BURKE-GILMAN TRAIL MISSING LINK PROJECT

SDOT
Seattle Department of Transportation

Draft Environmental Impact Statement

June 2016

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City of Seattle
Edward B. Murray, Mayor

Department of Transportation
Scott Kubly, Director

June 16, 2016

Dear Interested Tribes, Organizations, and Members of the Public:

The Seattle Department of Transportation (SDOT) proposes to complete the Burke-Gilman Trail, which is a regional, multi-use trail that runs east from Golden Gardens Park in Seattle and connects to the Sammamish River Trail in Bothell, except for a missing segment through the Ballard neighborhood known as the Missing Link. Currently, the trail ends at 30th Avenue NW by the Ballard Locks on the west and begins again at the intersection of 11th Avenue NW and NW 45th Street on the east. The project would connect these two segments with a marked, dedicated route to serve all trail users. SDOT is acting as lead agency under the Washington State Environmental Policy Act (SEPA).

This Draft Environmental Impact Statement (Draft EIS) evaluates a No Build Alternative along with four possible Build Alternatives known as Shilshole South, Shilshole North, Ballard Avenue, and Leary. SDOT has prepared this document to inform the public and to assist decision-makers in understanding the environmental effects—both positive and negative—associated with the project both during and after construction and in relation to other projects in the vicinity. Potential impacts have been analyzed and proposed mitigation measures have been identified for the following elements of the environment:

- Geology, soils, and hazardous materials
- Fish, wildlife, and vegetation
- Land use and economics
- Recreation
- Utilities
- Transportation
- Parking
- Air quality and greenhouse gases
- Cultural resources

We encourage you to comment on this Draft EIS. Instructions for submitting comments are outlined on the Fact Sheet included in this document, which also includes details of two public hearings on the Draft EIS scheduled for July 14 and 16, 2016. All comments are due by August 1, 2016.

Sincerely,

Scott Kubly,
Director

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www.seattle.gov/transportation

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FACT SHEET

Project Name

Burke-Gilman Trail Missing Link Project

Proposed Action

The Burke-Gilman Trail (BGT) is a regional trail that runs east from Golden Gardens Park in Seattle and connects to the Sammamish River Trail in Bothell, except for a missing segment through the Ballard neighborhood. Currently, the regional trail ends at 30th Ave NW by the Hiram M. Chittenden (Ballard) Locks on the west, and begins again at the intersection of 11th Ave NW and NW 45th St on the east. The Seattle Department of Transportation (SDOT) proposes to connect these two segments of the BGT with a marked, dedicated route that would serve all users of the multi-use trail. The proposed project to complete the regional facility is referred to as the Missing Link.

Project Proponent and SEPA Lead Agency

Seattle Department of Transportation (SDOT)

SEPA Responsible Official

Scott Kubly, Director

Date of Issue

June 16, 2016

Public Comment Period

This Draft Environmental Impact Statement (DEIS) will be available for a 45-day public comment period. Comments must be received or postmarked by August 1, 2016.

Date Comments are Due

August 1, 2016

Comment Submittal and Contact Information

Comments can be sent by email to: BGT_MissingLink_Info@seattle.gov

Written comments can be mailed to:

Scott Kubly, Director
Seattle Department of Transportation
c/o Mark Mazzola, Environmental Manager
P.O. Box 34996
Seattle, WA 98124-4996

Public Meeting

Two public meetings will be held to provide updated project-related information and receive comments from the public and interested parties on the DEIS.

The public meetings will be held at the **Leif Erikson Hall,** located at **2245 NW 57th Street** in Ballard.

Meeting 1: Thursday July 14, 2016

6:00 to 9:00 pm

Meeting 2: Saturday July 16, 2016

10:00 am to 1:00 pm

Court reporters will be available to receive oral testimony.

Document Availability

The DEIS is available online at: http://www.seattle.gov/transportation/BGT_Ballard.htm.

Printed copies of the DEIS are available for review at no charge at:

Seattle Department of Construction and Inspections Public Resources Center
700 5th Ave, Suite 2000
Seattle, WA 98124

Seattle Public Library, Central Library
1000 4th Ave
Seattle, WA 98104

Ballard Neighborhood Customer Service Center
5614 22nd Ave NW
Seattle, WA 98107

Seattle Public Library, University Branch
5009 Roosevelt Way NE
Seattle, WA, 98105

Seattle Public Library, Fremont Branch
731 N 35th Street
Seattle, WA 98103

Seattle Public Library, Wallingford Branch
1501 N 45th Street
Seattle, WA 98103

Seattle Public Library, Greenwood Branch
8016 Greenwood Ave N
Seattle, WA 98103

Seattle Public Library, Magnolia Branch
2801 34th Ave W
Seattle, WA 98199

Seattle Public Library, Queen Anne Branch
400 W Garfield Street
Seattle, WA 98119

University of Washington Suzzallo Library
University of Washington Campus

Various forms of the document are available by calling 206-615-0786.

