:	3	3	1	2	1	1
Guideway and Track Elements (mBtu)	1,841,488	2,488,132	756,275	1,167,653	539,505	539,505
Stations, Stops, Terminals (mBtu)	486,455	801,875	98,019	422,990	587,666	670,835
Sitework and Special Conditions (mBtu)	247,436	126,980	162,999	195,338	27,862	28,261
Systems (mBtu)	241,079	237,290	155,924	168,197	64,078	64,078
Construction Energy (mBtu)	**2,816,457**	**3,654,277**	**1,173,216**	**1,954,177**	**1,219,111**	**1,302,679**

Note: Estimates are based on preliminary construction cost estimates developed by the project team on September 28, 2012; they do not include change order contingency; right-of-way, land, and existing improvements; vehicles; professional services; unallocated contingency; or high-estimate factor (15 percent).

4.10.4 Indirect and Cumulative Impacts

Given the regional scale of the energy analysis and the scope of the travel demand model used for the analysis, the long-term indirect and cumulative impacts of the proposed project are accounted for in this analysis. The cumulative energy impacts of additional projects, such as the Link Operations and Maintenance Satellite Facility Lynnwood site alternative or the Edmonds School District support services center, would be negligible on the regional scale.

4.10.5 Potential Mitigation Measures

No mitigation measures would be needed for the Lynnwood Link Extension long-term or construction impacts. The light rail alternatives would consume less energy compared with the No Build Alternative because of a shift in travel mode, which would also reduce traffic congestion.

Mitigation for Construction Impacts

Energy used during construction and in the manufacture of construction materials would be irretrievable. However, the proposed project would not adversely affect the continued availability of energy because the scale of the project is negligible when compared to energy production in Washington, the United States, or globally.

Additionally, mitigation measures proposed for transportation and air quality impacts (see Section 3.6 in Chapter 3, Transportation Impacts and Mitigation, and Section 4.6, Air Quality and Greenhouse Gases) would also result in reduced energy consumption during construction.

4.11 Geology and Soils

This section describes the existing geologic conditions that could affect or be affected by the Lynnwood Link Extension, including topography, geology, groundwater, seismicity, and geologic hazards.

4.11.1 Affected Environment

This section discusses the geology and soils in a study area extending 100 feet from the light rail alternatives. Sound Transit also researched the geologic units and soil characteristics in the larger project area by reviewing existing geologic maps and surveys, including geotechnical reports for previous projects in and near the project area. These sources included logs of over 700 borings and test pits completed in or near the study area between 1962 and 2007.

Topography, Regional Geology, Groundwater, and Seismicity

The project would be located within the central Puget Lowland, a north-south trending trough bordered by the Cascade Mountains to the east and the Olympic Mountains to the west. The existing topography and regional geology have been largely shaped by glacial activity.

The regional geology generally includes a thick sequence of glacially consolidated soils overlying bedrock, which is generally 300 feet to 1,600 feet below the ground surface in the project area. Under the weight of the glaciers, the underlying soils became consolidated and are generally very hard or compact. More recent soils have been deposited over the glacially consolidated soils by lake and river actions.

Figure I-4.11-2 in Appendix I-4.11 shows the surficial geology of the project area, and Table I-4.11-1 in the same appendix describes the geologic units and their engineering properties.

Where pervious soils are present at the ground surface, rainfall and snowmelt infiltrate to sustain typical shallow water table or perched groundwater conditions. In upland areas of the project where glacial till is present at or near the surface, the upper portion of the till and/or the thin veneer of overlying sediments can develop perched groundwater conditions because the underlying till has low permeability and water percolates into the till only at very slow rates. Such groundwater occurrences are commonly seasonal, developing through the wet winter months and diminishing or drying out completely during the dry summer months.

Groundwater that percolates into the glacial till moves downward slowly to eventually recharge an aquifer, which is usable as a water resource. However, none of the aquifers present along the project alignment are used for municipal or private water supply.

In some lowland portions of the study area, groundwater occurs throughout the year. Water table conditions typically exist within unconfined aquifers in more permeable soils and are commonly near adjacent streams. Groundwater levels are usually tied to adjacent stream conditions, with levels increasing during the wet winter months and lowering as they feed the streams during drier weather conditions.

The Puget Sound region is seismically active and has experienced numerous earthquakes in the past and will experience earthquakes in the future. The region is located at the convergent continental boundary known as the Cascadia Subduction Zone. Three major types of earthquakes occur in this zone, which contribute to the overall earthquake hazard.

Shallow crustal earthquakes involve movement within the crust of the North American Plate. This movement tends to occur along faults such as the Seattle Fault (9 miles south of the project area) and the South Whidbey Island Fault (3 miles north of the project area); the Seattle Fault last ruptured 1,100 years ago and the South Whidbey Island fault last ruptured 3,000 years ago. Intraplate earthquakes occur within the subducting Juan de Fuca Plate at depths of 20 to 40 miles. Relatively recent intraplate earthquakes include the Olympia 1949, Seattle 1965, and Nisqually 2001 events. Even larger earthquakes involve movement along all or a portion of the Cascadia Subduction Zone and represent the largest anticipated earthquakes for the region; the most recent occurred just over 300 years ago in 1700.

Geologic Hazards

Washington State's GMA (RCW Chapter 36.70A) requires all cities and counties to identify critical areas within their jurisdictions and to formulate development regulations for their protection. The GMA defines critical areas, including geologically hazardous areas, as areas that are susceptible to erosion, sliding, earthquake, or other geological events; therefore, critical areas are not suited to the siting of commercial, residential, or industrial development consistent with public health or safety concerns.

The Lynnwood Link Extension would pass through four cities and two counties, all of which have defined geologically hazardous areas in their respective codes (see Figure I-4.11-1 in Appendix I-4.11, which shows geologic hazardous areas). These geologic hazards include the following:

- Erosion hazard areas (generally encompassing the entire project area), with surficial soils that are prone to erosion if left exposed.
- Steep slope hazard areas, with slopes having grades between 15 and 40 percent, that might move during wet weather or seismic events.
- Landslide hazard areas where past slides have occurred, where the soil types under steep slopes make them unstable, or any areas where the slope is

steeper than 40 percent. There are no known past landslides in the project area.

- Seismic hazard areas subject to earthquake-induced ground shaking or fault displacement. Seismic hazards shown on the maps indicate areas with saturated loose granular soils that can liquefy and become unstable during an earthquake (referred to as liquefaction). The project area is located outside known fault zones; therefore, the risk of fault displacement is low.
- Settlement hazard areas, with soft or loose soils that could experience significant settlement under the weight of new fill or structures.

Sole-Source Aquifers

The project would not be located within an EPA-designated sole-source aquifer area (EPA defines a sole-source aquifer as the primary source for drinking water in a given area). The nearest is Cross Valley Sole-Source Aquifer, which is located at least 3 miles east of the I-5 corridor.

Critical Aquifer Recharge and Wellhead Protection Areas

Aquifer recharge areas restrict developments that could affect sources for groundwater used for potable water supplies. Wellhead protection areas designated by local jurisdictions also help control activities involving potential sources of pollutants. The project would not be located within the boundaries of a King County or Snohomish County critical aquifer recharge or wellhead protection area.

Site Geology

The topography along the entire project corridor was substantially modified during construction of I-5 with engineered cuts and fills to create the existing freeway corridor. The light rail alternative routes within Segments A and B have similar geological conditions, but in Segment C the geology may vary slightly between the alternative routes. Most of the project area is underlain by glacial till and advance outwash. These soils are considered favorable for support of light rail, with good bearing support and little settlement, but several areas also include soils that would be subject to liquefaction. These areas include:

- Near Thornton Creek (south of NE 145th Street in Segment A)
- North and south of the King-Snohomish county line (in Segment B)
- Near Hall Lake (in Segments B and C)
- Near Scriber Creek (Lynnwood Transit Center in Segment C)

4.11.2 Long-Term Impacts

This section summarizes potential long-term operational impacts from the Lynnwood Link Extension and the No Build Alternative.

No Build Alternative

Under the No Build Alternative, the Lynnwood Link Extension would not be constructed. While there may be other localized projects, there are no major projects in the project corridor that would change existing geology and soils conditions.

Impacts Common to All Light Rail Alternatives

The discussion below considers long-term impacts that the proposed project could cause, as well as geologic conditions that could affect the project. Sound Transit anticipates that the overall impacts would be similar among the alternatives.

Insufficient Stability of Earth Slopes and Retaining Structures

Insufficient stability of earth slopes and retaining structures could endanger light rail facilities, light rail passengers, and neighboring properties. Earth slopes could include existing slopes, slopes that are steepened, and slopes for embankment fills. These would generally be areas identified as steep slope and landslide hazard areas. The risk of insufficient slope stability would be greater when a large seismic event occurs.

The overall risk from unstable slopes and retaining structures is low because Sound Transit would evaluate these risks during project design and propose preventive measures, such as increasing the stability of the slope and retaining structures to acceptable levels. If slopes intersect perched groundwater or the water table, the project design would include provision for the collection and drainage of seepage flows to prevent erosion and loss of soils by piping or sloughing that could otherwise compromise long-term slope stability.

Settlement of New Earth Fills

New earth fills would be used in some areas to support light rail structures, but the fills would typically include retaining structures to limit the extent of the fill. The fills would cause increased loads on the soil and could result in settlement of soft soils, which could damage light rail structures as well as existing improvements.

Most of the new earth fills would be located in areas underlain by glacially consolidated soils, which are not expected to experience significant settlement. The light rail alternatives would use elevated structures to cross over most areas underlain by soft soils (wetland deposits, younger alluvium, and recessional outwash), which would reduce the risk of settlement in these areas.

The overall risk of settlement along the project corridor is low. Project design would incorporate measures to improve the soils in locations where the potential for settlement is identified, or would allow tolerances for anticipated settlement.

Seismic Ground Shaking

The project area is located within a seismically active area. Seismic ground shaking during light rail operation would result in increased loading on light rail facilities and movement of the facilities. Seismic ground shaking could also result in liquefaction of loose, saturated, cohesionless soils; settlement from densification of loose soils; increased risk of instability of earth slopes and retaining structures; and increased earth pressures on retaining structures. The areas underlain by soft or loose soils (wetland deposits, younger alluvium, and recessional outwash) are identified as seismic hazard areas because these areas are likely to experience more significant impacts from seismic ground shaking.

These impacts could endanger both light rail facilities and users. However, the elevated light rail and retaining structures would be designed to withstand the effects of seismic ground shaking, thereby minimizing the risks to rail facilities and users. Sound Transit light rail design standards are based on the occurrence of a very rare and large seismic event; therefore, the risk of damage from seismic ground shaking would be low.

Light Rail Facilities

The light rail alignments would include both at-grade and elevated guideway sections. Light rail stations would be either elevated or at-grade. Both elevated guideway structures and light rail stations would likely have shallow foundations (approximately 6 feet to 10 feet deep) or drilled shaft foundations (approximately 40 feet to 60 feet deep).

Retaining structures would be required in many areas along the alternatives routes. Some could require permanent soil anchors that extend beyond the limits of the study area onto adjacent properties, which would require permanent easements and could affect the future use of neighboring properties. Retaining structures can affect or be affected by local groundwater movement and seepage. The retaining structures design would consider groundwater conditions and provide appropriate means of drainage or waterproofing for control of groundwater.

Parking garages and surface lots would be required for some of the station alternatives. Parking structures would likely be supported on shallow foundations (approximately 6 feet to 10 feet deep) or drilled foundations (approximately 30 feet to 50 feet deep); ground improvement may also be used, likely in combination with shallow foundations. Surface lots would be supported at grade.

Surface water runoff from impervious areas such as parking structures and station buildings would be managed using LID BMPs where feasible and practical. These would likely include infiltration facilities that are designed to discharge most or all of the collected stormwater to the ground (after appropriate treatment). Municipalities in Western Washington are required to maximize the use of LID for new projects due to the benefits provided by recharging aquifers, improving the base flow to streams, and reducing the risk of flooding, erosion, and surface water contamination.

The risk of adverse impacts on light rail facilities is low because the design would address potential impacts that could be caused by the geology and/or soils in the project right-of-way. The potential impacts on the light rail facilities would be similar among the alternatives, with slight variances arising from the available space for construction; proximity of existing structures; loads from adjacent slopes (surcharge loading); soil type; and steep slope, settlement, and seismic hazards (particularly liquefaction).

Street and Ramp Realignment

Some light rail alternatives would require realignment of adjacent streets or on-ramps. The realignments would add complexity to the design and construction, particularly related to staging and traffic maintenance. Temporary shoring might be required to complete the realignments. The risk of adverse impacts from the realignment is low because during the design process Sound Transit would address potential impacts from geologic features and soils.

Bridge Replacement

Some light rail alternatives would require replacement of existing WSDOT bridges over I-5. The bridges would be designed to current WSDOT standards and supported on drilled shafts (approximately 60 feet to 100 feet deep). The bridge replacements would add complexity to the design and construction, particularly related to staging and maintenance of traffic. The risk of adverse impacts from the bridge replacements is low because during the design process Sound Transit would address potential impacts that could be caused by the geology and soils.

4.11.3 Construction Impacts

The construction impacts of the Lynnwood Link Extension would be similar for all light rail alternatives because construction equipment and techniques would be similar for most alternatives. Construction activities could cause various geology- and soils-related impacts on a short-term basis. If not properly managed, the short-term construction impacts could become long-term problems.

Erosion

Construction activities could expose soils to rainfall and potential erosion through vegetation removal, excavation and grading, and stockpiling of soils. The risk of erosion is a function of the soil type, slope inclination, presence of perched or shallow groundwater, area of soil exposed, and rainfall intensity. Erosion hazards would be reduced using BMPs that include the following:

- Maintaining vegetation where possible and designing surface water runoff systems to reduce erosion
- Installing silt fences or straw wattles downslope of exposed soil and covering exposed soil with straw, mulch, or plastic sheeting
- Installing temporary erosion control blankets and mulch prior to vegetation reestablishment

Slope Instability and Excavations

Construction would include excavation of temporary and permanent cut slopes, placement of earth embankment fills, and construction of retaining structures. These activities could affect the stability of slopes, particularly in steep slope and landslide hazard areas.

Slopes and retaining structures would be evaluated and designed for adequate stability using several potential techniques, such as limiting slope inclination, limiting surcharge loading, or adding slope reinforcement such as soil nails. Shallow or perched groundwater intersected by cut slopes or other excavations would require drainage to control seepage and prevent it from contributing to slope instability.

Existing soils excavated during construction that cannot be used as structural fill would require removal from the project footprint and disposal elsewhere. Disposal of the material at off-site locations would result in additional truck traffic, dust, and other construction-related impacts.

Table 4.11-1 shows the estimated total cut-and-fill earthwork quantities for the light rail alternatives.

Table 4.11-1. Estimated Earthwork Quantities (in cubic yards)

	A1, A5, A10	A3, A5, A11	B1	B2, B2A	B4	C1	C2	C3
Cut[a]	214,000	83,000	98,000	123,000	92,000	11,000	10,000	9,000
Fill[a]	67,000	32,000	23,000	33,000	54,000	0	0	0

[a] Includes calculations of the areas with cuts or fills needed for elevated or at-grade structures, with a 50 percent addition for station earthwork and a contingency amount reflecting the early stage of design information available.

Seismic Ground Shaking

Seismic ground shaking could occur during light rail construction, and the impacts would be similar to those previously discussed. If a large earthquake occurred during construction, the major risk would be damage to facilities under construction and delay to the project from repair work. The risk of seismic ground shaking is low due to the low probability of an infrequent earthquake occurring during the construction window.

Settlement from Construction Earth Loads

Construction earth loads would occur as a result of temporary stockpiling of earthen materials and placement of new earth for embankments. The risk of settlement from construction earth loads is low. During the design process, Sound Transit would identify areas where soft soils could settle and avoid these areas or take other measures to protect against settlement damage.

Dewatering

Sound Transit does not anticipate dewatering for construction. Drilled shaft foundations are the primary project element that would extend below the groundwater table. Shafts would be completed without the use of dewatering, and may even require the addition of water during installation ("water heading") to prevent heaving conditions at depth.

If dewatering is required, the design process would consider the potential effects of dewatering-induced settlement on nearby structures. Methods to reduce settlement could include using localized dewatering, reinjecting groundwater, using sheet piles for groundwater cutoff, or underpinning nearby structures.

4.11.4 Indirect and Secondary Impacts

Although other developments could occur in the station areas, any new development would be built to meet current design standards and permit requirements. Permanent soil anchors could be used for major structures, which could restrict excavations for new developments within the anchor zone. However, such restrictions would be limited and alternative design remedies could be used.

4.11.5 Cumulative Impacts

A few proposed projects in the project area could alter geologic or soil conditions, including Sound Transit's Link Operations and Maintenance Satellite Facility alternative in Lynnwood and the Edmonds School District's support services center. Both of these projects would require earthwork and other construction-related activities, but these would not result in adverse cumulative impacts.

4.11.6 Potential Mitigation Measures

During final design, Sound Transit would conduct additional geotechnical studies, such as borings and detailed soils analysis, to inform and refine development of construction techniques and mitigation measures to avoid potential impacts and geologic risks during light rail operations. Where appropriate, Sound Transit would use engineering design standards and BMPs to avoid and minimize potential construction impacts from seismic hazards, soft soils, settlement, steep-slope hazards, landslide hazards, erosion and sediment control, vibrations, and groundwater. Typical BMPs for these geologic and soils conditions are discussed earlier in Section 4.11.3.

4.12 Hazardous Materials

This section discusses the potential for the Lynnwood Link Extension alternatives to encounter existing hazardous materials that could pose risks to human health and the environment or that could create control or cleanup requirements for the project. It also discusses the potential for the alternatives to introduce new sources of hazardous materials contamination.

Hazardous materials can be classified in a number of different categories based on laws and regulations that define their characteristics and use. These categories include hazardous waste, dangerous waste, hazardous substances, and toxic substances.

4.12.1 Affected Environment

The hazardous materials study area extends 1/8 (0.125) mile around the light rail alternatives. Contaminated sites within this area are most likely to affect the project. Because of the nature of hazardous materials, pollutants could migrate toward the project from nearby sites. To address this potential risk, Sound Transit considered the physical setting, including geologic, surface water, and hydrologic conditions, and collected regulatory database information about sites with known contamination or potential contamination, as well as relevant historical conditions, within 0.50 mile of the study area. This was a conservative approach to ensure that all hazardous materials sites that could potentially affect the study area were captured in the database review.

Physical Setting

The project corridor is located within the Central Puget Lowland ecoregion, where the existing topography and regional geology have been largely shaped by glacial activity. The terrain in the study area features valleys and hills varying by up to 300 feet in elevation. The region is mostly underlain by Vashon Till, and surface soils in the study area generally consist of a mixture of sands, silts, and gravels of varying thicknesses and occurrences.

Depth to groundwater in the study area can vary considerably. However, monitoring well information and local municipal information indicate that, in general, depth to groundwater ranges from less than 10 feet below ground to approximately 30 feet below ground. Groundwater flow direction is also variable and highly influenced by streams and other surface water features. In general, groundwater flow is relatively flat, with a slight gradient to the west toward Puget Sound in much of the study area.

As noted in Section 4.9, Water Resources, the study area lies entirely within the Lake Washington/Cedar/Sammamish Watershed (WRIA 8), which has the greatest urban development and population density of any watershed in Washington. Contamination issues are a particular concern in areas sensitive to human and ecological health, such as wetlands, floodplains, rivers, and creeks. Within 0.50 mile of the light rail alternatives, these areas include Lake Ballinger, Hall Lake, Hall Creek, McAleer Creek, Thornton Creek, and Scriber Creek.

Hazardous Materials Sites

Sound Transit identified approximately 200 properties with previous records of contamination in or near the study area. While much of the study area is residential, with fewer sites of past contamination, there are areas where businesses or other entities have used hazardous materials. These are mostly along arterials and in areas with commercial, manufacturing, or industrial uses. Sound Transit considered their potential to act as a contaminant source affecting the study area and ranked the sites based on:

- Location of the site (relative to the study area)
- Type and number of database listings
- Occurrence of a known release of a hazardous substance(s) or petroleum product
- Status of cleanup—active, inactive, or unknown; all sites are considered active unless identified as having no further action or inactive status

The site rankings are on a scale of 0 to 5 (lower priority concern to higher priority concern) as defined below.

0 – Identified site is more than 1/8 mile from the study area.

1 – Identified site is 1/8 mile or less outside the study area and has had no confirmed or suspected release.

2 – Identified site is within the study area and is not known to have had a confirmed or suspected release.

3 – Identified site is 1/8 mile or less outside the study area and has had a confirmed release.

4 – Identified site is within the study area and has had a confirmed or suspected release; however, no further action is required or pending.

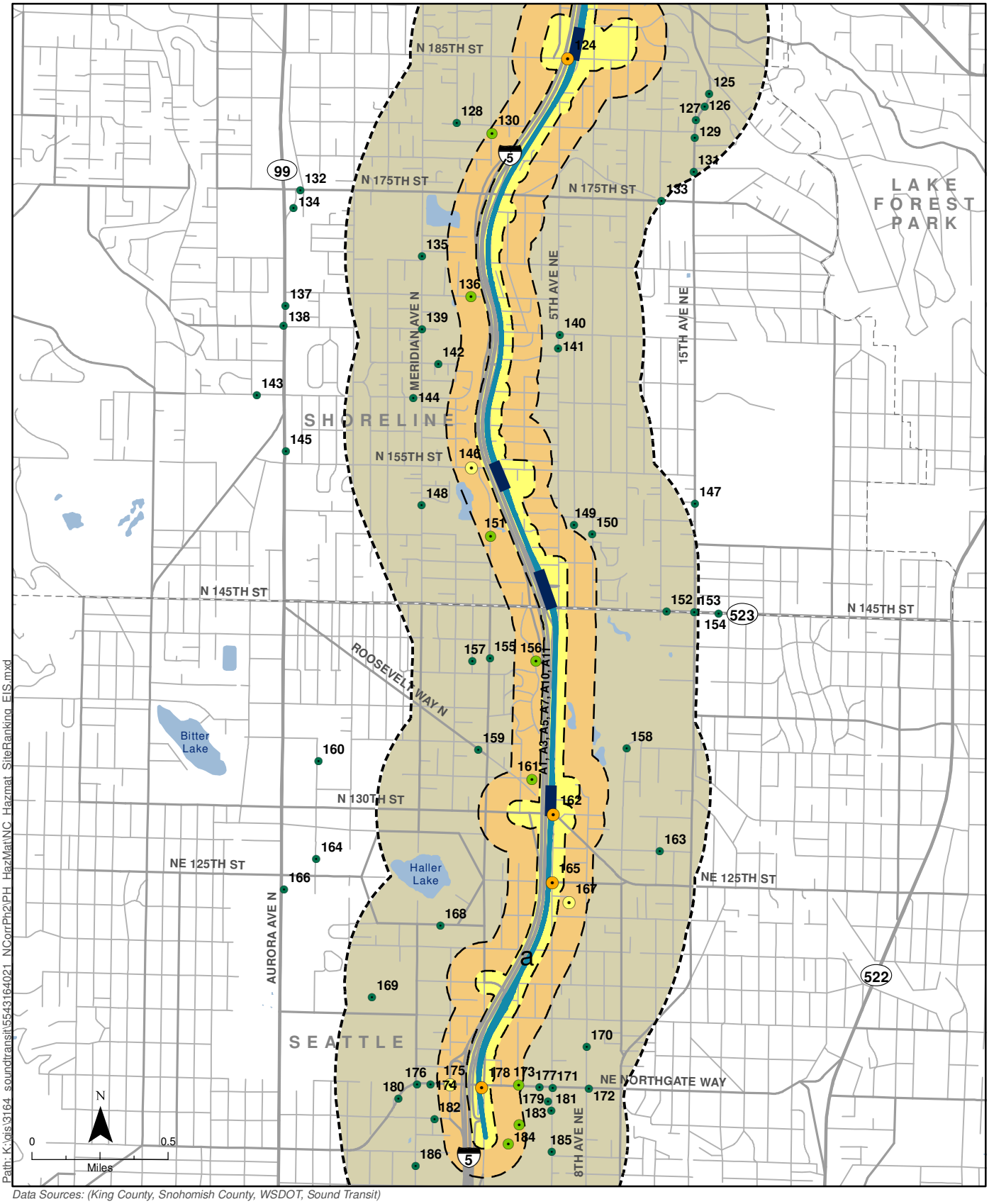
5 – Identified site is within the study area, has had a confirmed or suspected release, and cleanup activities at the site are active.

Figures 4.12-1a and 4.12-1b show the location and ranking of the hazardous materials sites identified in the study area. A higher ranking indicates sites of higher concern because of the type and extent of their contamination. In Appendix I-4.12, Hazardous Materials, Table I-4.12-1 lists all sites found in environmental databases and their environmental database number (EDR ID); Table I-4.12-2 shows the distance of each site from the study area and its corresponding rank; and Table I-4.12-3 lists the higher-priority hazardous materials sites (sites listed as a 4 or 5).

4.12.2 Long-Term Impacts

In analyzing the project's long-term direct impacts, long-term operation and maintenance activities were considered. An operating transit facility could cause long-term impacts if there is an accidental release of hazardous materials, such as a fuel spill. Because light rail trains operate on electricity and not fuel, major spills are unlikely; however, minor hazardous material releases could result during maintenance activities on the tracks or at the stations and park-and-ride facilities where buses and automobiles operate. Sound Transit has an established program for responding to emergencies within its system, including a spill response and hazardous materials handling plan. Overall, there is a low potential for impacts from ongoing system operations under all the light rail alternatives.

If Sound Transit purchases a contaminated property for project use, the agency might need to conduct cleanup activities (see Figures 4.12-1a and I-4.12-1b). Although this could affect project costs, Sound Transit would be cleaning up a contaminated site, and that would be an environmental benefit. Most of these cleanups would occur during light rail construction and are discussed below under Section 4.12.3, Construction Impacts. A site with complex hazardous materials concerns can require longer-term remediation actions. For example, remedial actions could include deed restrictions that would affect further site uses, and some types of cleanup measures might require monitoring or maintenance.



Data Sources: (King County, Snohomish County, WSDOT, Sound Transit)

Hazardous Materials Site and Ranking

0 1 2 3 4 5

118 (EDR ID)*

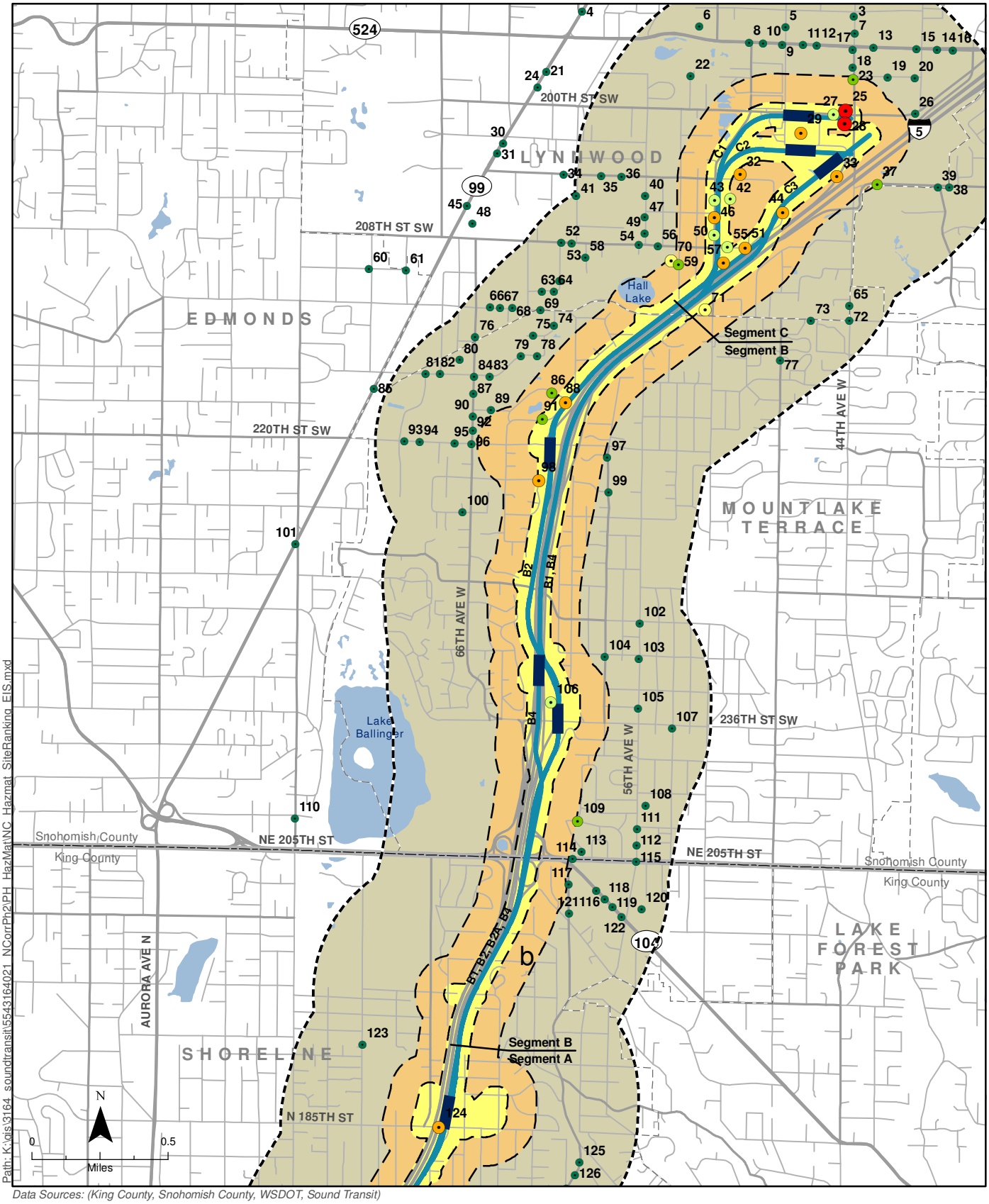
Project Study Area
1/8-Mile Study Area
1/2-Mile Study Area
Light Rail Alternatives
Station Location

Roadway
Local Street
City Boundary
County Boundary
Waterbody

**Note: EDR ID is assigned from the Environmental Data Resources (EDR) regulatory database review.*

Figure 4.12-1a
Ranking of Hazardous Materials Sites
Segment A

Lynnwood Link Extension



Path: K:\gis\3164_soundtransit\5543164021_NCorrPh2\PH_HazMat\NC_Hazmat_SiteRankingno_EIS.mxd

Data Sources: (King County, Snohomish County, WSDOT, Sound Transit)

Hazardous Materials Site and Ranking

- 0
- 1
- 2
- 3
- 4
- 5

118 (EDR ID)*

- Project Study Area
- 1/8-Mile Study Area
- 1/2-Mile Study Area
- Light Rail Alternatives
- Station Location
- Roadway
- Local Street
- City Boundary
- County Boundary
- Waterbody

**Note: EDR ID is assigned from the Environmental Data Resources (EDR) regulatory database review.*

Figure 4.12-1b
Ranking of Hazardous Materials Sites
Segments B and C

Lynnwood Link Extension

No Build Alternative

The No Build Alternative would not acquire potentially contaminated sites. Ongoing bus transit operations under the No Build Alternative would involve hazardous materials, but systems are in place to manage potential releases through spills or accidents.

Segments A and B: Seattle to Mountlake Terrace

There are no high priority hazardous materials sites on parcels identified for acquisition within Segments A and B. However, there is the potential to encounter contamination from known or unknown hazardous materials sites in the study area.

Segment C: Mountlake Terrace to Lynnwood

Under each of the Segment C alternatives, Sound Transit would acquire all or parts of parcels that contain hazardous materials sites; there are six sites of high concern. Most of these sites have already been remediated, but contamination could remain, requiring additional cleanup costs.

Alternative C1 would affect a service station site (Chevron 94953) that poses a higher level of concern than sites the other light rail alternatives would encounter. While contamination at most of the sites would be addressed before and during project construction, as discussed in more detail under Construction Impacts, there is the potential that longer-term activities on the Chevron site, such as monitoring or other protective measures or restrictions, could be needed. Each site would be handled in accordance with the requirements of applicable regulations and approvals.

4.12.3 Construction Impacts

During construction, direct impacts could result from the presence of hazardous materials on a site or the use of hazardous materials. Soils, sediments, surface water, stormwater, and groundwater can be adversely affected by existing contamination or the release of hazardous substances during construction activities. Construction impacts could occur when contaminated soil, groundwater, underground storage tanks (USTs), and/or leaking underground storage tanks (LUSTs) that contain hazardous materials are encountered during construction activities. Hazardous materials could be encountered during excavation, grading, dewatering, drilling, and demolition activities. Construction or demolition can create or expose contaminated materials, such as treated timbers; contaminated soil, sediment, and groundwater; transformers; abandoned waste; and lead or asbestos-containing materials in demolished structures. Fuels and other hazardous materials such as lubricants are also used during construction. Spills of any size could cause harm to the environment if not contained.

Hazardous materials could affect worker safety and public health during construction, although the handling of contaminated materials is regulated at the state and federal levels. Workers could be exposed through skin contact and inhalation of contaminated vapors or particulates, such as during excavation work, demolition, or the use of materials containing hazardous substances.

Contaminants encountered or released during construction can migrate into the environment through various pathways. Shallow soil contamination can migrate downward into subsurface soils and/or groundwater through "drag-down" from excavation, utility relocation, drilling, stormwater infiltration, or dewatering.

Segment A: Seattle to Shoreline

Four hazardous materials sites of concern were identified near all of the light rail alternative alignments in Segment A. However, these sites (see Table 4.12-1) are not located on parcels that might be acquired by Sound Transit. None of the other hazardous materials sites would be likely to affect any of the Segment A light rail alternatives.

Table 4.12-1. Higher Priority Hazardous Materials Sites Adjacent to Segment A Alternatives

EDR ID Number	Owner Name	Address	Rank	Potentially Affected Alternatives					
				A1	A3	A5	A7	A10	A11
Segment A									
165	Puget Sound Energy	5th Avenue NE and NE 125th Street	4	●	●	●	●	●	●
162	Unknown	5th Avenue NE and NE 130th Street	4	●	●	●	●	●	●
124	WSDOT	Interstate 5 and NE 185th Street	4	●	●	●	●	●	●
178	WSDOT I-5/Northgate	1st Avenue NE and NE 110th Street	4	●	●	●	●	●	●

In Segment A, the light rail alternatives would have different sections of elevated and at-grade profiles. Construction activities along both the elevated and at-grade profiles could potentially affect contaminated soil, if present, at these sites.

Segment B: Shoreline to Mountlake Terrace

Sound Transit identified two hazardous materials sites of concern near all of the Segment B alternatives where contaminated soil or groundwater has occurred. However, these sites are not located on parcels that might be acquired by Sound Transit. The sites of concern are indicated in Table 4.12-2. No other hazardous materials sites are likely to affect the Segment B light rail alternatives.

Table 4.12-2. Higher Priority Hazardous Materials Sites Adjacent to Segment B Alternatives

EDR ID Number	Owner Name	Address	Rank	Potentially Affected Alternatives			
				B1	B2	B2A	B4
Segment B							
88	Snohomish County PUD	21604 60th Avenue West	4	N/A	●	●	N/A
98	Snohomish County PUD	6200 222nd Street SW	4	N/A	●	●	N/A

N/A = not applicable; PUD = Public Utility District

These sites are closest to Alternative B2, which would operate on the west side of I-5 in Segment B, while the other alternatives would remain in the freeway median. While the elevated profile of Alternative B2 would lessen the need for excavation in contaminated soils, some excavation would be required. For Alternative B2A, Sound Transit would build a station near one of the contaminated sites; this would result in a higher potential for encountering contaminated soils or groundwater.

Segment C: Mountlake Terrace to Lynnwood

Sound Transit identified nine hazardous materials sites (from industrial, manufacturing, public utility, transportation, and service station sites) in Segment C that have generated past releases of contaminants to soil and groundwater. Six of these sites are located on parcels that Sound Transit might acquire for one or more of the alternatives, as listed in Table 4.12-3.

Table 4.12-3. Higher Priority Hazardous Materials Sites In and Adjacent to Segment C

EDR ID Number	Owner Name	Address	Rank	Potentially Affected Alternatives		
				C1	C2	C3
Segment C (potential acquisitions in Segment C)						
28	Chevron 94953	20010 44th Avenue West	5	●	N/A	N/A
29	Community Transit	20100 48th Avenue West	4	●	●	N/A
32	RIMPAC Steel Inc.	20311 52nd Avenue West	4	●	●	N/A
44	C Martin Trucking	20610/20631 48th Avenue West	4	N/A	N/A	●
46	Connelly Skis Inc.	20621 52nd Avenue West	4	●	●	N/A
57	Budget Tank Removal	20825 52nd Avenue West	4	●	●	●
Segment C (sites adjacent to Segment C)						
33	Lynnwood Sewer Lift Station 10	4599 204th Street	4	●	●	●
51	Sheldons Custom Cab LTD	20626 50th Avenue West	4	●	●	●
25	Shell Station 120839	19930 44th Avenue West	5	●	●	●

N/A = not applicable

Of these, the site of greatest concern (Chevron 94953) would be affected by Alternative C1, which would extend along 200th Street SW to 44th Avenue West, where it would involve construction at sites with the service station and a related business. Past contamination has occurred at these sites, and regulatory action is still

underway. Construction activities would be expected to encounter existing contamination in the soil and groundwater. Three additional properties (EDR ID #33, #51, and #25), ranked as a 4 or a 5, were identified within the study area, but would not be acquired.

4.12.4 Indirect and Secondary Impacts

Construction of the Lynnwood Link Extension could potentially result in redevelopment of existing structures and/or paved areas, as opposed to development of natural areas. Existing contamination is more likely to be encountered or potentially released during redevelopment activities in older urban areas. Therefore, if the redevelopment of older structures occurs in the study area, the result may be the cleanup of hazardous materials sites, which would be an indirect benefit of the project.

4.12.5 Cumulative Impacts

The trend in managing hazardous materials impacts is toward cleanup. Federal and environmental regulations have resulted in the identification and cleanup of past hazardous materials sites, and in fewer hazardous materials spills and releases. Because encountered hazardous materials must be cleaned up or remediated during project development, future development projects, with or without the Lynnwood Link Extension, would accelerate the cleanup of existing contaminated sites in the study area.

If the proposed Link Operations and Maintenance Satellite Facility site alternative near the Lynnwood Transit Center were selected, it would acquire properties associated with inventoried hazardous materials sites. Operation of this maintenance facility would involve storage and handling of some hazardous materials associated with vehicle maintenance. Sound Transit would handle materials in accordance with applicable state and federal regulations, and the facility would not be a source of additional cumulative effects related to hazardous materials. The Edmonds School District's master-planned services support center and bus facility near 52nd Avenue West would also have storage and handling of hazardous materials, but no additional cumulative impacts are expected.

4.12.6 Potential Mitigation Measures

Sound Transit would adhere to applicable regulations regarding hazardous materials handling and spill response during construction and long-term operation of the Lynnwood Link Extension; as a result, the project would not have an adverse effect and could have a net beneficial impact on the environment. When encountered, existing contaminated sites, as well as currently unidentified sites (if any), would be cleaned up or contained to the extent that would allow for project construction.

Sound Transit could minimize potential long-term impacts from contaminated sites by avoiding contaminated sites or portions of such sites, particularly where other alternatives may be available. To mitigate potential impacts from potential contaminated sites in the project area, Sound Transit would perform environmental due diligence for properties along the project corridor before property acquisition. Typical environmental due diligence includes the completion of environmental site assessments, which become more detailed if past contamination is identified. The results of these assessments could be used to establish the condition of acquisition properties and to determine plans for cleanup and construction management, as needed. Ecology would be notified if unknown contamination is encountered during an assessment. Where known hazardous sites are present, Sound Transit would be responsible for the remediation of any contaminated soil and groundwater, including contamination previously unknown but found during construction. To the extent practicable, Sound Transit would limit construction activities that might encounter contaminated groundwater or contaminated soil. Some previously contaminated properties might require longer-term covenants or restrictions or other remedial activities, which would be approved by Ecology.

To address potential impacts on environmental resources from construction activities, Sound Transit would implement applicable BMPs. These would include requiring contractors to prepare project-specific and site-specific hazardous material management plans, construction stormwater pollution prevention plans, health and safety plans, spill control and prevention plans, contaminated media management plans, and lead and asbestos abatement programs, as necessary. These plans would establish the procedures for managing hazardous materials in accordance with state and federal regulations. With these standard practices and measures in place, no adverse impacts are anticipated.

4.13 Electromagnetic Fields

Electric and magnetic fields, known as electromagnetic fields (EMFs), are produced wherever electricity is used. EMFs surround all electrical equipment, appliances, and facilities, including the electrical power lines and electrical devices as proposed in the Lynnwood Link Extension. Although there are no regulatory requirements or exposure limits for EMFs, these fields can result in electromagnetic interference, which can cause disruptions and possibly malfunctions in sensitive equipment. In addition, in certain situations, EMFs can affect human health.

4.13.1 Affected Environment

The study area for identifying potential EMF effects on sensitive equipment and facilities is 200 feet from the proposed project alignment. This area covers all locations where potential EMFs from the light rail facilities and operating light rail

vehicles would be more than the ambient EMFs from other common sources, such as automobiles, appliances, or street power lines.

Sources of Electromagnetic Fields

Electric charges and currents create electric and magnetic force fields. The greater the charge or current, the stronger the electric field at a given distance from it. The strength of both electric and magnetic fields decreases rapidly with distance from the source. The many existing electrical power lines and electrical devices in the project corridor create a complex pattern of EMFs in the project area.

Light Rail and Electromagnetic Fields

The power transmission lines that would provide power to the traction power substations along the proposed light rail alternative routes would produce EMFs. EMFs would also be produced by the overhead catenary wires that provide power to the light rail train and by the train cars themselves, especially when they are moving. The electricity needed to operate the cars flows from the overhead catenary wires to the traction motors and other electronic equipment. The amount of electricity flowing would vary depending on whether the train is accelerating, running at steady speed, decelerating, or is stationary. EMFs would be created whenever the train is operating, and the electrical current would be highest when the train is accelerating. The strength of the magnetic field generated by light rail operations diminishes sharply relative to the distance from the tracks.