Draft EIS: $50

Technical Appendices: $50

Executive Summary: Free

CD with DEIS and Technical Appendices: Free

The Executive Summary is available in braille free of charge by contacting SDOT at 206-615-0786.

Permits, Licenses, and Approvals Likely Required for Proposal

- State Environmental Policy Act (SEPA)
- Seattle Shoreline Master Program Review
- NPDES Construction Stormwater General Permit

Authors and Contributors

A list of authors and contributors is provided in Chapter 13 of the DEIS.

Location of Background Materials

Background materials used in the preparation of this DEIS are listed in Chapter 12, References. Several documents are available online at the project website:
http://www.seattle.gov/transportation/BGT_Ballard.htm.

Timing of Additional Environmental Review

After the DEIS comment period concludes, SDOT (lead agency) will review and respond to comments. A Final EIS will be prepared that contains the responses to the comments and potential updates to the environmental document. SDOT anticipates releasing the Final EIS in early 2017.

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EXECUTIVE SUMMARY

Introduction

The Burke-Gilman Trail (BGT) is a regional trail that runs east from Golden Gardens Park in Seattle and connects to the Sammamish River Trail in Bothell, except for a missing segment through the Ballard neighborhood. Currently, the regional trail ends at 30th Ave NW by the Hiram M. Chittenden (Ballard) Locks on the west, and begins again at the intersection of 11th Ave NW and NW 45th St on the east. The Seattle Department of Transportation (SDOT) proposes to connect these two segments of the BGT with a marked, dedicated route that would serve all users of the multi-use trail. The proposed project to complete the regional facility is referred to as the Missing Link.

Completing this section of the BGT has been discussed since the late 1980s. Refer to Chapter 1 in this Draft Environmental Impact Statement (DEIS) for a detailed summary of the project history. The alternatives evaluated in this DEIS were developed from suggestions received in 2013 during scoping for this DEIS. Suggested routes were evaluated using the following screening criteria: directness of route, number and types of trail crossings (i.e., driveways and intersections), street and arterial classification, adjacent land uses, and right-of-way width.

No Build Alternative

Under the No Build Alternative, no new multi-use trail would be constructed to connect the existing segments of the regional Burke-Gilman Trail. Trail users would continue to use the existing surface streets and sidewalks to travel between the existing trail segments, a distance of approximately 1.2 miles. Currently, trail users tend to use the most direct route, which is along Shilshole Ave NW. Pedestrians may opt for a street with sidewalks such as Ballard Ave NW or NW Leary Way. The No Build Alternative serves as the baseline condition, against which the Build Alternatives are compared over time to their 2040 design year. Over that time period, population and employment growth is expected to continue in the Ballard neighborhood, leading to an increase in traffic congestion, parking demand, and the number of people walking and biking.

Build Alternatives

Four Build Alternatives are analyzed in this DEIS: the Shilshole South, Shilshole North, Ballard Avenue, and Leary Alternatives. The alternatives described below are conceptual routes designed to provide distinct alternatives for analysis in the DEIS. The route that is eventually selected as the preferred alternative could be any one of these routes, or a combination of portions of any of them.

Shilshole South Alternative

Under the Shilshole South Alternative, the multi-use trail would be primarily routed along the south side of Shilshole Ave NW (Figure ES-1). There would be changes to parking, lanes, and intersection configurations on both sides of the street along this alternative alignment. The trail would accommodate users on a newly paved surface for most of its length.