Potentially Affected Receptors

Based on Sound Transit's projections for EMFs that could temporarily interfere with the operation of sensitive electronics and electrical equipment near the right-of-way, the project design team reviewed all nearby land uses and facilities that might be sensitive to EMFs. Hospitals or clinics that use sensitive electronic equipment would be typical facilities of concern, as would some broadcast facilities. Most of the properties near the light rail alternative alignments serve residential, open space, or transportation uses. The nearest medical facilities to the Lynnwood Link Extension are beyond 1,000 feet—more than 10 times the distance within which effects would be experienced. No other specialized technical or broadcast uses exist in the project area.

EMFs also can affect humans. Certain EMF combinations can cause shock and burn injuries through direct contact with energized components, or they can interfere with the operation of electrical and magnetic devices, including heart pacemakers.

4.13.2 Long-Term Impacts

No Build Alternative

The No Build Alternative would not introduce any new sources of EMFs into the project area.

Light Rail Alternatives

There are no potentially sensitive electronic or electrical receptors located closer than 1,000 feet to the light rail alternative alignments. The project's system designers have reviewed existing aerial utilities along the alignments to establish the necessary safeguards between light rail electrical systems and other systems. No impacts are anticipated. Receptors external to the light rail system (e.g., the public, nearby residences, institutions, and places of employment) would experience EMFs primarily from the overhead catenary system and the traction power substations. Cables emerging from the substations would carry direct current power, creating EMFs primarily in the static (0 to 3 Hz) frequency range.

Based on Sound Transit's existing operations and on data available from similar rail systems, the Lynnwood Link Extension alternatives would be unlikely to generate EMFs that would pose health concerns.

There are no federal regulations that limit exposure to electric or magnetic fields; however, anticipated EMF intensities at locations of human exposure within and adjacent to the light rail alignment are considerably below exposure guidelines established by the American Conference of Governmental Industrial Hygienists and the more recent guidelines established by the International Commission on Non-Ionizing Radiation Protection. These guidelines address known biological effects but do not address speculative concerns about cancer and other possible health effects.

4.13.3 Construction Impacts

Sound Transit anticipates no impacts from EMFs on nearby sensitive facilities during project construction.

4.13.4 Indirect, Secondary, and Cumulative Impacts

Increases in population and employment along the project corridor could increase the demand for electrical power and could also increase the number of sources and the cumulative intensity of EMFs. The proposed Lynnwood site alternative for the Link Operations and Maintenance Satellite Facility could increase EMF levels if the facility is sited in Lynnwood near the Segment C alternatives, but the combined levels from that and other potential projects would not result in adverse effects to people or equipment.

4.13.5 Potential Mitigation Measures

No mitigation measures for electromagnetic interference from the Lynnwood Link Extension are needed because there are no potentially sensitive receptors within the range of the light rail line.

4.14 Public Services, Safety and Security

This section discusses the Lynnwood Link Extension's potential impacts on public services, including fire and emergency medical services (including hospitals), police, solid waste and recycling, schools, and postal services. It also discusses public safety and security issues in the project corridor communities and in the light rail operating environment and facilities.

4.14.1 Affected Environment

The following subsections summarize the primary public services provided in the project area. Section 4.4, Social Impacts, Community Facilities, and Neighborhoods, provides a map showing the major facilities (Figure 4.4-4).

Emergency Services and Law Enforcement

Fire and emergency medical services are provided in Seattle by the Seattle Fire Department; in Shoreline by the Shoreline Fire Department, which is a member of King County Medic One; in Mountlake Terrace by Snohomish County Fire District 1; and in Lynnwood by the Lynnwood Fire Department. Table 4.14-1 indicates the response times in 2011 for emergency services by jurisdiction.

Table 4.14-1. Fire and Emergency Response Times by Jurisdiction in 2011

Jurisdiction	Advanced Life Support	Basic Life Support	Fire, Rescue, and Hazardous Materials Response
Seattle	3.81 minutes	3.89 minutes	4.22 minutes
Shoreline	5.87 minutes	4.95 minutes	6.10 minutes (first engine) Full: 12.73 minutes
Mountlake Terrace (Snohomish County Fire District 1)	7 minutes	7 minutes	Fire: 7.50 minutes; Others: 7.75 minutes
Lynnwood	7 minutes	7 minutes	7.50 minutes Overall for all services: 7.33 minutes

The Seattle Police Department precinct covering the project area is the north precinct/station at 10049 College Way North in Seattle. The Shoreline Police Department, which operates through a contract with the King County Sheriff's

Office, has one police station at 1206 North 185th Street in Shoreline. The Mountlake Terrace Police Department station is located at 5906 232nd Street SW in Mountlake Terrace, in a facility shared by Mountlake Terrace Fire Station 19. The Lynnwood Police Department station is located at 19321 44th Avenue West in Lynnwood.

Table 4.14-2 shows the 2011 crime rates for the jurisdictions in which the Lynnwood Link Extension would travel. Thefts of motor vehicles and thefts from motor vehicles are included in the property crimes total. Table 4.14-3 shows the police response times.

Table 4.14-2. Crime Rates by Jurisdiction in 2011

Jurisdiction	Population	Crimes per 1,000 residents	Crimes Against Persons per 1,000 residents	Property Crimes (Total)
Seattle	618,209	57.4	10.9	31,729
Shoreline	53,200[a]	33.6	1.6	1,719
Mountlake Terrace	19,909[a]	32.2	1.9	599
Lynnwood	35,860[a]	62.2	2.8	2,127

[a] 2010 data

Table 4.14-3. Police Response Times by Jurisdiction in 2011

Jurisdiction	Highest Priority[a]	Medium Priority[a]	Lower Priority[a]
Seattle	6.5 minutes	8.5 minutes	Not applicable
Shoreline	4.48 minutes	6.91 minutes	10.35 minutes
Mountlake Terrace	Standard is 8 minutes; met 90 percent of the time.		
Lynnwood	4.63 minutes	5.22 minutes	Not applicable

[a] Jurisdictions use different names for these categories.

Solid Waste and Recycling Services

In Seattle, the Seattle Solid Waste Utility, a division of Seattle Public Utilities, currently contracts with Waste Management, CleanScapes, SeaDruNar, and Allied. In Shoreline, curbside, multifamily, and business garbage and recycling pick-up is provided by CleanScapes. In Mountlake Terrace, residential and business waste and recycling pick-up is provided by Waste Management NW. In Lynnwood, the City does not provide garbage service and curbside pick-up. Residents and businesses may use private contractors or transport their own waste to transfer stations.

Schools

Twenty-three public and private schools are located within 0.50 mile of the light rail alternatives (see Figures 4.4-2a, b, and c in Section 4.4, Social Impacts, Community Facilities, and Neighborhoods). Altogether, the schools serve approximately 28,000 students, almost two-thirds of whom (about 18,000) are enrolled in North Seattle Community College.

4.14.2 Long-Term Impacts

No Build Alternative

With continued population and employment growth and related increases in development, traffic, and other activities, there would be higher demands on all public services and safety and security with the No Build Alternative, including emergency services. Increased traffic congestion could affect emergency service response times.

Light Rail Alternatives

The light rail alternatives share similar types of impacts on public services and safety and security. This subsection summarizes the impacts for all segments and alternatives jointly, and then briefly discusses the differences in impacts by alternative.

Fire and Emergency Medical Services

The Lynnwood Link Extension would run trains on an exclusive right-of-way, where there would be a very low potential for accidents; however, the potential for people or vehicles to enter the protected right-of-way and be injured cannot be eliminated.

Because light rail trains would not cross surface streets at grade, light rail operations at street crossings would not directly affect emergency and incident response routes or times. However, increased congestion at station areas and park-and-ride lots could affect response times. Chapter 3, Transportation Impacts and Mitigation, identifies locations where traffic congestion and delays would occur with the light rail alternatives.

All of the jurisdictions along the project corridor currently operate Emergency Vehicle Preemption (EVP) programs that give emergency vehicles priority. Sound Transit would work with the jurisdictions to anticipate the EVP programming needs around stations and to ensure that emergency response times would not be affected.

Service providers may need special training to respond to light rail elevated guideway sections and stations. In general, it is slower and more difficult to access elevated sections in an emergency compared to at-grade sections. This is also true for

sections within WSDOT's right-of-way, particularly areas within the freeway median (such as Alternatives B1 or B4) or where the guideway crosses above traffic lanes. However, Sound Transit's design standards for light rail directly address emergency access needs for all types of facilities and alignments featured in the light rail alternatives.

Access to stations and the guideway from I-5 will be identified and developed in consultation with WSDOT and FHWA. No existing I-5 median emergency and law enforcement vehicle turnarounds will be removed.

Alternatives A5 and A7 are the only alternatives that would have unique impacts because they would place a station and park-and-ride lot adjacent to Shoreline Fire Department Station No. 65 that would alter traffic levels and construct new driveways and intersections adjacent to that fire station. The increase in traffic at the park-and-ride lot could slightly increase response times. Design and operational approaches to maintain Station 65's emergency access routes and response times will be developed in cooperation with the Shoreline Fire Department.

Access to fire hydrants, fire lanes, and access points within or adjacent to the project boundaries will be maintained where possible; where it is not possible, access will be redesigned working with the appropriate agencies and jurisdictions.

Project design will be in accordance with Link light rail design standards and in coordination with local jurisdictions and the Link Fire, Life, and Safety Committee. Sound Transit design standards require specific facilities and locations to allow emergency access throughout the light rail line and for evacuating passengers if needed. They also include many principles and guidelines designed to ensure safety and security throughout the light rail system, such as design requirements for lighting, unobstructed views, pedestrian safety, elevators and escalators, public plazas, patron information centers, public telephones, call-for-aid stations, emergency management panels, security cameras, vandalism deterrents, public address systems, radio communications, and alarms.

Operationally, a Lynnwood Link Extension emergency response and safety and security plan will be developed and implemented to define training, equipment, and procedures for light rail construction and operations.

Law Enforcement

All alternatives would create facilities where additional police and security staff would be needed to monitor stations, parking facilities, and other areas to protect people and property. Sound Transit operates its own security force within its facilities.

Studies by Sound Transit, the City of Seattle, and others have consistently found that crime at transit facilities, such as stations, generally reflects the conditions in the

surrounding neighborhoods. Quality of life crimes (for example, vandalism, drunkenness, and panhandling) and property crimes account for more than 90 percent of transit facility crimes. Violent crimes account for most remaining crimes. Crimes are more likely to occur at a station than on a light rail car. In addition, stations with park-and-ride lots can have more potential for crime than stations without parking. Different types of station access (stairs, escalators, or elevators) do not appear to influence criminal activity, but their design and location can be a factor if they provide places where criminals can act without being observed by others.

Final designs will incorporate crime prevention through environmental design principles. These principles, in association with other security features of the light rail system and the presence of security personnel, would deter criminal activity and generally make light rail stations and parking facilities safer and more secure.

As with fire and emergency services, because light rail trains would not cross surface streets at grade, light rail operations at street crossings would not directly affect police response routes or times. However, increased congestion at station areas and park-and-ride lots could affect response times. Chapter 3, Transportation Impacts and Mitigation, identifies locations where traffic congestion and delays would occur with the light rail alternatives.

As with fire and medical emergencies, police access to trains operating on elevated track and stations, and to stations not easily accessible from the existing road network, would require additional planning.

Since events in 2001, terrorism has received heightened awareness, and federal legislation has given FTA a safety oversight role for transit systems. Many measures that address non-terrorism security and safety issues also address terrorism concerns. Sound Transit will continue to work with FTA, law enforcement agencies, the U.S. Department of Homeland Security, and emergency service providers to develop strategies to prevent and respond to terrorist activities that could affect the proposed project.

Solid Waste

The project would not acquire any property currently occupied by recycling, composting, and solid waste facilities or operating bases, and the travel times or collection routes for these facilities would not be notably affected by the project. Therefore, no impacts would be expected on recycling, composting, and solid waste collection during light rail operation; furthermore, the project would not cause a notable increase in demand for services.

Other Public Facilities

The project would not acquire any property currently occupied by operating schools, post offices, postal facilities, or hospitals. Section 4.1, Acquisitions, Displacements, and Relocations, identifies several areas where one or more alternatives could affect parcels owned by public school districts. None of the alternatives would involve an operating school or would affect the travel times or routes for school buses.

Alternative C3 in Segment C would cross part of a site owned by the Edmonds School District, where a district support facility is planned, but the site could still be developed. Current postal services or routes would not be notably affected by the project, and the project would not affect access to hospitals.

Regarding safety for children attending school, Lakeside School is close to the proposed NE 145th Street Station. Lakeside serves a widely dispersed student body, some of whom might arrive by light rail. The safety-related improvements (sidewalks and protected crossings) to serve all pedestrians accessing the station would also improve the walking environment for Lakeside students. While there are other schools near the proposed light rail alignment along I-5, no other schools are as close to a station alternative as Lakeside; see Figures 4.4-2a, b, and c in Section 4.4, Social Impacts, Community Facilities, and Neighborhoods.

Comparison of Impacts by Alternative

The alternatives would have only minor differences in their effects on public services. Although the alternatives represent a wide range of design variations, most of the guideway is built along the I-5 right-of-way. The guideway would not be shared in any way with travel routes for emergency vehicles, law enforcement, and public services. The transportation impacts of passenger access to and from the stations, which could vary by alternative, are discussed in detail in Chapter 3, Transportation Impacts and Mitigation; these impacts can be mitigated to avoid effects on public services.

In Segment A, Alternatives A5 and A7 have a NE 155th Street Station and parking garage adjacent to Shoreline Fire Station No. 65, while the other four alternatives do not. The increase in traffic to the parking garage could slightly increase response times; however, standard traffic design measures would help preserve access to the station. The alternatives that do not serve NE 155th Street would avoid any impacts on the fire station.

Also in Segment A, Alternatives A1, A3, A10, and A11 include a station at NE 145th Street, which would serve students and staff at Lakeside School, and station-related improvements would also improve the walking environment around the school. Alternatives A5 and A7 would not provide these benefits.

4.14.3 Construction Impacts

Traffic rerouting, lane closures, and construction traffic may affect emergency response times and the travel times or routes for public service vehicles during construction periods, especially at stations or construction sites. This could also require emergency responders to alter their response routes or it could increase their response times. The reconstruction or closure of I-5 overcrossings could require detours or increase delays. Several of the Segment A light rail alternatives involve rebuilding overpass bridges or ramps: Alternatives A1, A10, and A11 would rebuild the NE 117th Street overcrossing; Alternatives A1, A5, A10, and A11 would rebuild the NE 130th Street overcrossing and northbound off-ramp; and Alternative A1 would rebuild the NE 185th Street overcrossing. The closure and rebuilding of the NE 117th Street overpass for Alternative A1 would affect access to Northgate Elementary School, thereby affecting some students and school users.

The above impacts would be mostly limited to Segment A because the other light rail alternative alignments are mostly along I-5 and do not require major rebuilds of streets and bridges. Chapter 3, Transportation Impacts and Mitigation, identifies the locations where construction traffic changes are anticipated, and also describes the construction traffic mitigation plan that would be developed to reduce impacts. Construction haul routes would primarily be on arterials and at freeway ramps and would not affect public service facilities, except at Shoreline's Fire Station No. 65, where plans would be developed to maintain emergency access and response times.

4.14.4 Indirect, Secondary, and Cumulative Impacts

As described above for the No Build Alternative and light rail alternatives, the continued growth in population, employment, and general urban activity in the project area through 2040 would increase demand on public services, including emergency and public safety services. As described in Section 4.2, Land Use, and Section 4.3, Economics, population and employment growth consistent with regional and local comprehensive plans, the Lynnwood Link Extension, and other potential projects in the area, such as the proposed Link Operations and Maintenance Satellite Facility alternative (if sited in Lynnwood) and the Edmonds School District master planned services center development, would cumulatively increase the level of development and public activity in station areas and increase the demand for public services within the project area. However, the project's contribution to the potential increase in demand for public services would be minor.

4.14.5 Potential Mitigation Measures

No mitigation would be needed given the project commitments to:

- Provide mitigation measures as identified in Chapter 3, Transportation Impacts and Mitigation, for long-term and construction impacts on traffic.
- Design in accordance with Link light rail's design standards that fully address emergency, safety, and security.
- Operate in accordance with Link light rail's existing approaches to ensure safety and security throughout the system.
- Develop emergency response and safety and security plans and programs in cooperation with local jurisdictions.

4.15 Utilities

This section analyzes the short-term construction and long-term operations impacts of the Lynnwood Link Extension on utility providers and systems that currently serve, or are planned to serve, the project area.

4.15.1 Affected Environment

The study area for this analysis extends 100 feet from the alternative alignments and stations. Utility providers within the project area include municipal agencies, public utility districts, and private companies. In addition to public or municipal utility providers, such as the cities with water or sewer utilities, there are electrical power, natural gas, water, sanitary sewer, stormwater, and telecommunications service providers in the study area (Table 4.15-1).

Table 4.15-1. Utility Providers in the Study Area

Jurisdiction	Segment	Utility	Provider
Seattle	A	Gas	Puget Sound Energy
		Electricity	Seattle City Light
		Water	Seattle Public Utilities
		Wastewater	Seattle Public Utilities, King County Wastewater Treatment Division
		Stormwater	Seattle Public Utilities
		Cable	Comcast
		Communications	CenturyLink, Verizon, WSDOT, AT&T, Clearwire, Western PCS III
Shoreline	A, B	Gas	Puget Sound Energy
		Electricity	Seattle City Light, BPA
		Water	Shoreline Water District, Seattle Public Utilities
		Wastewater	Ronald Wastewater District
		Stormwater	City of Shoreline
		Cable	Comcast
		Communications	CenturyLink, Verizon, WSDOT

Table 4.15-1. Utility Providers in the Study Area

Jurisdiction	Segment	Utility	Provider
Mountlake Terrace	B	Gas	Puget Sound Energy
		Electricity	Snohomish County PUD, BPA
		Water	City of Mountlake Terrace, Alderwood Water & Wastewater District
		Wastewater	City of Mountlake Terrace, Alderwood Water & Wastewater District
		Stormwater	City of Mountlake Terrace
		Cable	Comcast, Black Rock Cable
		Communications	Frontier Communications, Verizon CenturyLink, WSDOT
Lynnwood	B, C	Gas	Puget Sound Energy
		Electricity	Snohomish County PUD, BPA
		Water	City of Lynnwood, Alderwood Water & Wastewater District
		Wastewater	City of Lynnwood, Alderwood Water & Wastewater District
		Stormwater	City of Lynnwood
		Cable	Comcast, Black Rock Cable
		Communications	Frontier Communications, Verizon, WSDOT I&ITS

Abbreviations: BPA = Bonneville Power Administration, PUD = Public Utility District, WSDOT = Washington State Department of Transportation Illumination & Intelligent Transportation Systems

Sound Transit asked all the utility providers in the project area about any planned improvements that might affect or be affected by the light rail alternatives.

Five of the future projects identified by providers in the project area are considered major utility projects (12-inch-diameter pipelines or larger for water, sewer, and stormwater). These five projects are the City of Shoreline's fish barrier removals west of I-5 near mile post 174.9, City of Mountlake Terrace's 24-inch-diameter stormwater line and 12-inch-diameter water line, Alderwood Water & Wastewater District's 20-inch-diameter water line, and Snohomish County PUD's electric power substation. Although the Snohomish County PUD's planned substation was initially identified as potentially within the Lynnwood Link Extension project footprint, Sound Transit subsequently adjusted the design for the project to avoid this potential conflict.

4.15.2 Long-Term Impacts

No Build Alternative

Under the No Build Alternative, light rail would not be extended to Lynnwood. Without the light rail extension, direct impacts on utilities would be avoided.

Impacts Common to All Light Rail Alternatives

Each of the light rail alternatives would have numerous potential conflicts with existing utilities. The potential for conflicts occurs wherever the alternative alignments and associated features would cross an existing utility such as electric lines, water or sewer lines, and stormwater or telecommunications (cable and fiber

optic) utilities. Also, impacts would occur where utilities are located parallel and in proximity to the light rail alignments. In Appendix I-4.15, Utilities, the areas where potential major utility conflicts might occur are shown by segment, alternative, and type of utility. Through project design, conflicts would be addressed by avoiding the conflict or by relocating the utility; no long-term impacts are expected.

There are no substantial differences among the light rail alternatives relative to their potential impacts on long-term utility service. Major disruptions in service to utility customers would be unlikely during light rail operations or maintenance along the guideway. In some cases, manholes, pipes, vaults, and other maintenance access points might need to be permanently relocated to ensure that maintenance activities could be conducted without interrupting either light rail or utility service.

Sound Transit would work closely with WSDOT or utility providers during the design process to provide required access to facilities and any relocated manholes, vaults, utility mains, fire hydrants, and/or other features.

Nearly all water, sewer, and stormwater lines within the proposed project footprint are 12 inches or more in diameter and all are considered major utilities. These major utility lines within the project footprint are either buried or hung from bridges. Consequently, except for elevated guideway column placement, there would be direct conflicts only where these utilities cross below at-grade sections of the light rail alternative alignments. The precise depth of the utility line burials is unknown to Sound Transit; therefore, all identified utility crossings have been flagged as potential impacts, including 26 water, sewer, and stormwater utility crossings. As project design progresses, additional coordination with the utilities would confirm and resolve potential conflicts.

The light rail system would draw power from the regional electrical power grid. The proposed light rail line would operate up to four-car electric trains from existing 26-kilovolt (kV) primary electric distribution facilities. Sound Transit would locate traction power substations approximately every 2 miles along the project corridor to provide power to the overhead catenary system that powers the light rail vehicles. These substations would be powered by 26-kV electric lines connecting to the nearest existing power source, either overhead or underground. In some cases, the existing local network may be upgraded or new power lines constructed to transmit power to light rail substations. However, the power demands of the light rail system would not impact the ability of electrical utilities to meet overall demand in their service areas.

Some utilities within or adjacent to the project footprint could be susceptible to stray currents. Without control measures, a portion of the electrical current flowing through the light rail trains could stray along conducting utility lines in the ground to the traction power substation. These lines will be carefully evaluated during design

for possible effects from stray currents. Sound Transit would also coordinate control measures with potentially affected utilities. These control measures could include the following:

- Installing cathodic protection systems
- Installing insulating unions to break the electrical conductivity of the utility
- Isolating electrical rails from the ground
- Installing stray-current-control track fastening systems where appropriate

Most of the telecommunications, cable, and fiber optic utility facilities in the proposed project footprint are identified as potential conflicts. Sound Transit would coordinate its further design work with the utilities to confirm and resolve potential conflicts. Almost all of the potential utility conflicts that Sound Transit has identified within the project footprint are located within the I-5 right-of-way. Most utilities within the I-5 right-of-way are franchise holders (the utility has an agreement with the city government to use the public right-of-way) who must relocate their utilities at WSDOT's request, at their own expense. Sound Transit would work with the affected utilities on relocation issues, consistent with Sound Transit's relocation polices and applicable laws, including city codes and charter provisions.

4.15.3 Construction Impacts

There is the potential for impacts during construction when utilities are located along the proposed project footprint (parallel impacts) or where utilities would intersect alternative alignments. Sound Transit's initial design and environmental review efforts are helping to identify potential utility conflicts. Service impacts could be avoided or minimized by permanently or temporarily relocating the affected utilities during construction, by adjusting the light rail alignments during final design, or by protecting utilities from construction damage, in accordance with Sound Transit's *Link Design Criteria Manual* (Sound Transit 2012b).

Underground utilities may need to be relocated because of impeded maintenance access, inadequate vertical clearance between the utility and the rail line (especially in cut sections), or structural impacts to the utility (both in cut sections and at-grade sections).

For elevated light rail profiles, impacts on underground utilities should be minimal, provided that the support columns could be located to provide adequate horizontal clearance between the utility and the support column. However, conflicts between elevated light rail profiles and overhead utilities could occur where elevated guideways either run directly underneath the utility lines or cross them. These conflicts could be resolved by raising the lines to go over the overhead light rail catenary system at the utility's required minimum distance, following the current recommendations of the National Electrical Safety Code, and submitting plans to the

utilities prior to construction. The method of relocation would need to be consistent with Sound Transit's policy of replacing existing utilities in-kind if Sound Transit funds the relocation.

Table 4.15-2 summarizes the number of existing or planned utilities by alternative that the Lynnwood Link Extension would cross.

Table 4.15-2. Utility Conflict Summary: Crossings and Parallel Relocations

Segment/Alternative	Total Crossings	Linear Feet of Parallel Utilities
Segment A		
Alternative A1	30	3,000
Alternative A3	28	550
Alternative A5	29	2,850
Alternative A7	25	550
Alternative A10	28	2,850
Alternative A11	27	550
Segment B		
Alternative B1	16	9,900
Alternative B2	21	1,150
Alternative B2A	21	1,150
Alternative B4	23	9,900
Segment C		
Alternative C1	12	2,400
Alternative C2	6	700
Alternative C3	11	0

Segment A: Seattle to Shoreline

There are 25 to 30 potential utility conflicts in Segment A depending on the alternative. Many of these utility conflicts would involve overhead power lines. There are also potential gas line conflicts in Segment A with all light rail alternatives. Other utilities of concern include a 30-inch-diameter Seattle Public Utilities water line crossing at North 115th Street and a 24-inch-diameter Shoreline Water District water line crossing at NE 185th Street. These crossings would be of heightened concern because of their large supply capacity and the large number of customers that would be affected if service were disrupted. The other conflicts would be with storm drains and communication lines.

In contrast to the number of potential utility conflicts, the linear feet of parallel utilities varies by Segment A alternative depending on whether it is at-grade or elevated (conflicts with parallel utilities are not only where they are along the alignment but also where they would be encountered at a similar grade or could restrict access). For example, there are 550 feet of parallel utilities within the mostly

elevated alternatives (A3, A7, A11) footprints, but the mostly at-grade Alternatives A1, A3, and A5 would have more than five times that amount.

Segment B: Shoreline to Mountlake Terrace

There are 16 to 23 potential utility conflicts in Segment B. Many of these conflicts would involve power lines, but there are also four potential gas line conflicts for all Segment B alternatives. Other conflicts would include water lines, one sewer line, storm drains, and communication lines.

In contrast to the number of potential utility conflicts, the linear feet of parallel utilities vary considerably among the Segment B alternatives. The footprint of Alternatives B2 and B2A would include only 1,350 linear feet of parallel utilities, but Alternative B4 would have more than eight times that amount.

Segment C: Mountlake Terrace to Lynnwood

All potential Segment C utility conflicts (from 6 to 12) would be from Snohomish County PUD power lines. Alternative C1 would have the greatest number of potential power line conflicts, both in terms of the number of crossings and in length of parallel construction conflicts. Alternative C2 would have approximately half as many potential power line conflicts as the two other Segment C alternatives. Alternative C3 would have nearly as many potential conflicts as Alternative C1, but no potential parallel conflicts. Alternative C3 would require relocating two large transmission poles and raising the Snohomish County PUD transmission lines, but they would remain within the PUD right-of-way, and the new poles would be outside the areas currently occupied by the Interurban Trail.

4.15.4 Indirect and Cumulative Impacts

The availability of light rail service could encourage development of property in the vicinity of the proposed project footprint, which in turn would increase the demand for utility services in this area. However, local governments have already accounted for this possibility in their adopted local land use plans. Furthermore, the project corridor is located entirely within the urban growth boundaries of the cities of Seattle, Shoreline, Mountlake Terrace, and Lynnwood, and any development near the project footprint would be no more intense than what is allowed in the adopted land use plans of these local governments. Therefore, the indirect and cumulative impacts on utilities should not be greater with or without the Lynnwood Link Extension. The conclusion is the same if the potential Link Operations and Maintenance Satellite Facility Lynnwood site alternative and the Edmonds School District master planned services center are included. See Section 4.2, Land Use, for more details on the indirect and cumulative impacts related to land use development.

4.15.5 Potential Mitigation Measures

The proposed project includes design measures and coordination with utility providers and the public to minimize impacts on utilities during light rail construction. These measures would include potholing and preconstruction surveys to identify utility locations, and outreach to inform customers of potential service disruptions. Sound Transit would continue to work with utility providers to minimize any potential service interruptions.

In some cases, establishing temporary utility lines might be necessary during construction to ensure continuous service or to minimize service disruptions. Some private utility providers would be responsible for costs related to utility relocation or other temporary or permanent measures that may be required, based on individual utility franchise agreements. In addition, Sound Transit and its contractors will follow safety protocols, especially when working near gas lines and power facilities, to protect the safety of construction workers.

Sound Transit does not anticipate any adverse impacts on utilities during light rail operation; therefore, no additional mitigation is proposed.

4.16 Cultural, Archaeological, and Historic Resources

This section identifies and describes the historic properties in the vicinity of the Lynnwood Link Extension alternatives. Section 106 of the National Historic Preservation Act (NHPA) requires federal agencies to identify historic properties and to consider the potential project impacts on those historic properties. Regulations in 36 CFR 800 outline the process for complying with Section 106 requirements. Historic properties are defined in 36 CFR 800.16(l)(1) as "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior," and can also include traditional cultural properties (TCPs). Historic properties are identified and evaluated in consultation with the State Historic Preservation Officer (SHPO) at the Washington State Department of Archaeology and Historic Preservation (DAHP), tribes with jurisdiction or interest, local jurisdictions—the Cities of Seattle, Shoreline, Mountlake Terrace, and Lynnwood—and other consulting parties.

To be eligible for National Register of Historic Places (NRHP) listing, a historic resource must meet standards of integrity and at least one of the following criteria (36 CFR 60.4):

a) Is associated with an important event or series of events that have made a significant contribution to the broad patterns of American history; or

b) Is associated with an important individual who was significant in our past; or

c) Embodies the distinctive characteristics of a type, period, or method of construction, or represents the work of a master or possesses high artistic values; or represents a significant and distinguishable entity whose components lack individual distinction.

d) Has yielded, or may be likely to yield, information important in history or prehistory.

Regulations in 36 CFR 800 outline the process for satisfying the Section 106 requirements. The process includes the following steps: (1) initiate consultation with regulatory agencies, tribes with jurisdiction or interest, local governments, and other interested parties; (2) define the Area of Potential Effects (APE); (3) identify, record, and evaluate resources for potential NRHP eligibility; (4) identify project effects; and (5) consult with affected parties to resolve adverse effects, if any, on historic properties.

A regulation known as Section 4(f) of the Department of Transportation Act provides further protection for historic properties that could be affected by a transportation project with FTA involvement; see Section 4.18, Section 4(f) and 6(f) Evaluation, for further details.

In addition to the federal regulations listed above, there are state and local regulations that also serve to regulate and protect cultural resources. SEPA and its implementing rules contained in WAC 197-11 require the identification of historic, archaeological, and cultural resources listed in national, state, or local registers, and the identification of measures to reduce or control effects on these resources. For listing in the Washington Heritage Register (RCW 27.34.200 and WAC 25-12), a property must typically be at least 50 years old, have a high-to-medium level of integrity, and have documented historic significance at the local, state, or federal level. Nine areas of significance are taken into consideration.

RCW 27.44 (Indian Graves and Records) protects Indian burials, while RCW 27.53 (Archaeological Sites and Resources) protects archaeological sites. RCW 76.09 (Confidentiality of Information) provides for the confidentiality of information on archaeological sites.

The Governor's Executive Order 05.05 addresses the need for state agencies to consult with Indian tribes in acquiring or developing land for capital improvements. This analysis follows guidance provided by DAHP's *Washington State Standards for Cultural Resources Reporting*.

Three of the jurisdictions within the APE—Seattle, Shoreline, and Lynnwood—have a local preservation program with a board or commission that maintains a register of significant historic properties. The City of Shoreline's ordinance incorporates the King County preservation ordinance. The City of Mountlake Terrace has not adopted a

preservation ordinance. The criteria for listing in local registers are generally similar to, but broader than, the NRHP criteria cited above.

The *Cultural, Archaeological, and Historic Resources Technical Report* provides detailed information on the historic, archaeological, and cultural resources discussed in this section. It also provides additional information about federal, state, and local regulations for protecting the resources.

4.16.1 Affected Environment

The APE for the Lynnwood Link Extension encompasses any historic, archaeological, and cultural property that could be directly or indirectly affected by construction or operation of the project. It includes all areas within a 200-foot-wide buffer on either side of the center of the light rail guideway, including at-grade or elevated profile sections, as well as any station, parking structure, staging area, or other project facility. The vertical APE for archaeological resources includes areas of ground disturbance associated with project construction, although at this stage in the project details regarding the depth of construction may vary by alternative and will continue to be developed as the project continues through environmental review and design.

Archaeological Resources

Archaeologists conducted a field survey in 2012, targeting locations within the APE that had some potential for having intact archaeological deposits. The project's Archaeological Work Plan (Appendix A of the *Cultural, Archaeological, and Historic Resources Technical Report*) describes the survey methods and the approach Sound Transit used to determine survey locations; the technical report also details the survey findings. In recent decades, roadway construction and residential or other urban development have disturbed much of the study area, and the overall APE has a low-to-moderate probability for intact archaeological remains.

Two historic-period archaeological sites (the Seattle-Everett Interurban Trail Segment site, 45SN531, and the Scriber Creek Park site, temporary site number 1792-1) were identified during the archaeological investigation, but neither site retains integrity nor is considered historically or prehistorically significant. In consultation with the SHPO and affected tribes, FTA has determined these sites are not eligible for listing in the NRHP; the SHPO concurred with these determinations. These sites are described in the *Cultural, Archaeological, and Historic Resources Technical Report*.

Traditional Cultural Properties

FTA and Sound Transit have consulted with the Muckleshoot Indian Tribe, Snoqualmie Indian Tribe, Suquamish Tribe, Tulalip Tribes of Washington, and

Yakama Nation.[2] None of these parties has identified any potential for a TCP within the APE.

Historic Buildings and Structures

To identify potential historic properties within the APE, Sound Transit conducted a historic resources field survey. Every property within the APE that was built in or before 1970 was surveyed at an intensive level. While the standard NRHP age threshold is 50 years, Sound Transit used 1970 as the threshold year based on a conservative estimate of 2020 as the start of construction. Over 650 properties were surveyed.

Sound Transit also reviewed properties that are less than 50 years old but meet the age criteria for a local jurisdiction's preservation program. The agency coordinated with the cities with historic resource programs (Seattle, Shoreline, and Lynnwood) to identify any properties that were potentially eligible for their historic registers.

FTA and Sound Transit determined five historic resources within the APE to be eligible for listing in the NRHP under Criterion C.[3] The SHPO concurred with these determinations. These buildings, which are described in the following paragraphs, retain a high level of integrity and meet NRHP eligibility criteria. Table 4.16-1 lists these historic properties and Figure 4.16-1 displays them.

Table 4.16-1. Historic Properties within the Area of Potential Effects

Address	Description	Construction Date	Historic Status Eligibility
11200 1st Avenue NE, Seattle (Segment A)	Northgate Plaza Apartments	1950–51	Eligible NRHP Criterion C
11725 1st Avenue NE, Seattle (Segment A)	Northgate Elementary School	1956	Eligible NRHP Criterion C
13130 5th Avenue NE, Seattle (Segment A)	Parsonage	1928	Eligible NRHP Criterion C
132 NE 155th Street, Shoreline (Segment A)	Log house	1920	Eligible NRHP Criterion C
6205 222nd Street SW, Mountlake Terrace (Segment B)	Melody Hill Elementary School (currently King's Temple Christian School)	1957	Eligible NRHP Criterion C

[2] Consistent with federal guidance, FTA and Sound Transit have also consulted with the potentially interested (although not federally recognized) Duwamish and Snohomish tribes.

[3] The NRHP-eligible resources are also considered Section 4(f) resources. Please see Section 4.18, Section 4(f) and 6(f) Evaluation, of this Draft EIS for details on the project's 4(f) analysis.

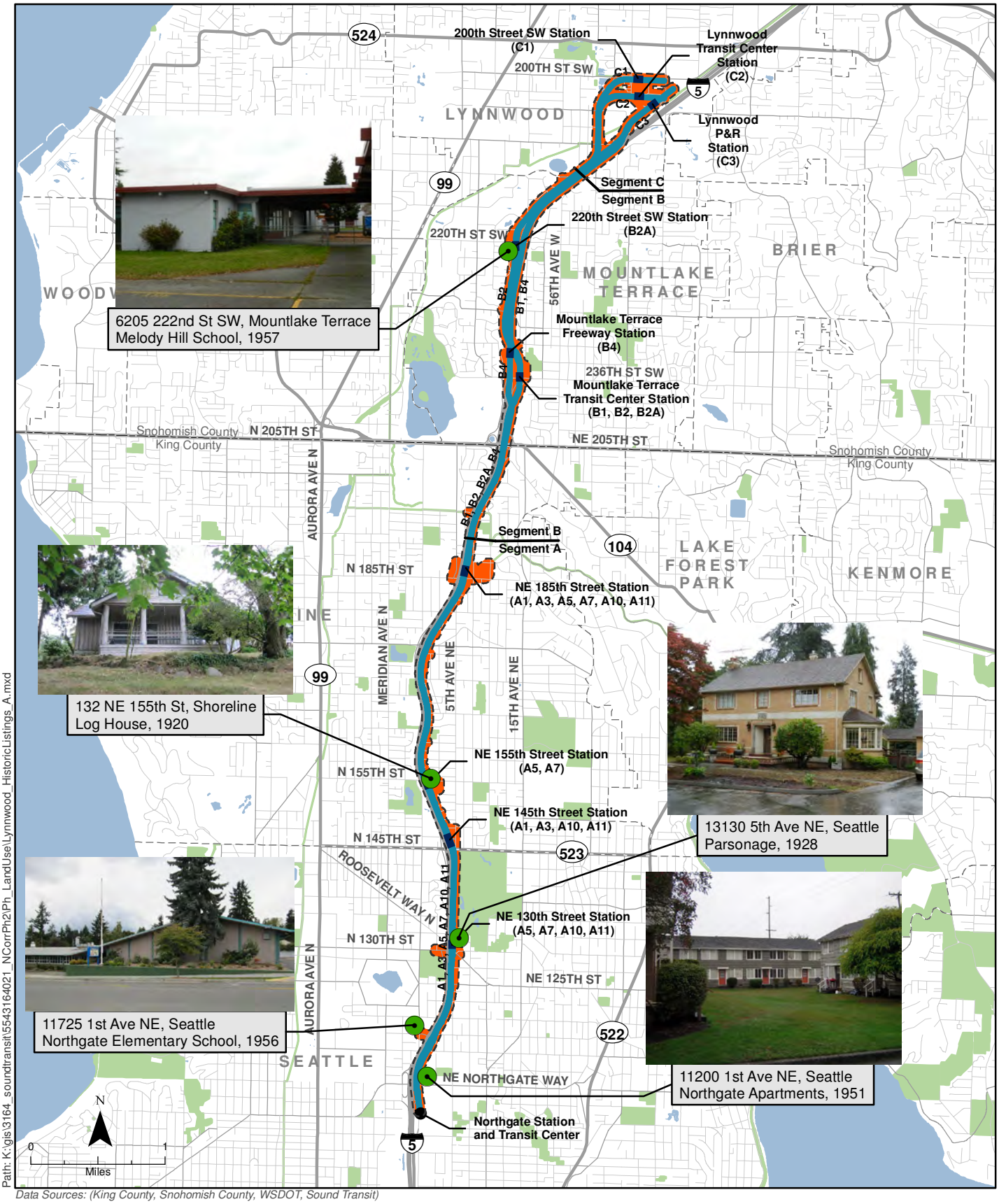


Figure 4.16-1
National Register Eligible Properties within the APE

Lynnwood Link Extension

Northgate Plaza Apartments is a garden apartment complex with 207 units in 34 buildings. It was designed in 1950–51 by John Graham, Jr., the architect of nearby Northgate Mall, to help address the critical need for housing after World War II.

Northgate Elementary School (11725 1st Avenue NE, Seattle) was built in 1956 to accommodate post-World War II population growth in north Seattle. It was designed by Paul Thiry, one of Seattle's premier Modernist architects.

A residence at 13130 5th Avenue NE, Seattle, currently used as a parsonage by the North Seattle Church of the Nazarene, is a very good example of the Georgian Revival style, exhibiting an Italian Renaissance influence and an extensive use of terra cotta ornamentation.

The log house (132 NE 155th Street, Shoreline) is one of the oldest houses in the vicinity and is an example of a style that is very unusual in north King County.

The former Melody Hill Elementary School (6205 222nd Avenue SW, Mountlake Terrace) is a very good example of mid-20th century school architecture. It was designed in 1958 for the Edmonds School District by Ralph H. Burkhard, an award-winning architect of many Puget Sound schools. It is largely unaltered except for a compatible multipurpose room addition designed in 1972 by Edward J. LaBelle, AIA.

In addition to being NRHP-eligible, these properties are also eligible for listing in the Washington Heritage Register and for landmark designation in the cities of Seattle and Shoreline.

The historic resources survey identified one additional property that appears likely to meet the Seattle landmark designation standards: the Seattle Latvian Evangelical Lutheran Church (11710 3rd Avenue NE, Seattle). The property, built in 1971, does not meet the age criteria for the NRHP but does meet Seattle's 25-year threshold for potential landmarks. Only the Seattle Landmarks Preservation Board has the authority to determine if a property is eligible for designation. No other properties in the survey appear likely to meet local landmark criteria.

Only one previously identified historic resource is within the APE: a house at 727 NE 189th Street, Shoreline, which was identified in King County's Historic Resources Survey of Shoreline as meeting King County's and Shoreline's criteria for landmark designation. In consultation with the SHPO, this house has been determined to not have sufficient integrity to be eligible for NRHP listing.

4.16.2 Determination of Adverse Effects

Under Section 106 regulations an adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the NRHP in a manner that would diminish the

integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Adverse effects include, but are not limited to, the following:

- Demolition or alteration of the property
- Alteration of the property's setting
- Introduction of visual, audible, or atmospheric elements that are out of character with the setting of the historic property
- Physical encroachment upon an archaeological site

An agency may make a finding of no adverse effect, in consultation with the SHPO, when the undertaking is modified or conditions are imposed to avoid adverse effects.

Effects on the identified historic properties are described below. No NRHP-eligible archaeological resources or TCPs have been identified; however, it is possible one or more archaeological sites exist beneath the ground surface in areas where project excavation would take place. Through the NEPA review and the Section 106 process, FTA and Sound Transit will continue to consult with the SHPO, tribes, and other interested parties to minimize impacts to a potential site, if it exists.

Long-Term Impacts

Long-term impacts are those that would occur or continue to occur while the proposed project is in operation. The impact would constitute an adverse effect if it, as described above, alters any of the characteristics that qualify the property for inclusion in the NRHP.