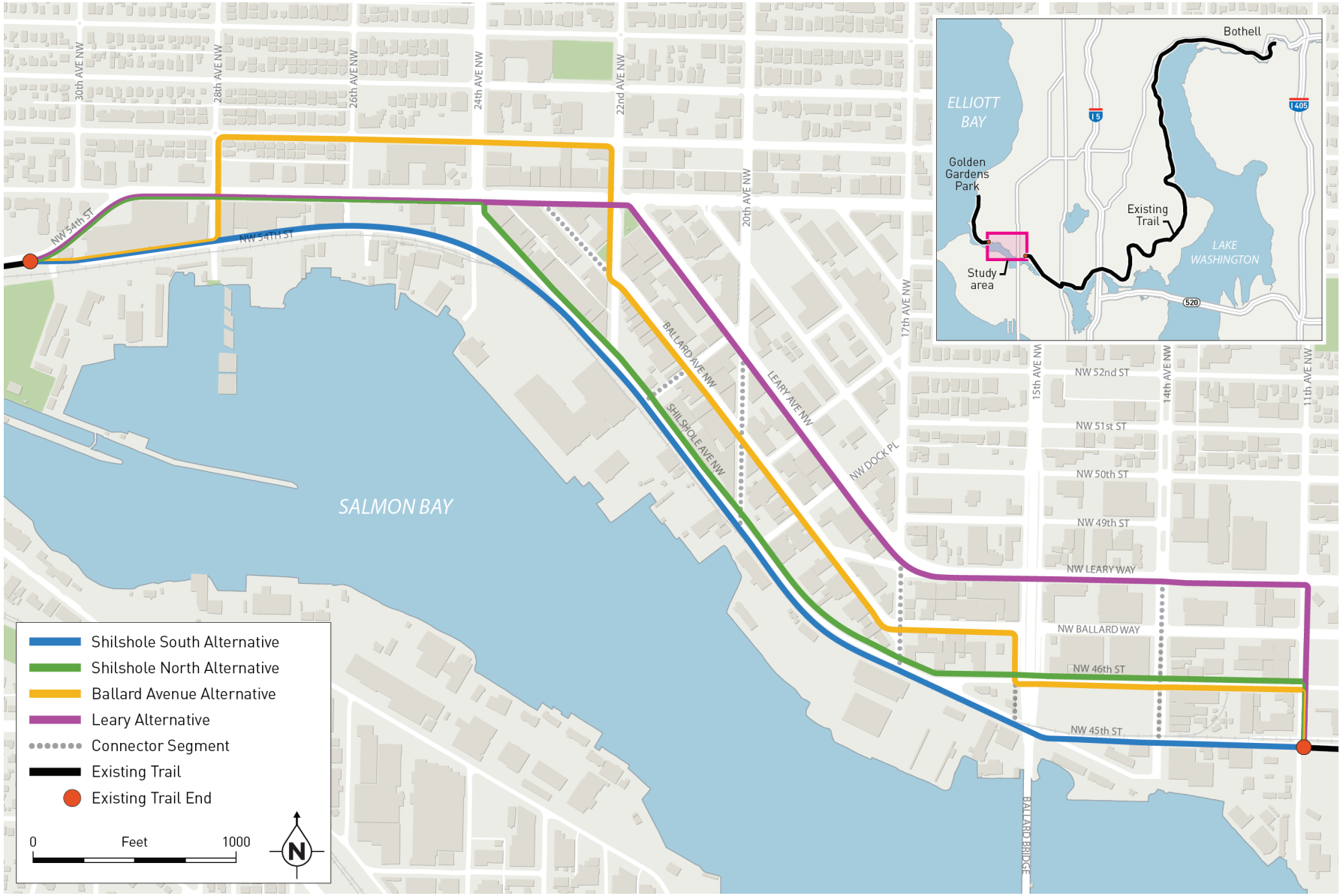

Figure ES-1. Proposed Alternatives

Beginning at the existing western trail end at the Ballard Locks, the trail would continue east along the north side of the unimproved NW 54th St right-of-way until the intersection with Shilshole Ave NW, just east of 24th Ave NW. The trail would then proceed along the south side of Shilshole Ave NW, continuing onto the south side of NW 45th St to the eastern project end at 11th Ave NW.

From the existing western trail end at the Ballard Locks, the trail would be north of the Ballard Terminal Railroad (BTR) tracks until just before 17th Ave NW, at which point the trail would cross to the south of the tracks. A signal would be installed at the intersection of Shilshole Ave NW and 17th Ave NW for trail users crossing Shilshole Ave NW to access 17th Ave NW**.**

The trail width would vary throughout the corridor due to existing conditions and constraints, but would generally be between 8 and 12 feet wide. Based on the design concepts, the typical right-of-way on Shilshole Ave NW for this alternative would include a buffer zone adjacent to the railroad tracks and vehicle traffic lanes, a multi-use trail, two vehicle travel lanes, and preservation of parking areas where feasible.

Shilshole North Alternative

Under the Shilshole North Alternative, the multi-use trail would be primarily routed along the north side of Shilshole Ave NW (Figure ES-1). Beginning at the existing western trail end at the Ballard Locks, the trail would continue east along the south side of NW 54th St until it turns into NW Market St. The trail would continue along the south side of NW Market St, until it crosses 24th Ave NW and turns south on the east side of 24th Ave NW. The trail would then proceed east along the north side of Shilshole Ave NW to the intersection with NW 46th St. A signal would be installed at the intersection of Shilshole Ave NW and 17th Ave NW for trail users crossing 17th Ave NW. It would continue along the north side of NW 46th St underneath the Ballard Bridge to 11th Ave NW. At this point, the trail would turn south along the east side of 11th Ave NW until it connects to the eastern end of the trail at NW 45th St.