None of the light rail alternatives would adversely affect any of the NRHP-eligible historic properties within the APE, and none would affect the King County and City of Shoreline landmark-eligible house at 727 NE 189th Street. The project may affect the Seattle Latvian Evangelical Lutheran Church, which may meet Seattle landmark criteria.

No Build Alternative

The No Build Alternative would have no long-term effects on historic properties.

Light Rail Alternatives

Segment A: Seattle to Shoreline

None of the Segment A alternatives would affect NRHP-eligible historic properties during operation of the transportation facility. All of the historic properties located within Segment A are located far enough from the transportation facility that vicinity impacts, such as noise, vibration, or visual effects, would be minor. The introduction of the new transportation facility would not alter or diminish the properties' integrity of setting because the light rail guideway would be constructed adjacent to I-5.

The **Northgate Plaza Apartments** are located across the street from the potential alignment; all of the Segment A alternatives would involve guideway construction between 1st Avenue NE and I-5, west of the Northgate Plaza Apartments. This would cause a minor alteration of the Apartments' integrity of setting, but because the new guideway is adjacent to I-5, the effect would not be adverse.

Northgate Elementary School is adjacent to the 117th Street overpass, which would be rebuilt under Alternatives A1 and A10. However, there would be no effect to the historic property, because the overpass is being replaced, not newly located to the site.

The **Parsonage** is located to the east of 5th Avenue NE, where all Segment A alternatives have an alignment to the west. Alternatives A5, A7, A10, and A11 would include a station at NE 130th Street. This would cause a minor alteration to the Parsonage's integrity of setting and feeling, but because the new guideway and station are adjacent to I-5 and across 5th Avenue NE, these effects would not be adverse.

The **Log House** is located across the street from the proposed parking facility, which would be constructed under Alternatives A5 and A7. This would cause a minor alteration to the building's integrity of setting and feeling, but because the new guideway is adjacent to I-5 and the parking facility is across NE 155th Street and adjacent to the fire station, these effects are not adverse.

Although not NRHP-eligible, the project could affect the **Seattle Latvian Evangelical Lutheran Church**, which may meet Seattle Landmarks eligibility criteria. All of the Segment A alternatives would result in the use of a small part of the property along I-5 but would not cause any physical alteration to the building. However, Alternatives A1, A5, and A10 would remove the church's access, displacing the church if alternative access cannot be provided. Because this building is not NRHP-eligible, it would not be adversely affected by the undertaking under Section 106.

As design progresses, Sound Transit will work to maintain access or provide alternative access. If access cannot be maintained, the church would be displaced.

If the Seattle Landmarks Preservation Board were to designate the property as a Seattle Landmark, Sound Transit would seek a Certificate of Approval from the Board to undertake the necessary work on the site and would comply with the Board's requirements.

Segment B: Shoreline to Mountlake Terrace

None of the Segment B alternatives would affect the historic property—**the former Melody Hill Elementary School**—within this segment. The school is located far enough from the transportation facility that vicinity impacts, such as noise, vibration,

or visual effects, would be minor. Alternative B2 would place the elevated guideway in the adjacent WSDOT right-of-way. Alternative B2A would place the elevated guideway and station on the adjacent WSDOT right-of-way and over 220th Street SW, with parking north of 220th Street SW. The introduction of the new transportation facility would not alter or diminish the building's integrity of setting because the guideway would be constructed adjacent to I-5.

Segment C: Mountlake Terrace to Lynnwood

None of the Segment C alternatives would affect historic properties because there are no historic properties within this segment of the APE.

Construction Impacts

Construction impacts such as noise, vibration, dust, or reduced access are considered temporary and occur only during project construction. While construction activities may temporarily disturb occupants, they would only be an adverse effect if they diminished the qualities that make the property eligible for NRHP listing.

In order to reduce construction-related effects, such as fugitive dust, noise, vibration, and other impacts, Sound Transit will implement standard BMPs throughout the entire project construction period. Construction noise and vibration impacts can be reduced with operational methods and scheduling, equipment choice, and acoustical treatments. Noise and vibration control will meet local regulatory requirements, ordinances, and permit or variance conditions.[4]

Although Sound Transit has not identified significant archaeological resources in the project area and the corridor overall has a moderate-to-low probability for containing intact archaeological resources, construction activities involving excavation could encounter an unanticipated archaeological site. If the site is determined to be significant, an adverse effect could occur.

No Build Alternative

The No Build Alternative would have no construction-related effects on historic properties.

Light Rail Alternatives

Segment A: Seattle to Shoreline

The **Northgate Plaza Apartments** are located across the street from the potential alignment. All of the Segment A alternatives would involve guideway construction between the Northgate Plaza Apartments and I-5, which would have temporary

[4] For specific noise and vibration control measures during construction, please see Section 4.7, Noise and Vibration, of this Draft EIS. For information on air quality, see Section 4.6, Air Quality and Greenhouse Gases.

minor effects, including noise, changed visual quality, and reduced access. These effects may temporarily alter integrity of setting, but they would not permanently diminish any of the seven aspects of integrity; therefore, the effects would not be adverse.

Northgate Elementary School would experience temporary, minor proximity effects from Alternatives A1 and A10 during the rebuilding of the 117th Street overpass. These effects may include noise and visual intrusions. Integrity of setting may potentially be temporarily altered, but not diminished. These alternatives would not diminish other aspects of the building's integrity, and the effects would not be adverse.

The **Parsonage** would experience temporary, minor proximity effects from all Segment A alternatives. The duration of these effects would be longer from Alternatives A5, A7, A10, and A11, which would also construct a NE 130th Street Station. Construction impacts, such as noise, vibration, reduced access, or visual intrusions, could temporarily alter the integrity of setting and feeling of this historic resource. However, setting and feeling would not be permanently diminished and the effects would not be adverse. No other aspects of integrity would be altered.

The **Log House** would experience temporary, minor proximity effects from Alternatives A5 and A7 during construction of a parking facility across the street. Construction impacts, such as noise, vibration, reduced access, or visual intrusions, could temporarily alter the integrity of setting and feeling of this historic resource. However, setting and feeling would not be permanently diminished, and these effects are not considered adverse. No other aspects of integrity would be altered.

The **Seattle Latvian Evangelical Lutheran Church** could have restricted access during construction of the alternatives that are elevated at that location (A3, A7 and A10).

Segment B: Shoreline to Mountlake Terrace

Alternatives B2 and B2A would involve construction near the former Melody Hill Elementary School, which could result in temporary and minor construction impacts such as noise, vibration, reduced access, or visual intrusions. This could affect the current uses within the building and might temporarily alter its integrity of setting and feeling but would not damage or alter the building itself. No other aspects of integrity would be altered.

Segment C: Mountlake Terrace to Lynnwood

No historic properties are located within or adjacent to the proposed construction area.

4.16.3 Indirect and Secondary Impacts

Indirect or secondary effects would be limited because there are so few historic properties in the project corridor. The Melody Hill Elementary School is located at a freeway interchange, where there is a high likelihood of new development regardless of whether a station is built in the immediate vicinity.

4.16.4 Cumulative Impacts

Cumulative impacts would be limited because few historic properties exist in the project corridor; moreover, there are few pending projects involving construction or other developments that could affect historic resources in areas where the light rail project could also have effects.

The Edmonds School District owns the Melody Hill Elementary School site, which is zoned for mixed-use development, and could make the property available for redevelopment regardless of whether the light rail project is built in the immediate vicinity.

4.16.5 Potential Mitigation Measures

Section 106 of the NHPA stipulates that the agency official, in consultation with the SHPO and other consulting parties, must develop and evaluate alternatives or modifications to the undertaking that could avoid, minimize, or mitigate adverse effects on historic properties. Where adverse effects cannot be avoided, they will be resolved through mitigation measures in a Memorandum of Agreement (MOA). Because there would be no adverse effects on NRHP-eligible historic properties, no MOA is anticipated for the Lynnwood Link Extension. To avoid a displacement due to the loss of access for the Seattle Latvian Evangelical Lutheran Church, which may meet Seattle landmark criteria, Sound Transit would further explore options to maintain access. If the City of Seattle designates the church as a landmark, Sound Transit would seek a Certificate of Approval.

To minimize the risk of damage to currently unknown archaeological resources, Sound Transit would develop an Inadvertent Discovery Plan prior to ground-disturbing construction activities. FTA and Sound Transit would coordinate with SHPO and tribes to review the plan. In addition, archaeologists would conduct training for contractors to help them identify potential archaeological remains during construction; the training would also cover protocols to implement if something is discovered. If potentially significant archaeological materials or sites (or evidence thereof) are discovered during the construction of the project, activities would be halted around the find. All reasonable measures would be taken to avoid or minimize harm to the property until such time as FTA and Sound Transit, in consultation with SHPO and the tribes, determine that appropriate measures have been taken to ensure that the project is in compliance with Section 106.

The Inadvertent Discovery Plan also would describe the procedures that Sound Transit and FTA would follow if any human remains were discovered during project construction.

4.17 Parks and Recreational Resources

The parks and recreational resources considered in this section consist of designated public parks, designated open spaces, trails, and other publicly owned and publicly accessible lands that support recreational activities.

4.17.1 Affected Environment

The study area covers parks and recreational resources within 200 feet of potential light rail track alignments and 0.25 mile of potential station locations. Figures 4.17-1a and 4.17-1b map the parks and recreational resources in the study area. Table 4.17-1 summarizes the size, recreational uses, location, and access for the resources.

In addition to the effects discussed in this section, impacts on parks and recreational resources are also evaluated under two federal statutes: Section 4(f) of the U.S. Department of Transportation Act of 1966 (23 CFR 771), and Section 6(f) of the 1965 Land and Water Conservation Fund Act (36 CFR 59). These statutes require specific analysis of and avoidance or mitigation for certain direct impacts on some properties with parks and recreational uses. The analysis of recreational resources that may be covered by these statutes, including potential impacts and mitigation measures, is found in Section 4.18, Section 4(f) and 6(f) Evaluation.

Segment A

Jackson Park Golf Course, Seattle

Jackson Park Golf Course is a 27-hole golf course owned by the City of Seattle and managed by a private company. This golf course, which opened in 1930, is characterized by mature conifers and rolling topography. A public walking trail is located near the boundary of the course. In some locations the trail is a soft-surface walking path; in other locations the trail is a sidewalk.

Thornton Creek Park #1, Seattle

The undeveloped Thornton Creek Park #1 open space consists of riparian forest along the banks of Thornton Creek. There are a few unofficial trails in this park, but otherwise the open space does not accommodate recreational use.

Northacres Park, Seattle

Northacres Park is a large open space that provides baseball/softball/soccer fields for active recreation, as well as nature trails, play areas, an off-leash dog area, and undeveloped open space for more passive recreation. The children's play area includes a wading pool.

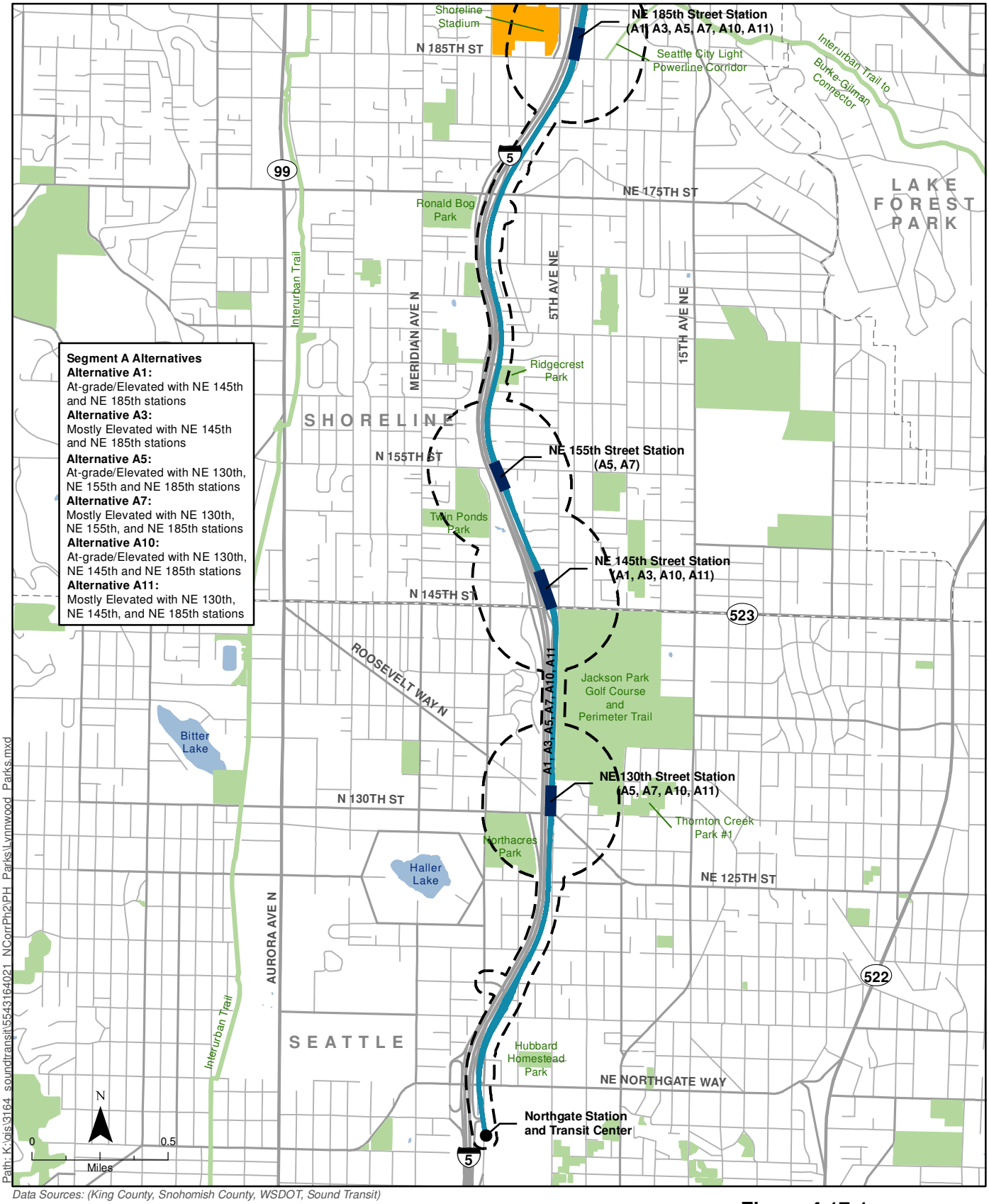
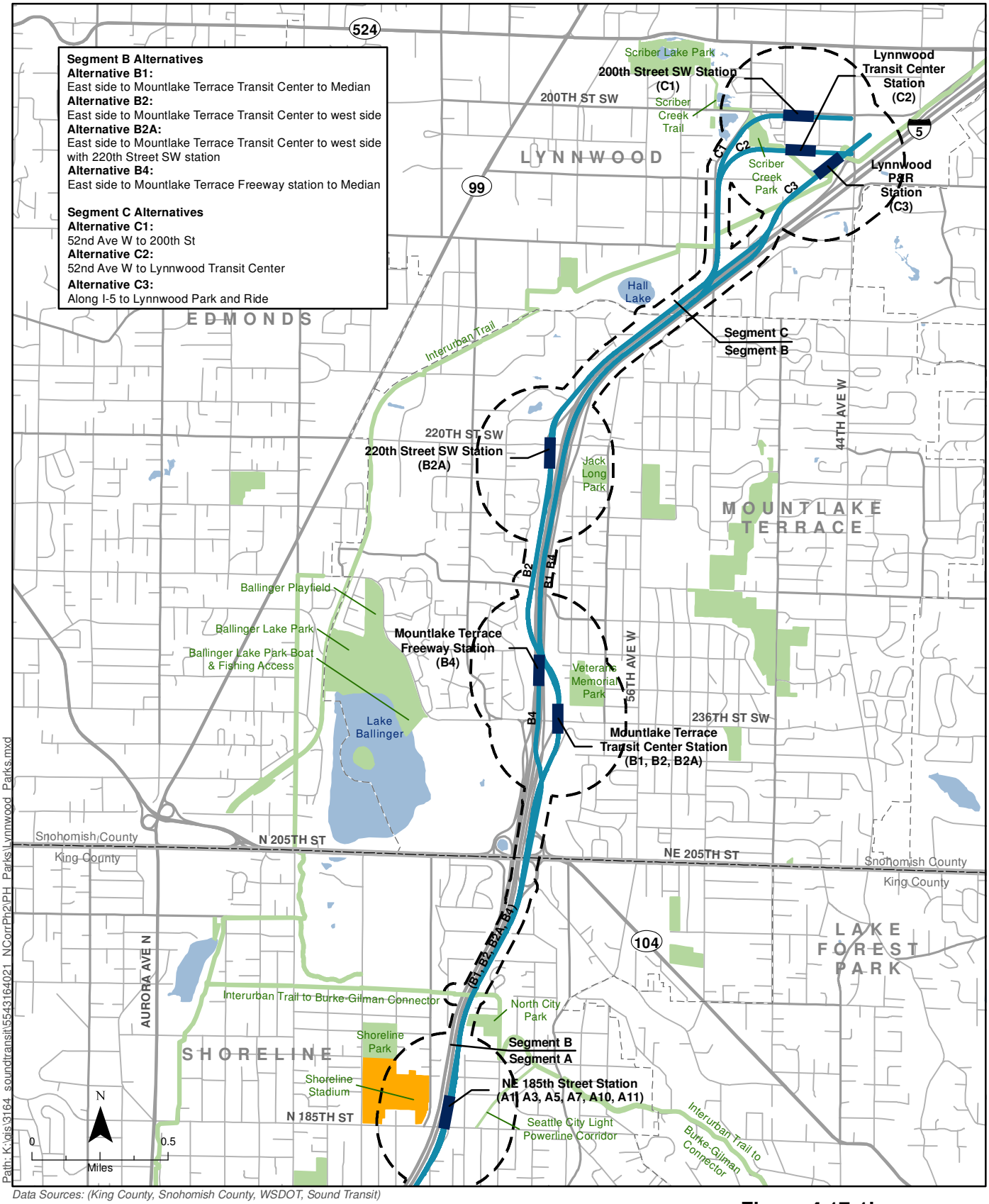


Figure 4.17-1a
Park and Recreational Facilities in the Study Area

Lynnwood Link Extension



Data Sources: (King County, Snohomish County, WSDOT, Sound Transit)

Study
Light Rail
Station Location
Public Recreation Facility
Park
Trail
Roadway
Local Street
City Boundary
County Boundary
Waterbody

Figure 4.17-1b
Park and Recreational Facilities in the Study Area

Lynnwood Link Extension

Twin Ponds Park, Shoreline

Twin Ponds Park includes an artificial turf soccer field, children's playground, tennis court, nature trails, and a viewing deck for its namesake ponds.

Ridgecrest Park, Shoreline

Ridgecrest Park features a baseball diamond and a concrete handball court, as well as a grassy outfield/open space area. It has a small parking lot in the southwest corner. Although this park is located just east of I-5, a berm planted with mature cottonwood trees buffers the park from the freeway.

Shoreline Park and Stadium, Shoreline

This recreational complex includes Shoreline Park, Shoreline Stadium, and the Shoreline Pool. Shoreline Park includes tennis courts and two artificial turf soccer fields as well as a small forested area with walking paths. Recreational facilities on a portion of the site owned by the Shoreline School District include an undeveloped grass field and the Shoreline Stadium. The grass field is used for track and field events and informal recreation. The Shoreline Stadium includes an artificial turf football/soccer field as well as track and field facilities. The stadium has a covered grandstand, and has historically hosted large regional high school sports competitions, including an annual invitational track meet. Shoreline School District high schools use the stadium throughout the year for football games, track meets, and soccer games. The recreational facilities associated with the Shoreline Stadium are open for public use.

Seattle City Light Powerline Corridor

Between North 185th Street and North 188th Street, Seattle City Light maintains a powerline corridor as a grassy open space. A few informal trails cross the corridor. This corridor has no developed facilities, and the prominent overhead powerlines reduce the aesthetic quality of the open space.

Table 4.17-1. Parks and Recreational Resources in the Study Area

Park Facility	Size (acres)	Recreational Uses	Location of Recreational Uses	Access Locations	Unique Recreational or Open Space Values
Segment A					
Jackson Park Golf Course City of Seattle	160.38	Golf, walking trail	Throughout; trail facility along boundary.	NE 135th Street	Golf, scenic setting, mature conifers.
Thornton Creek Park #1 City of Seattle	7.8	None	Not applicable (N/A)	N/A	Scenic natural setting.
Northacres Park City of Seattle	20.67	Baseball, softball, soccer, nature trails, off-leash dog area, children's playground.	Throughout	1st Avenue NE	Active recreational facilities, off-leash dog area, large mature forest.
Twin Ponds Park City of Shoreline	21.96	Soccer, tennis, nature viewing, trails, playground.	Throughout; developed recreation located at the east side of park.	1st Avenue NE	Ponds and wildlife viewing access.
Ridgecrest Park City of Shoreline	3.82	Baseball diamond, handball, open grass.	Baseball diamond is nearest the proposed light rail route; handball is located on the east side of the park.	NE 161st Street	None
Seattle City Light Power Line Corridor	2.21	Open space.	Throughout	NE 185th Street, NE 188th Street	None
Shoreline Park and Stadium City of Shoreline	39.62	Football/soccer/track and field stadium, tennis indoor swimming pool, grass fields, field turf soccer fields, forested trails.	The stadium is located nearest the potential light rail development; other uses are more distant to the west.	Primary from 1st Avenue NE, secondary access from NE 185th Street	One of the few venues for large-scale track and field meets in the region; stadium seating for football, track, and soccer events.
Segment B					
Interurban Trail to Burke-Gilman Trail Connector City of Shoreline	(planned)	Planned signed trail route connecting Interurban and Burke-Gilman trails.	Follows NE 195th Street to the Burke-Gilman Trail at NE 170th Street in Lake Forest Park; uses existing bridge crossing over I-5.	Part of street system	Urban street
North City Park City of Shoreline	3.96	Forest trails; adjacent school property is open to the public for soccer and playground use.	The forested section of North City Park extends east from the I-5 right-of-way.	10th Avenue NE	Mature Pacific Northwest forest.
Veterans Memorial Park City of Mountlake Terrace	10	Forested walking trails, gazebo, picnicking.	Throughout	232nd Street SW and 58th Avenue West	Mature Pacific Northwest forest; Veterans Memorial installation.
Jack Long Park City of Mountlake Terrace	3	Nature trails, picnicking, horseshoes.	Throughout	58th Avenue West	Mature conifers.
Segment C					
Interurban Trail City of Lynnwood	N/A	Walking, running, bicycling, skating.	Entire facility	Several street crossings; existing park-and-ride.	Long-distance recreational trail.
Scriber Creek Trail City of Lynnwood	N/A	Walking, running, nature viewing.	Throughout	Scriber Creek Park and Lynnwood Park-and-Ride.	Nature viewing.
Scriber Creek Park City of Lynnwood	4.59	Nature trail, picnicking.	Picnicking and short loop trail in the northernmost section of the park; wetland trail to the south.	Cedar Valley Road, additional pedestrian access from 48th Avenue West.	Mature conifers, natural character, wetland boardwalk, and trail.

Segment B

Interurban Trail to Burke-Gilman Trail Connector, Shoreline

This planned route will connect the Interurban Trail and the Burke-Gilman Trail along North/NE 195th Street and NE 170th Street in Lake Forest Park. The route includes the existing pedestrian bridge over I-5 at NE 195th Street. According to the City of Shoreline, this route is primarily a transportation facility that can support recreational activities; impacts on the connector as a transportation facility are discussed in Chapter 3, Transportation Impacts and Mitigation.

North City Park, Shoreline

This small park includes a patch of remnant conifer forest with nature trails. The park is adjacent to and provides public access to a school play area, including a grass soccer field and children's play structure. The school's play area is adjacent to I-5 on the east side of the freeway and is buffered from the freeway by a relatively wide stand of mature mixed forest.

Veterans Memorial Park, Mountlake Terrace

Veterans Memorial Park is located just northeast of the Mountlake Terrace Town Center and is a forested park offering nature trails, a gazebo, picnicking, and a children's play area. It also includes a flagpole and plaque as a memorial to veterans.

Jack Long Park, Mountlake Terrace

This small park east of I-5 is located adjacent to the Mountlake Terrace water towers. Its most significant feature is a patch of mature conifers. Recreational facilities include a nature walk trail, picnic tables, a small climbing rock, and horseshoe pits.

Segment C

Interurban Trail, Lynnwood

The Interurban Trail is a regional, multipurpose trail that spans several local jurisdictions. The segment of the trail in the study area is managed by the City of Lynnwood and includes segments on Snohomish County PUD right-of-way, as well as a side path adjacent to city streets. North of the Lynnwood Park-and-Ride, the trail continues north adjacent to the I-5 right-of-way.

Scriber Creek Park, Lynnwood

This small park includes a parking area, picnic tables, a grassy area for passive recreation, and a short trail through mature conifers. It includes an open-water pond that is part of a larger wetland extending southward beyond the park property. A trail on the south end of the park (Scriber Creek Trail, described in the following paragraph) provides recreational access to the wetland within the park and expansive views over the larger wetland outside the park.

Scriber Creek Trail, Lynnwood

Scriber Creek Trail connects Scriber Lake Park with Scriber Creek Park and the Interurban Trail. It enters Scriber Creek Park from Cedar Valley Road, extends southward to the park's boundary at a large wetland, then turns eastward to the edge of the Lynnwood Park-and-Ride and follows the boundary of the park-and-ride southeast, eventually connecting with the Interurban Trail.

4.17.2 Long-Term Impacts

Long-term impacts typically include permanent changes to a resource, such as when a project converts land from a park or recreational resource to another use. Indirect long-term impacts include changes to the area surrounding the park or recreational resource that would affect recreational opportunities or the recreational experience. While long-term impacts generally refer to permanent changes, some construction impacts can be considered long term if they would have a major effect on the resource and extend for years.

Table 4.17-2 lists the long-term impacts that would affect parks and recreational resources in Segment A where the highest number of resources would be encountered. The impacts in all three segments are described below for all alternatives.

No Build Alternative

Under the No Build Alternative, no direct or indirect impacts are expected on parks and recreational resources in the study area.

Segment A Alternatives

Jackson Park Golf Course

Portions of the light rail alignment and an elevated station at NE 145th Street (Alternatives A1, A3, A10, and A11) would be visible from parts of the playing area of the Jackson Park Golf Course and from the walking trail along the boundary of the course. The light rail facility would be most visible from the section of trail along 5th Avenue NE. The visibility of the guideway and station would not affect the use of the golf course or trail but would change some of the views. The guideway also would be visible with the other Segment A alternatives (Alternatives A5 and A7), but the overall effects would be similar. For more discussion of this impact on views, see Section 4.5, Visual and Aesthetic Resources.

Thornton Creek Park #1

The project would have no long-term impacts on Thornton Creek Park #1.

Table 4.17-2. Long-Term Impacts, Segment A

Park Facility	Alternative A1	Alternative A3	Alternative A5	Alternative A7	Alternative A10	Alternative A11
Jackson Park Golf Course	No property impacts, but areas with vegetation removal and an elevated NE 145th Street Station would be visible from parts of the golf course and walking trail.	Similar to Alternative A1, but elevated guideway more visible.	Visual impacts from vegetation removal only.	Visual impacts from guideway only.	Same as Alternative A1.	Same as Alternative A1.
Thornton Creek Park #1	No anticipated impacts.	No anticipated impacts.	No anticipated impacts.	No anticipated impacts.	No anticipated impacts.	No anticipated impacts.
Northacres Park	No anticipated impacts.	No anticipated impacts.	NE 130th Street light rail station would provide improved access to park. Possible unintended use of parking lot as informal parking for light rail.	Same as Alternative A5.	Same as Alternative A5.	Same as Alternative A5.
Twin Ponds Park	No anticipated impacts.	No anticipated impacts.	NE 155th Street light rail station would provide improved access to park. Possible unintended use of parking lot as informal parking for light rail.	Same as Alternative A5.	No anticipated impacts.	No anticipated impacts.
Ridgecrest Park	Light rail facility would use 0.30 acre at the western edge of the park, removing a berm and trees that provide a buffer to I-5. Park would be affected by property and visual impacts.	Same as Alternative A1.	Same as Alternative A1.	Same as Alternative A1.	Same as Alternative A1.	Same as Alternative A1.
Shoreline Park and Stadium	Relocated local road would require use of 0.18 acre of the parking lot and stadium field for Shoreline Stadium. Impacts would include reduced parking spaces.	No anticipated impacts.	No anticipated impacts.	No anticipated impacts.	No anticipated impacts.	No anticipated impacts.
Seattle City Light Powerline Corridor	Potential minor additional use of informal trail to access light rail station.	Same as Alternative A1.	Portion of the open space replaced with parking for light rail station.	Same as Alternative A1.	Same as Alternative A1.	Same as Alternative A5.

Northacres Park

The project would have no long-term impacts on Northacres Park.

Twin Ponds Park

The project would have no long-term impacts on Twin Ponds Park.

Ridgecrest Park

All Segment A alternatives would use a portion of the park's western edge for light rail right-of-way. The total impact area would be approximately 0.30 acre. This area is adjacent to parking on the south side of the park and to the baseball diamond on the north side. The light rail facility would partially replace a berm and row of mature cottonwoods that currently buffer the park from I-5. A portion of the berm and existing trees may be retained at the northern edge of the park, depending on the final design of the light rail facility.

Figure 4.17-2 shows the area that would be affected within the park. The light rail guideway would be in a retained cut through this area, although the tracks would be close to existing grade. The anticipated impacts would not reduce parking or affect use of the baseball diamond, handball court, or grassy play area. The alternatives would include a barrier between the light rail facility and the park that replaces the noise reduction and visual screening functions of the affected berm (see Viewpoints 19 and 20 in Appendix G, Visual Simulations).

Shoreline Park and Stadium

Alternative A1 would realign 5th Avenue NE, which would require using a small portion of the Shoreline Stadium's parking lot and space adjacent to the running track for the realigned road and sidewalk. These changes within the property boundaries would not interfere with areas used for track and field activities in Shoreline Park or the stadium operations. The impact area would be approximately 0.18 acre, as shown in Figure 4.17-3. A parking garage would be built beside I-5 to serve a station on the east side of the freeway. Realigning 5th Avenue NE would displace about 10 parking spaces out of 62 in the lot. The other Segment A alternatives would place both the parking and the station on the east side of I-5, which would have no impacts on the stadium.

Seattle City Light Powerline Corridor

Alternative A5 would replace a portion of the open space with parking for the NE 185th Street Station.

Path: K:\qis\3164_soundtransit\5543164021_NCorrPh2\PH_Parks\Parks_8x11_100scale.mxd

Data Sources: (King County, Snohomish County, WSDOT, Sound Transit, Bing Aerial)

Potentially Affected Park and Recreation Facility

Impact

Figure 4.17-2
Ridgecrest Park Potential Impacts with Segment A Alternatives

Path: K:\qis\3164 soundtransit\5543164021 NCorrPh2\PH Parks\Parks 8x11 100scale.mxd

Data Sources: (King County, Snohomish County, WSDOT, Sound Transit, Bing Aerial)

Potentially Affected
Park and Recreation Facility

Impact

Figure 4.17-3
Shoreline Stadium Potential Impacts with Alternative A1

Segment B Alternatives

Interurban Trail to Burke-Gilman Trail Connector

Under all Segment B light rail alternatives, the existing pedestrian bridge crossing I-5 at NE 195th Street would be removed and replaced for the Interurban Trail to Burke-Gilman Trail connector. The replacement bridge would provide the same or improved functions as a trail connection.

North City Park

Under all Segment B light rail alternatives, the forested buffer between North City Park and I-5 would be narrowed, and the light rail facility would be developed at-grade in the I-5 right-of-way. No direct impacts to park property are anticipated.

Veterans Memorial Park

The project would have no long-term impacts on the Veterans Memorial Park.

Jack Long Park

The project would have no long-term impacts on Jack Long Park.

Segment C Alternatives

Interurban Trail

All Segment C alternatives include at least one overcrossing of the Interurban Trail, and two alternatives include two crossings. In all cases, the light rail facility would be elevated over the trail and not interfere with its use or maintenance.

Under Alternatives C1 and C2, the guideway would cross over the trail just east of 52nd Avenue West. The elevated tracks would also be located directly east of the trail for approximately half a block extending north from 208th Street SW. The project would change the visual character of the trail environment but would not directly affect recreational use of the trail. The light rail facility would be prominent for trail users; however, the trail is already in a visually complex urban setting in this location and the light rail facility would have a negligible impact on its use and enjoyment.

Under Alternative C2, the tail tracks for the light rail facility would also extend above the trail near 202nd Street SW as the trail slopes upward to the 44th Avenue West overcrossing.

Under Alternative C3, the elevated guideway would cross over the Interurban Trail as it passes through an open field and wetland area south of Scriber Creek (see Viewpoint 43 in Appendix G, Visual Simulations). The light rail guideway would then travel northeast, roughly parallel to the trail for about 400 feet, until it crosses the trail again at the ramp leading to the 44th Avenue West overcrossing. An existing set of power line poles beside the trail would be relocated. The light rail guideway would alter the quality of the views from the trail, but would not affect the use of the trail

for recreation or commuting purposes. The light rail station would feature a direct connection to the trail.

Scriber Creek Park

Under Alternative C1, an elevated portion of the light rail route would pass above the Scriber Creek Park's entrance road and parking lot. Support columns would be located within the park property, and would directly affect approximately 0.42 acre of the park. The elevated guideway would be a prominent feature of the parking area, crossing directly overhead and changing the experience of the parking lot, which is currently buffered from the surrounding street and neighborhoods by established vegetation. The light rail facility would be visible from the short nature trail and picnic areas in the park but would not be as prominent as it would be from the parking area, and would not restrict recreational activities inside the park. Without mitigation or other design measures, Alternative C1 could modify the character of the park by introducing larger-scale transportation infrastructure within the park. Figure 4.17-4 shows the area within the park anticipated to be used for the project right-of-way. Also, see Viewpoints 38 and 39 in Appendix G, Visual Simulations.

Under Alternative C2, an elevated guideway would pass over a wetland area adjacent to and south of the park and be visible from the segment of Scriber Creek Trail located in this area of the park, as shown in Figure 4.17-4 and Viewpoints 41 and 42 in Appendix G, Visual Simulations. Although the park would not experience direct property impacts, the light rail would be a prominent part of the view from the trail and would change the experience of this area of the park, which is focused on the natural wetland area. Enjoyment of some activities in the park, including wildlife watching and enjoyment of the natural environment of the adjacent wetland, could be diminished by the location of the elevated structure. The project includes noise walls to mitigate noise impacts at nearby residences, which would also reduce the potential for noise increases in the park. However, the park is not considered noise sensitive because it already experiences higher levels of ambient noise and its activities do not require quiet surroundings. Support columns, the elevated guideway, and the presence of passing trains would change the natural character of the wetland view from the park. Without mitigation, Alternative C2 could reduce the natural character of the park setting and user experience.

Alternative C3 would not have any direct impacts on Scriber Creek Park. The light rail facility would be visible from a park trail, but only from a distance.

Figure 4.17-4
Scriber Creek Park Potential Impacts with Alternatives C1 and C2

Scriber Creek Trail

Each Segment C alternative includes an overcrossing of the Scriber Creek Trail, and effects would be similar to those described above for the Interurban Trail. The overcrossing would change the visual character of the trail in that location.

Under Alternative C1, light rail would cross the trail inside Scriber Creek Park where the trail is adjacent to the parking lot.

Under Alternative C2, light rail would cross the trail as it follows the edge of the Lynnwood Park-and-Ride near 48th Avenue West. Under this alternative, an elevated guideway also would be adjacent to the trail for approximately 500 feet, including the portion of the trail on the southern boundary of Scriber Creek Park and its extension to 48th Avenue West. This section of the trail is adjacent to the large wetland to the south, as described previously under Scriber Creek Park. The addition of light rail facilities, including structures and passing trains, would change the character and experience of this section of the trail.

Under Alternative C3, the light rail facility would cross over the Scriber Creek Trail near the location where the trail currently crosses under the park-and-ride HOV direct access ramp. The addition of the light rail facility would have a minor effect in this location where the trail is already entering an underpass.

4.17.3 Construction Impacts

For parks in the vicinity of construction activities, access could be affected by detours and street or lane closures, which would result in increased congestion caused by construction traffic. Visual impacts, light, glare, dust, and noise could also affect users in some of the parks and trails, although most of these impacts would affect smaller portions of the parks closest to the light rail facilities being constructed. The parks and recreational facilities with direct physical impacts from one or more of the alternatives (Ridgecrest Park, Shoreline Park and Stadium, and Scriber Creek Park) could have larger areas temporarily affected to allow construction access, staging, or other activities.

Under all light rail alternatives, there might be temporary trail closures and detours. The planned Interurban Trail to Burke-Gilman Trail connector could be temporarily affected by the removal and replacement of the existing pedestrian bridge crossing I-5 at NE 195th Street. Closures or detours may be needed. If the replacement pedestrian bridge is constructed prior to the demolition of the existing bridge, the trail could remain open during construction.

Each light rail alternative includes at least one crossing of the Interurban Trail near the Lynnwood Transit Center. Work above or adjacent to the trail would require temporary closures or reroutes, depending on the duration of the work and coordination with the City of Lynnwood.

Alternatives C2 and C3 would require temporary closures of the Scriber Creek Trail either within Scriber Creek Park, as it connects between the park and the Interurban Trail, or both.

Tables 4.17-3 through 4.17-5 summarize the construction impacts for all light rail alternatives by segment.

Table 4.17-3. Potential Construction Impacts, Segment A

Park Facility	Alternative A1	Alternative A3	Alternative A5	Alternative A7	Alternative A10	Alternative A11
Jackson Park Golf Course	Noise and minor visual impacts from construction of facility along 5th Avenue NE, and from construction of NE 145th Street Station.	Same as Alternative A1.	Noise and minor visual impacts from construction of facility along 5th Avenue NE.	Same as Alternative A5.	Same as Alternative A1.	Same as Alternative A1.
Ridgecrest Park	Light rail facility would be located on western part of the park, replacing existing buffer; property, noise, and visual impacts on the park.	Same as Alternative A1.	Same as Alternative A1.	Same as Alternative A1.	Same as Alternative A1.	Same as Alternative A1.
Shoreline Park and Stadium	Noise and visual impacts and additional parking restrictions to stadium.	No impacts.	No impacts.	No impacts.	No impacts.	No impacts.

Table 4.17-4. Potential Construction Impacts, Segment B

Park Facility	Alternative B1	Alternative B2	Alternative B2A	Alternative B4
North City Park	Noise and screened views of construction activities.	Same as Alternative B1.	Same as Alternative B1.	Same as Alternative B1.
Veterans Memorial Park	Alteration of transit center sidewalks connecting to a park trail, but the park would remain accessible.	Same as Alternative B1.	Same as Alternative B1.	No impacts.
Interurban Trail to Burke-Gilman Trail Connector (planned)	Temporary closure or reroute during replacement of NE 195th Street pedestrian bridge.	Same as Alternative B1.	Same as Alternative B1.	Same as Alternative B1.

Table 4.17-5. Potential Construction Impacts, Segment C

Park Facility	Alternative C1	Alternative C2	Alternative C3
Interurban Trail	Short-term closures with detours during construction.	Same as Alternative C1.	Similar to Alternative C1 but in different locations.
Scriber Creek Park	Short-term partial closure of the park during construction.	Noise and visual impacts on Scriber Creek Park during construction activities.	Minor visual and noise impacts on the wetland boardwalk area of the park.
Scriber Creek Trail	Detour during a short-term closure of the segment connecting Scriber Creek Park and the Interurban Trail.	Short-term closure during construction of adjacent elevated guideway.	Detour around temporary closure of the section of the trail on sidewalks connecting Scriber Lake Park and the Interurban Trail.

4.17.4 Indirect and Secondary Impacts

Indirect or secondary impacts resulting from the Lynnwood Link Extension could include improved access to parks and recreation facilities. Station areas could also make surrounding properties more attractive to developments or redevelopment and could encourage the initiation of other projects to improve vehicular access and circulation. Section 4.2, Land Use, describes the station areas that are more likely to experience transit-oriented developments. Other impacts could include increased congestion and unplanned parking at park and recreation facilities, resulting in a need for cities to restrict parking to parks and recreation users.

In Segment A, the Shoreline Park and Stadium could be affected by unauthorized transit patron parking as well as increased roadway congestion under all Segment A alternatives. Although there are no current plans for redevelopment of the complex, which is school district property, the light rail station could increase the potential for redevelopment.

At Northacres Park, light rail alternatives that include a light rail station at NE 130th Street (Alternatives A5, A7, A10, and A11) would have potential indirect effects on the park. The light rail station would improve access to the park, which could increase use of park facilities. The park may also be used as a pedestrian or bicycle route for neighborhood residents using the light rail facility. The parking area for the park could also be used for parking by light rail users, reducing the available parking capacity for park users.

For Twin Ponds Park, the light rail alternatives that include a light rail station at NE 155th Street (Alternatives A5 and A7) would potentially have effects similar to those described above for Northacres Park.

In Segment B, Veterans Memorial Park could benefit from higher levels of use due to increased development in the areas targeted by the City of Mountlake Terrace for transit-oriented development. Apart from the Lynnwood Link Extension, an improved pedestrian connection could be developed by others between the Mountlake Terrace Town Center and the station. This could increase the number of users in the park. The Veterans Memorial Park trail also could experience increased use from commuters accessing the station area. This effect could occur with all Segment B alternatives.

In Segment C, Scriber Creek Park and Scriber Creek Trail, could have increased use due to high levels of development in the station area. Several properties adjacent to the park and trail could be ultimately developed to higher levels. The Interurban Trail also could experience increased use from commuters accessing the station area.

4.17.5 Cumulative Impacts

The proposed Link Operations and Maintenance Satellite Facility Lynnwood site alternative is adjacent to the southwest corner of Scriber Creek Park and the Scriber Creek Trail. While the rail facility would not occupy park property, it would be adjacent to a corner of Scriber Creek Park and would require lead track guideways over the Interurban Trail to connect to the light rail alternatives. Most of the property to be acquired for the facility is developed, but part of lands that currently buffer the park and trails could be developed. While much of the facility would be screened from views, it could be visible from some locations in the park and would be visible from portions of the Interurban Trail. The Edmonds School District has a master plan for a support services building and bus storage facility on its property. The Lynnwood site alternative overlaps with the District's site. Either or potentially both of the projects could alter the views and setting from parts of the Interurban Trail, but overall impacts would remain minor.