There would be changes to parking, vehicle travel lanes, and intersection configurations on both sides of the street in this alternative. The typical right-of-way section on NW Market St would include a sidewalk, the multi-use trail, a buffer zone, two vehicle travel lanes, center turn lane, and parallel parking areas on both sides of the street. The typical right-of-way on Shilshole Ave NW for this alternative would include a buffer zone and informal parking adjacent to the railroad tracks, two vehicle travel lanes, parallel parking area, buffer area, multi-use trail, and sidewalk. The existing gravel shoulder on the south side of Shilshole Ave NW would be maintained. These elements would vary along the trail due to the existing road configuration and structures.

Ballard Avenue Alternative

Under the Ballard Avenue Alternative, the multi-use trail would be primarily routed along the south side of Ballard Ave NW (Figure ES-1). Beginning at the existing western trail end at the Ballard Locks, the trail would continue east along the north side of the unimproved NW 54th St right-of-way until 28th Ave NW. At this point the trail would turn north along the east side of 28th Ave NW until it reaches NW 56th St. The trail would then turn east along the south side of NW 56th St to the intersection with 22nd Ave NW. At 24th Ave NW and NW 56th St, a new pedestrian-activated signal would be installed to facilitate the trail crossing of 24th Ave NW. The trail would turn south along the west side of 22nd Ave NW, cross NW Market St, and proceed south to Ballard Ave NW. At this point the trail would turn southeast along the south side of Ballard Ave NW and continue east on the south side of NW Ballard Way to the intersection with 15th Ave NW. The trail would then turn south onto the one-way road on the west side of 15th Ave NW, which could potentially be converted to trail-only use (no motor vehicles). The trail would

cross to the south side of NW 46th St at a newly signalized intersection and proceed east across 11th Ave NW. It would then turn south along the east side of 11th Ave NW to the eastern trail end at NW 45th St.

There would be changes to parking and vehicle travel lane configurations on all streets traversed by this alternative. The typical right-of-way section on Ballard Ave NW would include pedestrian sidewalks on both sides of the street, buffer zone, two vehicle travel lanes, and a parallel parking area on the north side of the street. These elements would vary along the trail due to the existing road configurations and structures.

Leary Alternative

Under the Leary Alternative, the multi-use trail would be primarily routed along the south side of Leary Ave NW (Figure ES-1). Beginning at the existing western trail end at the Ballard Locks, the trail would continue east along the south side of NW 54th St until it turns into NW Market St. The trail would continue east along the south side of NW Market St, crossing 22nd Ave NW. At 22nd Ave NW, the trail would turn southeast on the south side of Leary Ave NW. The trail would continue east along the south side of Leary Ave NW, which becomes NW Leary Way, to 11th Ave NW. At this point, the trail would turn south along the east side of 11th Ave NW to the current trail end at NW 45th St.

There would be changes to parking, vehicle travel lanes, and intersection configurations on both sides of the street along this alternative. The typical right-of-way on Leary Ave NW would include buffer zones on both sides of the street, a multi-use trail, parking areas on both sides of the street, sidewalks on both sides of the street, two vehicle travel lanes, and one two-way center left turn lane. The typical right-of-way on NW Market St would include a sidewalk, the multi-use trail, a buffer zone, two vehicle travel lanes, center turn lane, and parking areas on both sides of the street. These elements would vary along the trail due to the existing road configuration and structures.

Connector Segments

As mentioned previously, there are a number of possibilities to configure the routes, and six segments have been identified as the most likely connectors (Figure ES-1). These segments may be used as connections between portions of the previously identified alternative routes and could be on either side of the road. The connector segments include the following:

- Ballard Avenue NW;
- NW Vernon Place;
- 20th Avenue NW;
- 17th Avenue NW;
- 15th Avenue NW; and
- 14th Avenue NW.

Should NW Vernon Pl be used as a connector segment, a signal at NW Vernon Pl and Shilshole Ave NW may also be warranted, depending on whether the trail would continue on the north or south side of Shilshole Ave NW.

Features Common to All Build Alternatives

Roadway Design Considerations

Roadway designs would vary for each alternative based on factors such as intersection geometry, vehicle volumes, and types of vehicles. This section describes roadway modifications, intersection treatments, driveway design, and parking lot changes that could be incorporated during the final design phase of the project to address safety, access, nonmotorized users, and vehicle types. Similar concepts can be found throughout the city and in design documents such as the Urban Bikeway Design Guide (National Association of City Transportation Officials [NACTO], 2015) and Guide for Development of Bicycle Facilities (American Association of State Highway and Transportation Officials [AASHTO], 2012). These features are common to all Build Alternatives, but the location and other specifics would vary by alternative.