No major additional changes to parks or recreational resources are anticipated by other projects or actions. The No Build Alternative and the light rail alternatives all assume continued population and employment growth through 2040, which would likely increase the use of parks and recreational facilities throughout the project area.

4.17.6 Potential Mitigation Measures

For all of the potentially affected resources, Sound Transit would work closely with the owning or managing jurisdictions to develop design measures and construction plans that minimize potential long-term and construction effects. Many of the mitigation measures identified in this EIS for other resources (visual and aesthetics, air quality, water quality, neighborhoods, noise and vibration, and transportation) would also reduce the potential effects on affected resources and their users. Similarly, where park property would be needed for the proposed project, Sound

Transit would work with the agency that has jurisdiction to provide compensation, consistent with the procedures outlined in Section 4.1, Acquisitions, Displacements, and Relocations. Also, see the related discussion in Section 4.18, Section 4(f) and Section 6(f) Evaluation. Below is a listing of potential mitigation measures for the affected resources that Sound Transit could implement.

- **Ridgecrest Park** (Segment A alternatives). Sound Transit would work with the City of Shoreline to provide suitable property to replace all park areas converted to transportation use, and develop replacement landscaping and other improvements to restore the park to the same or better condition as now. The alternatives would include a barrier between the light rail facility and the park that replaces the noise reduction and visual screening functions of the affected berm.
- **Shoreline Park and Stadium** (Alternative A1). Sound Transit would coordinate with the Shoreline School District and the City of Shoreline during design and construction to minimize effects on stadium parking. The reduced parking capacity could be offset by modifying the parking lot layout, and the improved transit service and adjacent park-and-ride would also lessen the impact. Signage or time-limited parking could discourage use of the stadium parking area by transit patrons. The project would allow continued use of the stadium for sporting events. Sound Transit would provide compensation for the areas needed for the project. The agency could also provide other improvements necessary to maintain the current functions of the Shoreline Park track and field facility during project construction because construction would occur immediately adjacent to the facility. Potential design elements for mitigation could include replacement fencing or relocation of field elements such as the existing long jump facility. Sound Transit would coordinate with the school district to ensure that no property would be converted to a light rail use that is necessary for staging sporting events. Visual impacts would be minimized as described in Section 4.5, Visual and Aesthetic Resources.
- **Trails**. For all temporary trail closures or reroutes associated with construction, Sound Transit would coordinate with trail owners to develop detours, and to provide public information and signed detour routes during construction to allow for continued connections.
- **Scriber Creek Park** (Alternative C1). Sound Transit would coordinate with the City of Lynnwood to develop landscaping and site improvements to offset the impact of guideway encroachments; options could also include expanding the park or improving trail connections. For Alternative C2, Sound Transit could make landscaping and trail improvements to reduce the

visual impacts and related changes to the park's setting, or it would implement other mitigation as agreed to with the City of Lynnwood.

- **Northacres Park** (Alternatives A5, A7, A10, A11). Potential parking impacts could be addressed by using signage and other parking control and management measures.

Mitigation for construction impacts would include coordination with appropriate jurisdictions and facility operators to minimize impacts and develop plans for construction period activities. Mitigation for construction period impacts typically includes outreach to the public to provide information on temporary closures or detours; on-site signage describing the duration and type of temporary impacts; detour signage and temporary ADA improvements (for example, temporary curb ramps for detour routes that do not currently include curb ramps for existing sidewalks); and similar strategies to accommodate the continued use and enjoyment of affected park facilities.

4.18 Section 4(f) and Section 6(f) Evaluation

This section addresses a federal regulation known as Section 4(f), which protects parks, recreation areas, historic and cultural resources, and wildlife and waterfowl refuges. This section also describes the project's compliance with Section 6(f), which restricts the conversion of lands previously purchased with money from the Land and Water Conservation Fund (LWCF).

4.18.1 Section 4(f)

The U.S. Department of Transportation Act of 1966, Section 4(f), generally prohibits U.S. Department of Transportation (USDOT) agencies (including the FTA) from approving projects that would use land from:

> …a significant publicly-owned park, recreation area or wildlife and waterfowl refuge or any significant historic site, unless there is no feasible and prudent alternative to the use of land from the property and the action includes all possible planning to minimize harm to the property resulting from the use.

A *use* is generally defined as a transportation activity that permanently or temporarily acquires land from a Section 4(f) property, or that substantially impairs the important activities, features, or attributes that qualify the property as a Section 4(f) resource.

Section 4(f) applies to significant publicly owned parks and recreation areas that are open to the public; publicly owned wildlife and waterfowl refuges; and historic sites of national, state, or local significance. The USDOT regulations for Section 4(f) define historic properties as those listed in or eligible for the NRHP.

The Section 4(f) study area for this project is based on the APE used for cultural, archaeological, and historic resources (see Section 4.16) and the parks and recreational resources analysis (see Section 4.17). This evaluation also takes into account the areas of effect and analyses from other environmental investigations, including acquisitions, displacements, and relocations; transportation; land use; noise and vibration; and visual and aesthetic resources.

4.18.2 "Uses" of Section 4(f) Resources

Under Section 4(f), a use can be permanent, temporary, or constructive.

Permanent use would acquire or incorporate all or part of a Section 4(f) property as part of the transportation facility.

Temporary use occurs when the project temporarily occupies any portion of the resource (typically during construction), and it substantially impairs the resources. A temporary occupancy can avoid a use if:

- The project would occupy the property less than the time needed for the construction of the project, and there will be no change in ownership;
- There are minimal changes to the Section 4(f) resource;
- There are no permanent adverse physical changes or interference with protected activities, features, or attributes of the resource;
- The land is restored to the same or better condition; and
- The federal, state, or local officials with jurisdiction over the resource and the authority over the land agree in writing that the use is not adverse.

Constructive, or indirect, use can occur when the project is near the Section 4(f) resource and has effects that substantially impair the protected activities, features, or attributes of a property. For example, a park property that is primarily a scenic viewpoint could have a constructive use if a transportation project blocks its views.

The FTA can approve a transportation use of a Section 4(f) property if:

- The use of the property meets the requirements for a regulatory exception established under Section 4(f). For instance, a temporary use can be allowed if it meets the requirements described above.

Or:

- The use will have a *de minimis* impact on the property.

Or:

- There is no feasible and prudent *avoidance* alternative to using the property; and
- The program or project includes all possible planning to minimize harm to the property resulting from the use.

De minimis impacts cannot "adversely affect the activities, features, and attributes" of a Section 4(f) resource. A *de minimis* impact finding can take into account any mitigation or enhancement measures that would be implemented, including design measures to avoid or reduce impacts. Before FTA can make this finding, it must send a written notice to notify the official with jurisdiction over the resource, and there must be an opportunity for public notice and comment (the Draft EIS comment period is serving this purpose for the Lynnwood Link Extension).

For public parks or recreation properties, a *de minimis* impact finding requires written concurrence from the agency with jurisdiction over the property, such as a city or county parks department. For historic and archaeological sites, a *de minimis* impact is allowed if FTA has determined "no adverse effect" in compliance with Section 106 of the NHPA (see Section 4.16). Prior to making a *de minimis* finding, FTA must send a written notice to the SHPO. If the SHPO concurs or does not object, FTA may proceed with a *de minimis* finding.

When FTA has made a *de minimis* determination, the project is not required to analyze avoidance alternatives for that Section 4(f) property.

Avoidance Alternatives and Least Harm Analysis

When a project's Section 4(f) impact would be greater than *de minimis*, FTA must consider whether there are feasible and prudent alternatives that would avoid the impact. As defined in the Section 4(f) regulation, an alternative is feasible if it can be built as a matter of sound engineering judgment. An alternative is prudent if:

- It meets the project purpose and need and does not compromise the project to a degree that makes it unreasonable to proceed in light of its stated purpose and need; and
- It does not cause extraordinary operational or safety problems; and
- It causes no other unique problems or severe economic or environmental impacts; and
- It would not cause extraordinary community disruption; and
- It does not have construction costs of an extraordinary magnitude; and
- There are no other factors that collectively have adverse impacts that present unique problems or reach extraordinary magnitudes.

If FTA finds that an alternative is not feasible and prudent, that alternative is removed from consideration as a way to avoid a Section 4(f) use. If there are no prudent and feasible alternatives that can avoid all Section 4(f) resources, then FTA must determine which alternative results in the least overall harm, after considering the following factors:

i. The ability to mitigate adverse impacts to each Section 4(f) property (including mitigation measures that result in benefits to the property);

ii. The relative severity of the remaining harm, after mitigation, to the protected activities, attributes, or features of the Section 4(f) property;

iii. The relative significance of each Section 4(f) property;

iv. The views of the official(s) with jurisdiction over each Section 4(f) property;

v. The degree to which each alternative meets the purpose and need for the project;

vi. After reasonable mitigation, the magnitude of any adverse impacts to resources not protected by Section 4(f); and

vii. Substantial differences in costs among the alternatives.

4.18.3 Section 6(f) Resources

The LWCF Act provides funds for acquiring or developing parks and recreation areas. Section 6(f) of the LWCF prohibits conversion of LWCF properties to a non-recreational purpose, without the approval of the U.S. Department of the Interior's National Park Service.

Sound Transit reviewed the records of grants under the LWCF, which are maintained by the Washington State Recreation and Conservation Office, and confirmed there are no properties in the study area that were developed with LWCF funds. No further evaluation is needed for the project to comply with Section 6(f) requirements.

4.18.4 Section 4(f) Resources

Sound Transit's Section 4(f) analysis considered potential impacts on significant publicly owned parks, recreation areas, and NRHP-eligible historic properties in a study area that extended 200 feet from any potential project feature. Sound Transit also reviewed existing public agency records and plans, performed field inspections, and coordinated with the agencies that own or have jurisdiction over the resources. The Section 4(f) analysis reflects Sound Transit's and FTA's research and coordination for Section 106 of the NHPA, as described in Section 4.16, Cultural, Archaeological, and Historic Resources, and the parks and recreational analysis discussed in Section 4.17, Parks and Recreational Resources. These efforts helped Sound Transit and FTA identify the important features, qualities, and characteristics of potential Section 4(f) resources.

Sound Transit did not find any public wildlife and waterfowl refuges in the study area. Historic properties and parks and recreation properties were the only Section 4(f) resources found within the study area. The parks, recreation, or NRHP-eligible historic resources within the study area that qualify as Section 4(f) resources are shown on Figures 4.18-1a and 4.18-1b.

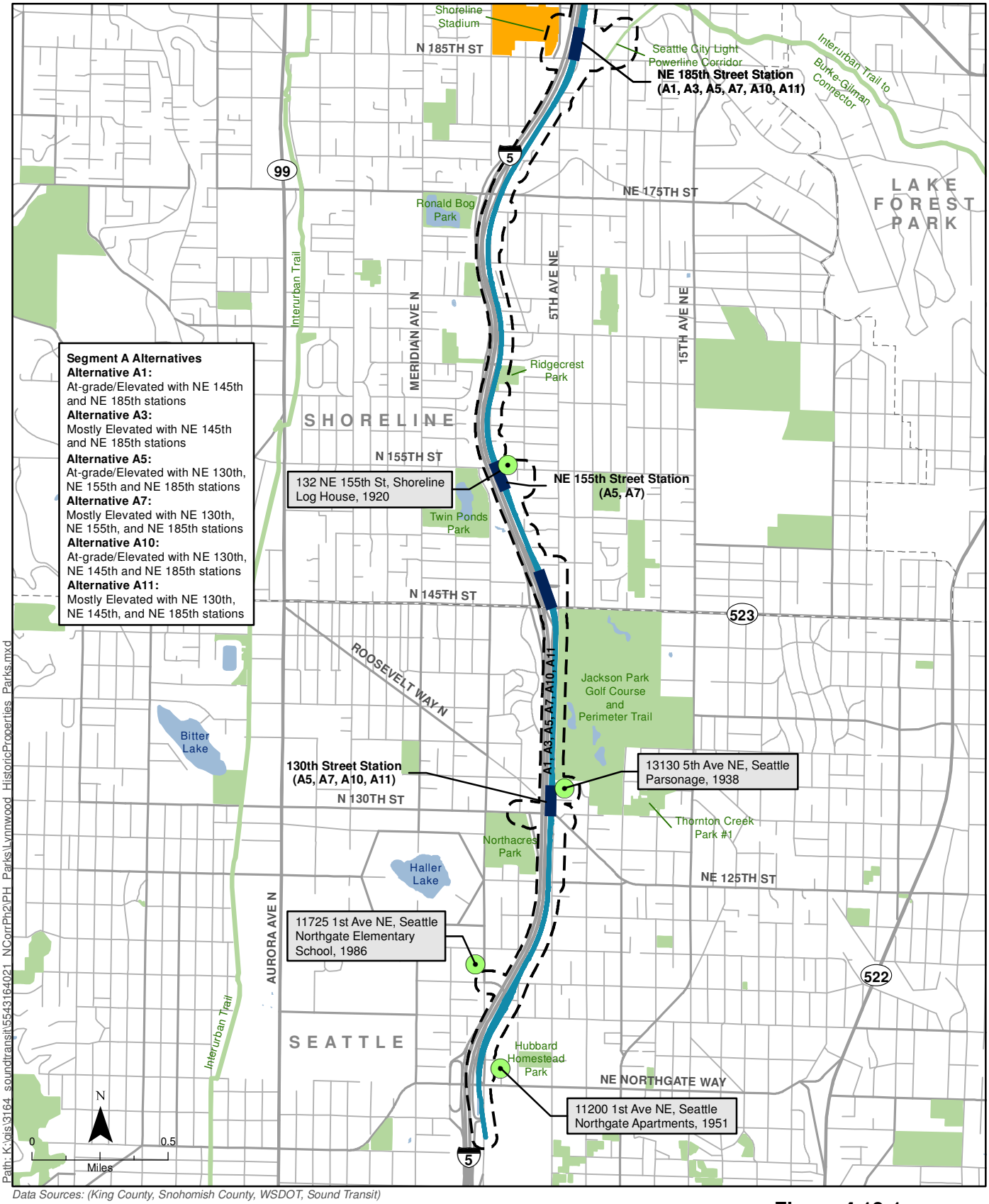
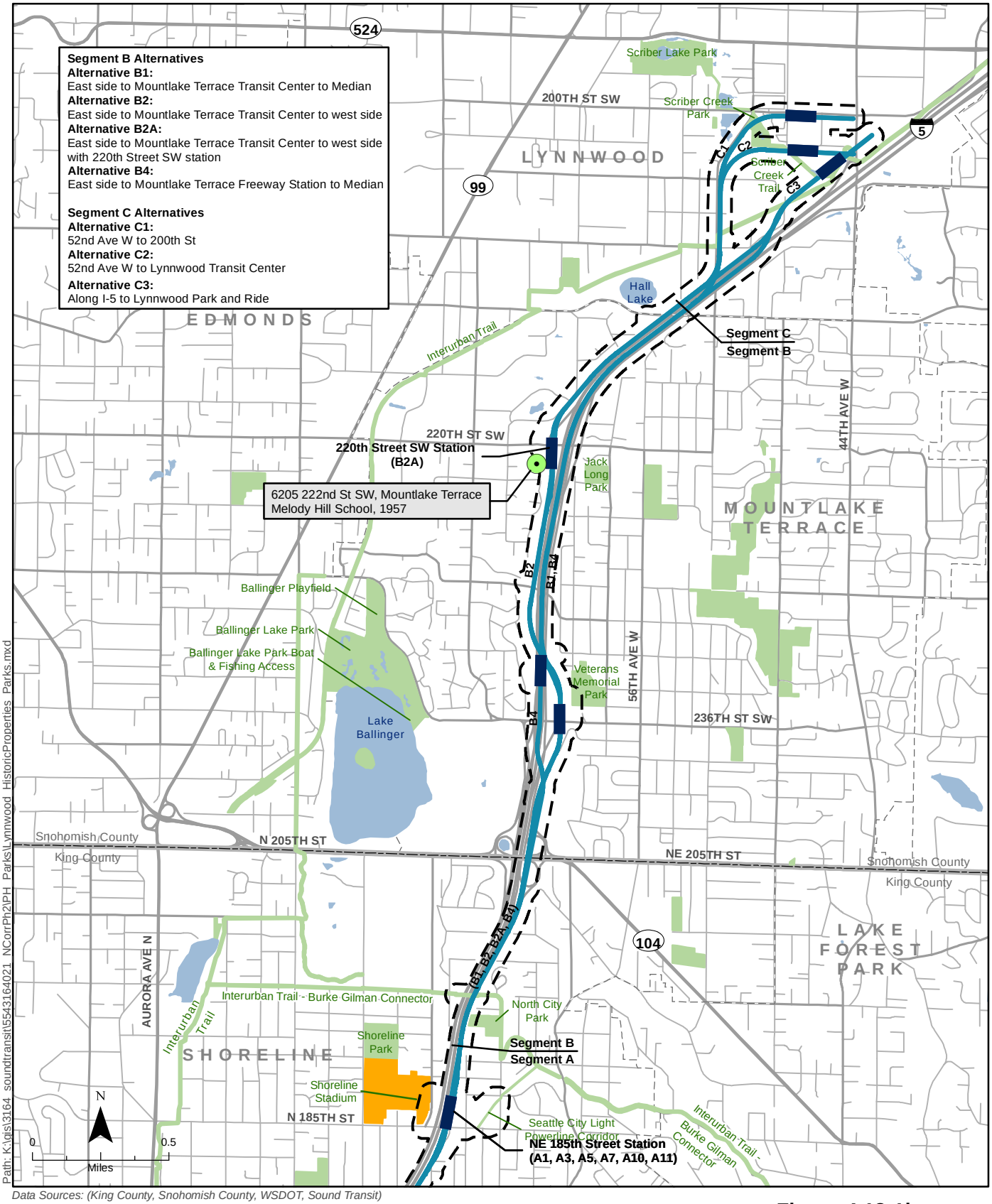


Figure 4.18-1a
Section 4(f) Resources in Segment A Study Area

Lynnwood Link Extension



Data Sources: (King County, Snohomish County, WSDOT, Sound Transit)

Study Area
Light Rail Alternatives
Station Location
Historic Property Within Study Area
Public Recreation Facility
Park
Trail
Roadway
Local Street
City Boundary
County Boundary
Waterbody

Figure 4.18-1b
Section 4(f) Resources in Segments B and C Study Area

Lynnwood Link Extension

Historic Resources

Sound Transit conducted a historic resources field survey considering every property within 200 feet of any of the alternatives. The survey documented every property built on or before 1970, although the standard age threshold for NRHP eligibility is 50 years. Over 600 properties were surveyed. Five historic resources have been determined eligible for listing in the NRHP.

Table 4.18-1 lists the historic resources in the study area.

Table 4.18-1. Historic Properties

Address	Description	Construction Date	Historic Status	Section 4(f) resource?
11200 1st Avenue NE, Seattle (Segment A)	Northgate Plaza Apartments	1951	Eligible NRHP Criterion C	Yes
11725 1st Avenue NE, Seattle (Segment A)	Northgate Elementary School	1956	NRHP Criterion C	Yes
132 NE 155th Street, Shoreline (Segment A)	Log House	1920	Eligible NRHP Criterion C	Yes
13130 5th Avenue NE, Seattle (Segment A)	Parsonage	c. 1920	Eligible NRHP Criterion C	Yes
6205 222nd Avenue SW, Mountlake Terrace (Segment B)	Melody Hill School	1957	Eligible NRHP Criterion C	Yes

Field surveys, records reviews, and contacts with tribes in the study area and the SHPO revealed no significant archaeological resources or traditional cultural properties in the study area.

For more detail on individual historic resources in the study area and the project's Section 106 research and consultation efforts, see Section 4.16 (Cultural, Archaeological, and Historic Resources) and the *Cultural, Archaeological, and Historic Resources Technical Report.*

Parks and Recreational Resources

Table 4.18-2 lists parks and recreational resources in the study area, and identifies the resources qualifying as Section 4(f) properties. Section 4.17, Parks and Recreational Resources has more detail about these resources.

Table 4.18-2. Parks and Recreational Properties Reviewed for Section 4(f) Eligibility

Park Facility and Owner or Jurisdiction	Size	Recreational Uses	Section 4(f) resource?
Segment A: Seattle to Shoreline			
Jackson Park Golf Course, City of Seattle	161 acres	Golf	Yes
Northacres Park, City of Seattle	21 acres	Baseball, softball, soccer, nature trails, off-leash dog area, children's playground	Yes
Twin Ponds Park, City of Shoreline	22 acres	Soccer, tennis, nature viewing, trails, playground	Yes
Ridgecrest Park, City of Shoreline	3.8 acres	Baseball diamond, handball, open grass	Yes
Shoreline Stadium, Shoreline Public Schools	40 acres	Football/soccer/track and field stadium with adjacent parking area	Yes
Segment B: Shoreline to Mountlake Terrace			
Interurban Connector Trail, City of Shoreline	(planned)	Planned signed bicycle and trail route connecting Interurban and Burke-Gilman trails, crossing I-5	No. Planned trail is along city streets and WSDOT-owned facilities, and is considered a transportation facility by the City of Shoreline.
North City Park, City of Shoreline	4 acres	Forest trails	Yes
Veterans Memorial Park, City of Mountlake Terrace	10 acres	Forested walking trails, gazebo, and picnicking	Yes
Segment C: Mountlake Terrace to Lynnwood			
Interurban Trail, Snohomish County PUD, City of Lynnwood	15 miles	Walking, running, bicycling, skating	Yes
Scriber Creek Trail, City of Lynnwood	1.5 miles	Walking, running, nature viewing	Yes
Scriber Creek Park, City of Lynnwood	4.7 acres	Picnicking and short loop nature trail in the north section of the park; trail to the south	Yes

4.18.5 Potential Impacts on Section 4(f) Resources

Sound Transit reviewed all locations where light rail alternatives would be within the boundaries of Section 4(f) properties, and also examined the potential for direct or indirect impacts that could impair the protected activities, attributes, or features of a Section 4(f) property. Table 4.18-3 summarizes the potential impacts. Unaffected properties in the study area are not listed.

For this preliminary Section 4(f) evaluation, Sound Transit and FTA have coordinated with the Cities of Seattle, Shoreline, Mountlake Terrace, and Lynnwood, as well as with the Snohomish County PUD and the Shoreline School District, which

are the resource owners or managing jurisdictions for parks and recreational facilities in the project area. Through the Section 106 process, Sound Transit and FTA have also consulted with the SHPO and tribes on cultural and historic resources.

This Draft EIS Section 4(f) evaluation identifies potential uses of Section 4(f) resources, along with potential mitigation or avoidance measures. As the project continues, Sound Transit and FTA will consider public comments and will continue coordination with the agencies with jurisdiction to further explore opportunities to avoid, minimize, or mitigate impacts.

Table 4.18-3. Potential Section 4(f) Impacts

Section 4(f) Resource	Alternatives	Potential Use
PARK AND RECREATION PROPERTIES		
Jackson Park Golf Course	All Segment A Alternatives	No Section 4(f) use.
Ridgecrest Park, City of Shoreline	All Segment A Alternatives	Anticipated *de minimis* determination. Light rail facility would be located on the western part of the park, removing a berm and trees that provide an existing visual buffer. Park would experience property and visual impacts but current park functions and activities would be unchanged.
Northacres Park, City of Seattle	Alternatives A5, A7, A10, and A11	No Section 4(f) use.
Twin Ponds Park, City of Shoreline	Alternatives A5, A7, and A11	No Section 4(f) use.
Shoreline Stadium, Shoreline Public Schools	Alternative A1	Anticipated *de minimis* determination. Minor right-of-way acquisition that would affect a parcel and parking near the stadium.
North City Park, City of Shoreline	All Segment B Alternatives	No Section 4(f) use.
Interurban Trail, Snohomish County PUD, City of Lynnwood	All Segment C Alternatives	No Section 4(f) use, but requires documentation for a 4(f) exception for temporary occupancy during construction.
Scriber Creek Park, City of Lynnwood	Alternative C1	Potential *de minimis* determination with a program of mitigation measures including facility improvements and design measures; guideway and structures are within the edge of the park and cross a corner of the park, removing trees and vegetation.
	Alternative C2	No Section 4(f) use assuming measures to reduce visual and setting impacts to levels that would not impair the park's essential functions, attributes, and activities.
	Alternative C3	No Section 4(f) use.
Scriber Creek Trail, City of Lynnwood	Alternatives C2 and C3	No Section 4(f) use, but requires documentation for a 4(f) exception for temporary occupancy during construction.

Table 4.18-3. Potential Section 4(f) Impacts

Section 4(f) Resource	Alternatives	Potential Use
HISTORIC PROPERTIES		
Northgate Plaza Apartments	All Segment A Alternatives	No Section 4(f) use.
Log House	Alternatives A5 and A7	No Section 4(f) use.
Northgate Elementary School	Alternatives A1, A5, and A10	No Section 4(f) use.
Parsonage	All Segment A Alternatives	No Section 4(f) use.
Melody Hill Elementary School	Alternatives B2 and B2A	No Section 4(f) use.

Segment A

Northgate Plaza Apartments (Historic)

All Segment A Alternatives would place the light rail guideway between the Northgate Plaza Apartments and I-5, which would alter some views to and from the apartments. No alternative would physically alter the building or the property or adversely affect the property's historic qualities.

Log House (Historic)

Alternatives A5 and A7 include a NE 155th Street Station several properties away, and a park-and-ride structure would be across an arterial from a historic log house at 132 NE 155th Street in Shoreline. The house is eligible for the NRHP because it is one of the oldest houses in the area and is an example of a log house, which is very unusual in north King County. There would be no physical impacts, and the development of nearby areas for light rail would not affect its historic characteristics, which do not depend on its setting.

Northgate Elementary School (Historic)

All of the at-grade/elevated alternatives (A1, A5, and A10) would reconstruct the NE 117th Street bridge over I-5, which is adjacent to the Northgate Elementary School at 11725 1st Avenue NE. The reconstruction of the bridge would not affect the school building. There would be no Section 4(f) use of the property by any alternative.

Parsonage (Historic)

None of the alternatives would require any land from the parsonage building at 13130 5th Avenue NE. Alternatives A1, A5, and A10 would have no effects on the parsonage, and the elevated alternatives (A3, A7, and A11) would install noise walls along the guideway to avoid noise impacts. These would not alter the historic characteristics of the parsonage, and there would be no Section 4(f) use.

Jackson Park Golf Course

None of the light rail alternatives would acquire any part of the Jackson Park Golf Course property, and no other impacts would rise to the level of a Section 4(f) use. All Segment A alternatives would be visible from the golf course, and the elevated alternatives (A3, A5, A7, and A11) would have visual impacts, as noted in Section 4.5, Visual and Aesthetic Resources. Still, the change in views would not impair the ongoing recreational activities, features, and attributes of the golf course.

Ridgecrest Park

All Segment A alternatives would acquire about 0.30 acre of Ridgecrest Park property for the light rail right-of-way. The park's affected area is along its west side, beside a parking area and a baseball diamond. The light rail alternatives would cut into a berm and remove mature cottonwoods that buffer the park from I-5, and they would also alter the parking area and southern entrance during construction. (Viewpoints 19 and 20 in Appendix G, Visual Simulations and Illustrations, show a visual simulation of this potential change to the park).

Because the affected area is at the edge of the park and does not alter the recreational activities or features of the park, and potential mitigation measures would replace or enhance park features, FTA is considering a *de minimis* impact finding. The City of Shoreline has written a preliminary letter of concurrence with the *de minimis* finding. The measures proposed to replace and enhance park features include landscaping affected areas, potential improvements to the park's southern access, or other measures as determined by the City and Sound Transit. The alternatives would include a wall along the guideway's eastern side, which is mitigation for residential noise impacts. However, the wall also would provide a visual buffer between the park and the light rail facility and I-5, and would maintain the function of the current berm to shield the park from I-5 noise. This is an active use, recreational park that is not considered noise-sensitive, but it would not have noise impacts under FTA criteria even if it were a sensitive property.

Shoreline Stadium

Alternative A1 would acquire about 0.10 acre for a roadway realignment (see Figure 4.18-1) to accommodate a parking garage on the west side of I-5 for a station at NE

185th Street. (All the other Segment A light rail alternatives place both the parking and the station on the east side of I-5, avoiding the Section 4(f) use.) The acquisition would affect the edge of a parking lot serving the stadium and would bring the sidewalks and roadway closer to the southeastern edge of the track and field facilities, affecting a corner of the area adjacent to the track. Several parking spaces could be displaced, and some buffering landscape elements could also be removed.

Considering the limited amount of land involved, as well as potential mitigation measures, FTA is considering a *de minimis* impact finding. The Shoreline School District has written a preliminary letter of concurrence with the *de minimis* impact finding. Proposed measures to offset the impacts include compensation for the acquired property, replacing or redesigning the parking lot to replace parking spaces, and developing designs so the affected area near the track does not disrupt track and field activities or operations. Stadium users could also use transit more easily with a station and parking nearby, and this could help reduce the demand for parking in the stadium lot. In addition, the park-and-ride could also have parking availability on weekends or evenings when stadium events are typically held. Landscaping, lighting, fencing, and drainage improvements would be included as part of the roadway realignment and adjacent garage. Other potential mitigation could include additional improvements for pedestrian access, or additional landscaping near the stadium.

Northacres Park

Alternatives A5, A7, A10, and A11 would develop a NE 130th Street Station that would modify a street adjacent to Northacres Park. No permanent acquisition is needed, and there would be no adverse effects on the park or its activities. There would be no Section 4(f) use.

Twin Ponds Park

Alternatives A5, A7, and A11 would develop a NE 155th Street Station to the east, on the other side of the freeway. There would be no impacts on Twin Ponds Park and no Section 4(f) use.

Segment B

Melody Hill School (Historic)

Alternatives B2 and B2A would develop light rail facilities on the I-5 right-of-way adjacent to the former Melody Hill School. Alternative B2A would place the elevated guideway and station on the adjacent WSDOT right-of-way and over 220th Street SW, with parking north of the station. Alternative B2 would develop the guideway without a station. The presence of the light rail facilities would not alter the historic characteristics of the school building and there would be no Section 4(f)

use. Alternatives B1 and B4 would both be in the I-5 median and would also avoid a Section 4(f) use.

North City Park

All light rail alternatives would remove part of a forested area on WSDOT land adjacent to North City Park, but no park land would be acquired. Trees on the park property would not be disturbed and a visual buffer between the park and I-5 would be maintained. There would be no Section 4(f) use.

Veterans Memorial Park

Under Alternatives B1 and B4, Sound Transit would develop a light rail station west of the Veterans Memorial Park and within the current Mountlake Terrace Transit Center. The existing parking and traffic circulation at the transit center, immediately adjacent to the park, would be reconfigured. No property within the park would be affected. Construction activities would temporarily increase noise levels and visually alter areas adjacent to the park's western boundaries, but not to an extent that would impair the important features and attributes of the park. Construction could also temporarily alter the transit center sidewalks connecting to a trail in the park, but the public would have several other ways to access the park. There would be no Section 4(f) use.

Segment C

Interurban Trail

In Segment C, an elevated guideway would pass directly over a short section of the Interurban Trail for all three Segment C alternatives (Viewpoint 43 in Appendix G, Visual Simulations, shows simulated views of the crossings). In each case, the light rail facility would change the visual setting for part of the trail, but would not directly affect the essential activities, features, and attributes of the regional trail. Although the elevated guideway would be visually prominent to trail users, the trail is already in a variable urban setting with nearby roads, industrial properties, the freeway and its ramps, and other large infrastructure. The elevated guideway would require air rights, but no physical property would be acquired. USDOT's Section 4(f) policy paper (FHWA 2012) distinguishes the need for air rights from the acquisition of land, and states that there is no use as long as the aerial structure does not adversely affect the resource. Therefore, the analysis below considers constructive use (proximity impacts). It also considers temporary impacts during construction.

For Alternatives C1 and C2, the light rail guideway would cross above the Interurban Trail at 52nd Avenue West. Some vegetation where the trail currently crosses the street would be removed, and the elevated guideway would pass overhead. The

guideway would create shading and alter views at the existing arterial crossing, but this would not affect the trail's active recreational and trail travel activities.

Under Alternative C3, the elevated guideway would cross over the Interurban Trail in an area where the trail has an open field and wetland area on one side and industrial properties on the other. The alternative would then run parallel to the trail for approximately 400 feet until both the trail and the light rail alignment reach the Lynnwood Transit Center Station. Existing power poles beside the trail would be relocated and the transmission lines would be raised to provide clearance for the light rail facilities. Tail tracks for the light rail alternative would cross over the trail again near 44th Avenue West. The light rail facility would create shading and alter views for part of the trail, but the change in the view for this section of the 15-mile trail would not adversely affect the active recreational and trail travel activities that are essential to the trail's purpose. The station and the tail tracks would be visible from the existing trail's bridge overcrossing above 44th Avenue West. Because the trail frequently crosses or is beside major transportation facilities, including I-5, ramps, and bridges, as well as a variety of other light industrial or commercial properties, the presence of light rail facilities near a part of the trail would not be a notable change in the trail's character.

To mitigate the construction period closure of the trail under all light rail alternatives, Sound Transit would coordinate with the City of Lynnwood and the Snohomish County PUD to develop a detour and provide signage and notices to users. The trail would be reopened in the same or better condition than today. Replacement landscaping would also be provided where vegetated areas need to be cleared for construction. With these measures in place, Sound Transit anticipates the short-term construction impacts would qualify for a Section 4(f) exception for temporary occupancy, and no Section 4(f) use would occur. The City of Lynnwood, which has jurisdiction over the trail as a recreational resource, would need to agree in writing.

Scriber Creek Park

Alternative C1. Under Alternative C1, an elevated guideway would pass above Scriber Creek Park's entrance road and parking lot before curving to cross over a corner of the park and a portion of the creek. Sound Transit would place an elevated guideway over 0.42 acre of the park and would acquire the portion of the park property that is needed for the structures that support the guideway (see Figure 4.17-4 for a diagram and Viewpoints 38 and 39 in Appendix G, Visual Simulations). In addition to vegetation clearing that would include removing mature trees, the elevated guideway would affect views, light, and shade for part of the park. Alternative C1 would remove some mature trees, primarily along the roadway, but many of the existing trees would remain. The guideway structures

and the tree removal would alter views from surrounding areas as well as from within the park, and the elevated guideway would cross over the primary entrance to the park. The light rail facility would also be visible from a nature loop trail and picnic areas in the park. The light rail facility would change the visual character of part of the park, but the public would still have continued access to the park's trails and open areas. The park is not considered a noise-sensitive resource under FTA's noise impact guidance. Existing noise measurements in the area record a high level of ambient noise at the park due to the nearby freeway, roadways, and adjacent light industrial properties. The light rail guideway would have noise barriers along the guideway to avoid noise impacts to nearby residences, which would also minimize light rail noise levels within the park.

Construction activities would also require a short-term closure of a portion of Scriber Creek Park. This would include all or part of the parking area and potentially the main entrance, but the trail entrance or an alternative entrance, would be maintained to allow the park to remain open for normal public use.

The City of Lynnwood and Sound Transit have conducted initial coordination regarding mitigation and identified potential measures to reduce and offset long-term and short-term impacts Alternative C1 would have on the park. These potential measures could include providing additional landscaping after construction, restoring affected natural areas to minimize impacts on the park's natural setting, and expanding the park or its parking and access areas into certain adjacent properties that would also be needed for the alternative. Given the range of mitigation measures available, the narrow extent of property directly affected, and best construction management practices, FTA is considering a *de minimis* finding. This would require FTA to determine if there would be any anticipated impacts, temporary or permanent, that would adversely affect the park's important activities, features, or attributes, which are mostly focused on the creek, its natural setting, and its related picnic and trail features. The City of Lynnwood would need to agree in writing to a *de minimis* finding.

Alternative C2. Under Alternative C2, no park land would be acquired. The elevated guideway would pass over a wetland area adjacent to and south of Scriber Creek Park near the park's nature trail, which also forms part of the Scriber Creek Trail (see Appendix G, Viewpoints 41 and 42, for visual simulations). The elevated guideway would change views from the trail, where the adjacent wetland contributes to the park's environmental setting. The elevated light rail facility, with a parking garage visible to the east, would replace wetland vegetation as prominent elements in the view from the trail along Scriber Creek Park's southern boundary. The visual impacts and changes in setting would be less for other areas of the park such as the loop trail or the picnic area. Construction of the guideway could also restrict access

to this area of the park, and would create temporary impacts including dust, noise, and visual impacts that would affect park users.

The City of Lynnwood and Sound Transit have coordinated to explore mitigation opportunities and potential measures to help offset these impacts. For instance, restoration of cleared areas could help restore some of the natural setting. Landscaping and other improvements to other areas of the park could improve the overall experience of park users. For example, realigning the trail away from the park boundary and developing it as a raised boardwalk rather than as a filled trail would support and enhance the environmental orientation of the park. Moreover, this realignment would help reduce visual impacts due to the guideway because park users would be farther away and there would be more room for screening from vegetation. Other mitigation opportunities include creating additional trail, park, or wetland natural improvements on other nearby properties that would be acquired for the light rail project. Alternative C2 would also require wetland mitigation, and this could present further opportunities to restore wetlands in conjunction with measures that also restore and enhance the park's natural setting. For example, rebuilding the trail on a walkway rather than on fill and gravel could help replace lost wetland functions and buffer. Design treatments can also be explored for the light rail structures to help minimize visual impacts by reducing the number of columns adjacent to the park. With mitigation measures in place to help maintain the natural setting characteristics of the park and its boardwalk, FTA anticipates no constructive use of the park.

With measures to address visual impacts, no other impacts would impair the park to the level rising to a constructive use. The park is not considered a noise-sensitive resource under FTA's noise impact guidance. Existing noise measurements in the area record a high level of ambient noise that already exists at the park due to the nearby freeway, roadways, and adjacent light industrial properties. The light rail guideway would have noise barriers along the guideway to avoid noise impacts to nearby residences, which would minimize the change in noise levels within the park.

Alternative C3. Under Alternative C3, Scriber Creek Park would not have any direct property or vegetation impacts. The light rail facility would be visible from the wetland boardwalk, but only from a distance, and would not impair the park's setting or any other important features, activities, or attributes. Construction work may be noticeable from the park, but public activities in the park could continue without impairment. There would be no Section 4(f) use.

Scriber Creek Trail

Alternatives C1, C2, and C3 would cross over part of the Scriber Creek Trail, which would require an aerial easement, but no trail property would be permanently acquired. Alternative C1 would cross over the trail at Cedar Valley Road, where the

trail connects to Scriber Creek Park. Alternative C2 would be elevated beside a 300-foot section of the trail along the south side of Scriber Creek Park and toward the Lynnwood Transit Center. It would cross the trail near the Lynnwood Transit Center, where the trail turns southward.

The vicinity impacts caused by Alternative C2 are largely discussed in the previous section about Scriber Creek Park. For the section of the trail that runs between the Lynnwood Transit Center and the adjacent Scriber Creek wetland area, Alternative C2 would cross above the trail, remove mature vegetation, and place a parking garage on what is now a surface parking lot.

Alternative C3 would cross over the trail near where the trail connects to the Interurban Trail near an existing utility building and the corner of the current park-and-ride.

With all three alternatives, the trail would continue to maintain its essential function of connecting parks to a regional trail. Sound Transit would coordinate with the City of Lynnwood to address a temporary closure of the trail for construction, and a detour would be provided. The trail would be reopened in the same or better condition than today. Moreover, there would be opportunities to improve the trail as a raised boardwalk, which would also enhance conditions for adjacent wetland and natural areas. Replacement landscaping would also be provided where vegetated areas need to be cleared for construction. With these measures in place, Sound Transit anticipates the short-term construction impacts would qualify for a temporary occupancy exception. The City of Lynnwood would need to agree in writing.

If these conditions can be met, there would be no Section 4(f) use of the trail with any of the alternatives.

4.18.6 Conclusions

Section 4(f) regulations do not allow FTA to approve an alternative with a Section 4(f) use if there are prudent and feasible avoidance alternatives, unless there is a *de minimis* finding.

All Segment A alternatives would require a portion of Ridgecrest Park adjacent to the freeway. Given the minor impacts to the park, available mitigation measures, and the results of coordination with the City of Shoreline, FTA is considering a *de minimis* impact finding, and the City of Shoreline has written a preliminary letter of concurrence.

Similarly, FTA is considering a *de minimis* finding for Alternative A1's impacts to Shoreline Stadium, and the Shoreline School District has preliminarily concurred. Again, a final concurrence would be needed before FTA can make a *de minimis* finding.

Alternative C1 has a potential *de minimis* impact to Scriber Creek Park, but such a determination requires concurrence by the City of Lynnwood. Sound Transit would commit to mitigation measures to maintain the important characteristics, activities, and features of the park.

Alternative C2 does not require park property, and Sound Transit and the City of Lynnwood have initiated coordination on mitigation to develop potential measures to reduce vicinity impacts that could otherwise impair some of the park's important characteristics. These mitigation measures would be further developed with the City of Lynnwood, following public comment on the Draft EIS and this draft Section 4(f) evaluation; these measures could avoid a Section 4(f) use. Alternative C3 would completely avoid a Section 4(f) use of Scriber Creek Park.

All of the Segment C alternatives cross over two trails—the Interurban Trail and the Scriber Creek Trail—but they would require air rights only and not land from the trails. The crossing of light rail over the trails would not permanently impair the important activities, characteristics, or features of the trail, and there would be no permanent use of Section 4(f) resources. Sound Transit would commit to specific signage, detour, and construction measures to address the impacts of a trail closure during construction. FTA would need written concurrence from the City of Lynnwood before it could apply the Section 4(f) temporary occupancy exception.

4.18.7 Next Steps

The Draft EIS public comment period supports Section 4(f) requirements for involving the public, tribes, and jurisdictions in the draft Section 4(f) evaluation, including FTA's potential *de minimis* impact findings. The Final EIS evaluation will have a final Section 4(f) evaluation that will address Sound Transit's Preferred Alternative and other EIS alternatives. The evaluation will also include the records of coordination and correspondence needed to support FTA's determinations regarding Section 4(f) use and the related Section 4(f) commitments. Appendix D, Section 4(f)/Section 6(f) Correspondence, provides the preliminary letters of concurrence by the City of Shoreline and the Shoreline School District on the *de minimis* findings FTA is considering for the project.