Roadway Design

Adding a trail to the existing street system would require roadway modifications for vehicles to co-exist with nonmotorized users. These changes could include geometric changes to create perpendicular intersections, changes to roadway lane configurations, alterations of curb radii, and design details that provide sight lines between vehicles and nonmotorized users.

Intersection Design

Intersections would be designed to more clearly identify crossings of the multi-use trail. These improvements could include the following:

- Curb extensions or curb bulbs;
- Pavement markings;
- Raised crosswalks;
- Driveway-style entrances at intersections;
- Signalized intersections;
- Rapid flashing beacons at road crossings of the trail;
- Medians used either to improve the street crossing for pedestrians or to restrict left turns across the trail;
- Barriers, fences, or buffers separating nonmotorized trail users from moving vehicular traffic or the railroad; and
- Alternative pavement treatments.

Driveway Design

Driveways that cross or intersect with the multi-use trail would also be evaluated for possible design changes. Design changes could include many of the intersection elements described above, including curb bulbs, and pavement markings and treatments. Driveways and loading docks would be reconfigured so that parked vehicles or trucks would not block the trail. Some driveways may be eliminated, relocated, or consolidated where there are multiple driveways at a single property.

Access Modifications

Some private lots may be affected where vehicle parking currently extends into the public right-of-way, or due to changes to property access from the multi-use trail. For example, striping in parking lots may be modified to prevent vehicles from parking in the right-of-way and blocking the trail, which may reduce the number of parking spaces in some lots.

Construction Activities and Durations

Overall construction of any of the Build Alternatives would last 12 to 18 months. Duration would vary depending on the extent of utility relocations, storm drainage improvements, and existing roadway reconfigurations, including bus stop relocations. Construction would likely occur in segments, and one segment would be completed before moving on to the next segment to minimize the construction duration at any given location.

Construction of any of the Build Alternatives would consist of the following general activities:

- Demolition, including removal of pavement, curbs, sidewalks, driveways, trees, signs, bus shelters, fencing, or other features located in the new trail area.
- Construction of new roadway elements, including pavement, curbs and gutters, sidewalks, driveways, trees, bus shelters, fencing, signs, and buffer elements. Buffer elements include such things as paving, landscaping, barriers, fencing, and signage.
- Utility relocations, ranging from moving fire hydrants, stormwater catch basins, and overhead utility and power poles to the installation of new drainage facilities.

Construction Staging

Construction staging and scheduling are typically determined by the contractor; however, the City would specify some mandatory restrictions for the contractor. Demolition would likely be limited to a certain length of the trail; as such, the contractor would not be allowed to demolish the work space along the entire length of the trail. Rather, the project would be constructed in multiple smaller segments.

The project would generally use areas within or near the project footprint for construction staging and storing materials and equipment, including vacant lots, parking lots, and unused rights-of-way. Temporary construction offices (such as trailers) could also use these areas. Alternatively, construction offices may be located in a rented office space. All staging areas would be restored to their pre-construction condition or better.

Construction Traffic and Haul Routes

Construction would generate traffic to transport materials and equipment to the work site and to remove demolition debris and excess soil. The contractor would require access to the site for heavy vehicles such as dump trucks and concrete trucks, light vehicles such as pickup trucks, and heavy equipment such as excavators and compactors. Trucks would transport construction material. The contractor would determine the best construction methods, as permitted by the City and in conformance with the project construction plans and specifications. The exact number of truck trips per day during construction cannot yet be determined because project design is not yet complete. However, preliminary estimates indicate that the highest number would be approximately 20 round-trip truck trips per work day during a paving operation, spread uniformly throughout the day. City streets that could be used as haul routes include Shilshole Ave NW, NW 46th St, NW Leary Way/Leary Ave NW, and 15th Ave NW.

Summary of Impacts

Potential impacts would vary by alternative. In general, impacts are associated with construction activities and would be temporary. Long-term (operational) impacts to parking and transportation patterns are expected, but these would not be significant. Refer to the individual chapters in the DEIS for further discussion of impacts.

Table ES-1 summarizes the key construction impacts that would be similar among all Build Alternatives. The No Build Alternative is not included in this table because there would be no trail construction activities associated with it. Refer to the individual chapters in the DEIS for a more complete discussion of impacts.

Table ES-1. Construction Impacts Common to All Build Alternatives

Element of the Environment	*Potential Construction Impact*
Geology, Soils, and Hazardous Materials	• Erosion potential during construction. • Potential for encountering contaminated materials.
Fish, Wildlife, and Vegetation	• Potential for dust and erosion to disturb wildlife. • Potential for the removal of street trees during construction.
Land and Shoreline Use	• Noise, traffic, dust and debris, and sidewalk and road closures could reduce patronage for businesses that rely on auto and foot traffic. • Traffic congestion could delay the pick-up and delivery of goods. • Disruption to trail users during construction; however, nonmotorized users would generally use alternative routes.
Recreation	• Disruption to recreational users during construction. • Disruption to access to the parking lot and entrance of the Ballard Locks.
Utilities	• Potential utility disruptions during utility relocations.
Transportation	• Traffic congestion during the 12- to 18-month construction period. • Driveway access to properties would be maintained during construction. • Temporary, minor delays to freight traffic. • Increased delays and congestion for public transit. • Potential for increased accident frequencies in isolated locations during construction.
Parking	• Temporary reduction of on-street parking as construction moves along trail alignment. The amount of parking affected would vary by construction stage and street block.
Air Quality and Greenhouse Gas	• Increased CO2 emissions associated with construction activities.
Cultural Resources	• Vibration, noise, and dust from construction. • Indirect effects to historic properties due to limited access in areas of active construction. • Moderate to high probability for encountering archaeological resources.

Table ES-2 summarizes the key construction impacts that vary by alternative. Because no construction would occur under the No Build Alternative, it is not included in this table. There are no construction impacts associated with Land and Shoreline Use, so it is not included in this table. Refer to the individual chapters in the DEIS for a more complete discussion of impacts.

Table ES-2. Construction Impacts Varying by Build Alternative

Element of the Environment	*Shilshole South Alternative*	*Shilshole North Alternative*	*Ballard Avenue Alternative*	*Leary Alternative*
Recreation	• Would disrupt and displace bicyclists on Shilshole Ave NW. • May disrupt access to some street end parks; construction noise may diminish users' experience.	• Similar to Shilshole South Alternative, but lesser impact to street end park users.	• Audible and visible to park users at Marvin's Garden and Bergen Place, as well as visitors along historic Ballard Ave NW. • Impacts to Farmers Market.	• No construction impacts.
Utilities	• No anticipated above-ground utility relocation.	• Potential relocation of above-ground utilities.	• Potential relocation of above-ground utilities. • New stormwater facilities likely needed on Ballard Ave NW.	• Potential relocation of above-ground utilities.
Transportation	• Construction on Shilshole Ave NW would cause traffic and freight delays.	• Construction on Shilshole Ave NW could cause traffic and freight delays. • Construction on NW Market St could affect public transportation.	• Additional traffic and freight delays on 28th Ave NW, NW 56th St, 22nd Ave NW, and Ballard Ave NW.	• Additional traffic and freight delays on 11th Ave NW. • Construction on NW Market St and Leary Ave NW could affect public transportation.
Cultural Resources	• Potential realignment of or alternations to the BTR.	• Potential realignment of or alternations to the BTR.	• Potential realignment of or alternations to the BTR. • Potential changes to features of the Landmark District, such as brick pavers, granite curbs, and hitching rings.	• Potential realignment of or alternations to the BTR.

Table ES-3 summarizes the key operational impacts that would be similar among all Build Alternatives. The No Build Alternative is not included in this table. Operational impacts associated with the No Build Alternative are included in Table ES-4. Refer to the individual chapters in the DEIS for a more complete discussion of impacts.

Table ES-3. Operational Impacts Common to All Build Alternatives

Element of the Environment	*Impact*
Geology, Soils, and Hazardous Materials	• Potential liquefaction during an earthquake.
Fish, Wildlife, and Vegetation	• No operational impacts to fish, wildlife, or vegetation. • No changes to habitat for threatened species. • Potential disturbances to urban species from more pedestrians and bicyclists.
Land and Shoreline Use	• All Build Alternatives are consistent with the intent of the Growth Management Act (GMA) and several planning documents, which promote nonmotorized and multimodal transportation opportunities. • In all Build Alternatives, some portion of the trail would cross through the Ballard-Interbay Northend Manufacturing and Industrial Center (BINMIC); some adopted policies do not support locating regional trails within the BINMIC. • The trail would be adjacent to water-dependent and water-related uses.
Recreation	• The Missing Link would be used by many people, including bicyclists, skaters, joggers, and walkers. • Completion of the trail would improve recreational connectivity to attractions like the Ballard Locks and Golden Gardens Park. • The Missing Link would be consistent with numerous recreation plans and policies.
Transportation	• Vehicles blocking the trail could occasionally delay trail users (on average, 15 to 25 seconds). • Where the trail intersects driveway access locations, drivers would need to stop and check the trail for pedestrians and bicyclists, resulting in minor delays (10 to 25 seconds). • Proximity of the trail to buildings adjacent to the right-of-way would cause sight-distance concerns at certain locations. • Freight access points (driveways, loading docks, etc.) may have to be consolidated or reoriented.
Parking	• All of the Build Alternatives would remove some parking spaces.
Air Quality and Greenhouse Gas	• The Build Alternatives would generate minor increases in total emissions of PM10 and CO relative to the No Build Alternative. • Emissions would be well below applicable thresholds for all alternatives.
Cultural Resources	• The streetscape would change slightly, but in most areas, these changes would not alter the overall character (except within the historic district).

Table ES-4 summarizes the key operational impacts that vary by alternative. Refer to the individual chapters in the DEIS for a more complete discussion of impacts. Geology, Fish and Wildlife, Utilities, Air Quality & Greenhouse Gas, and Cultural Resource impacts are not included in this table as the differences between alternatives are minor.

Table ES-4. Operational Impacts Varying by Alternative

Element of the Environment	*No Build Alternative*	*Shilshole South Alternative*	*Shilshole North Alternative*	*Ballard Avenue Alternative*	*Leary Alternative*
Land and Shoreline Use	• Would not alter current land uses. • Inconsistent with land use plans that emphasize multimodal transportation.	• Just over half of alignment is adjacent to industrial uses that depend on freight mobility.	• Two-thirds of alignment is adjacent to industrial uses that depend on freight mobility. • Adjacent to highest number of uses dependent upon loading zone access.	• Nearly half of alignment is adjacent to industrial uses that depend on freight mobility.	• One-third of alignment is adjacent to industrial uses that depend on freight mobility.
Recreation	• Inconsistent with adopted plans promoting more trails. • Potential for user conflicts on public streets that lack adequate pedestrian or bicycle facilities.	• Similar recreational experience to existing BGT. • Most disconnected from commercial areas of Ballard. • Crosses 4 unsignalized roadway intersections.	• Similar recreational experience to existing BGT. • Crosses 14 roadway intersections, both signalized and unsignalized.	• Would run through the Ballard Avenue Landmark District, which would provide a different recreational experience. • Conflicts with Farmers Market. • Increase in trail user conflicts with pedestrians along Ballard Ave NW. • Crosses 16 roadway intersections, both signalized and unsignalized.	• Would run through busy commercial district, which would provide a different recreational experience. • Crosses 13 roadway intersections, both signalized and unsignalized. • Potential for increased trail user conflicts along NW Market St.

Element of the Environment	*No Build Alternative*	*Shilshole South Alternative*	*Shilshole North Alternative*	*Ballard Avenue Alternative*	*Leary Alternative*
Transportation	• 5 intersections would operate at Level of Service (LOS) E or F in 2040 due to projected traffic growth.	• Crosses about 41 driveways and loading docks. • Would improve LOS at study intersections. • Has the fewest driveways with sight distance concerns.	• Crosses the most (about 58) driveways and loading docks. • Would generally improve LOS at study intersections. • Potential delays for transit along NW Market St. • Has the most driveways with sight distance concerns.	• Crosses about 42 driveways and loading docks. • Would generally improve LOS at study intersections. • Potential user conflicts with the Farmers Market.	• Crosses fewest (about 33) driveways and loading docks. • Would generally worsen LOS at study area intersections. • Reduces the sidewalk by up to 12 feet on NW Market St (between 24th Ave NW and 22nd Ave NW). • Potential delays for transit along NW Market St and Leary Ave NW.
Parking	• No change to parking supply. • No changes to loading zones.	• 261 on-street parking spaces removed. • No removal of designated loading zone spaces. • Some undesignated loading zone loss.	• 227 on-street parking spaces removed. • Potentially remove 10 generic loading zone spaces and 14 truck-only loading zone spaces.	• 198 on-street parking spaces removed. • 86 paid parking spaces removed. • Potentially remove 10 generic loading zone spaces, 2 truck-only loading zone spaces, and 2 commercial vehicle loading zone spaces.	• 103 on-street parking spaces removed. • Potentially remove 8 generic loading zone spaces, 3 passenger loading zone spaces, and 4 truck-only loading zone spaces.

Summary of Mitigation Measures

Table ES-5 summarizes the mitigation measures that could be considered for all Build Alternatives. Refer to the individual chapters in the DEIS for further discussion of mitigation measures.

Table ES-5. Mitigation Measures Similar for All Build Alternatives

Element of the Environment	*Potential Mitigation Measures*
Geology, Soils, and Hazardous Materials	• Utilize construction best management practices (BMPs) as detailed in a Storm Water Pollution Prevention Plan (SWPPP) to minimize the potential for erosion. • Implement BMPs such as dedicated refueling areas, following manufacturer's specifications on hazardous materials storage and disposal, spill containment supplies, and spill response supplies to control emergency situations. • Prepare and implement a Soil Management Plan during all earthwork activities. • Stop construction activities upon discovery of potentially contaminated soils or groundwater and determine appropriate disposal in accordance with SDOT requirements. • If contamination is discovered, further earthwork activities would be conducted in accordance with a site-specific Health and Safety Plan. • Prepare a design-level geotechnical report to provide design specifications.
Fish, Wildlife, and Vegetation	• Where possible, avoid disturbing vegetation and wildlife habitat. • Implement construction BMPs to avoid spills, and minimize dust or erosion during the construction period. • Develop a SWPPP specifically for the project. • Protect trees during construction. Where possible, avoid removing street trees, and replace in accordance with code requirements. • Street trees may also be added in areas where there currently are no street trees.
Land and Shoreline Use	• Construction and staging plans could be required to minimize impacts to business and residential access, maintain traffic flow, and maintain business visibility to encourage continued patronage. Provide the public and business owners information regarding the construction schedule, hours of operation, location and duration of lane closures, and changes to parking provisions. • Time the construction and coordinate with other construction projects to minimize potential use conflicts. • Employ additional measures, such as flaggers, to minimize freight delays in areas heavily used by freight. • Maintain loading zones and access, or identify alternative loading locations to minimize impacts to uses that rely on goods deliveries and shipments.
Recreation	• Use construction BMPs to control fugitive dust and vehicle emissions. • Clearly mark pedestrian and bicycle access routes as well as locations of detour signage and other wayfinding elements.

Element of the Environment	*Potential Mitigation Measures*
Utilities	• Coordinate with utility providers prior to initiating construction activity. • Coordinate with property owners to obtain input on undocumented utility locations. • Notify property owners in advance of disruptions in service. • Comply with stormwater code requirements.
Transportation	• Develop a Traffic Control Plan to reduce impacts on traffic operations, maintain access, and protect the public during construction. • Clearly mark detours for motor vehicles to provide alternative routes. • Make accommodations for loading zone access for business deliveries, taxi and bus service, and garbage pickup. • Use flaggers, uniformed police officers, barricades, signage, or other traffic control devices. • Designate construction haul routes. • Make accommodations for oversized freight vehicles to travel through construction zones during road closures. • Publicize transit stop closures, alternative transit stop locations, and interim transit routes. • Provide emergency access through construction areas to minimize impacts on emergency response times. • Maintain rail facilities and operations to minimize impacts on freight rail service. • Business access points could be reoriented to improve safety and operations. • Design elements could improve safety in locations with sight distance concerns. • Pavement modifications could be used to identify where the trail intersects with driveways. • Trail driveway notification signage could be used to maintain safe speeds and identify trail intersections. • Driveways could be combined to reduce the number of conflict locations.
Parking	• Maintain parking availability to the extent feasible during construction. • Encourage the contractor's workers to find alternative parking areas or to use transit to access the work site. • Modify on-street parking policies and practices to make parking more consistently available for short-term users. • Adjust short-term parking limits to make the most efficient use of the supply of short-term parking. • Provide information on off-street parking spaces on the City’s website. • Shift loading zone spaces to other locations along existing block faces, to the other side of a street, or to an adjacent block.

Element of the Environment	*Potential Mitigation Measures*
Air Quality and Greenhouse Gas	• Use measures to control dust and cover haul trucks that transport soil, sand, or other loose material. • Wash construction equipment to prevent dirt from being tracked out onto public roads. • Limit vehicle speeds on unpaved roads. • Pave exposed soils in areas planned for paving as soon as possible. • Minimize vehicle and equipment idle times. • Maintain construction equipment and vehicles. • Encourage carpooling options for construction workers. • Use local building materials to reduce transport distances.
Cultural Resources	• Minimize the removal or alteration of railroad rails, and avoid effects to other contributing features, such as switches and sleepers. • Use BMPs to control noise, air pollution, dust, and mud, and avoid damage to historic resources.

Table ES-6 summarizes the mitigation measures that could vary by alternative. Refer to the individual chapters in the DEIS for further discussion of mitigation measures. Geology, Fish and Wildlife, Land Use, Utilities, Parking, and Air Quality & Greenhouse Gas are not included in this table as the mitigation measures do not vary substantially between alternatives.

Table ES-6. Mitigation Measures Varying by Alternative

Element of the Environment	*Shilshole South Alternative*	*Shilshole North Alternative*	*Ballard Avenue Alternative*	*Leary Alternative*
Recreation	• No specific mitigation measures identified.	• No specific mitigation measures identified.	• SDOT would coordinate with the Farmers Market regarding trail use through the market.	• No specific mitigation measures identified.
Transportation	• BTR track relocations would be coordinated to maintain operations.	• No specific mitigation measures identified.	• No specific mitigation measures identified.	• To mitigate the four intersections that would experience an LOS decrease, additional right-of-way could be required. • Design elements could be used to mitigate impacts along NW Market St and where the sidewalk widths would be reduced. • Queue jumps (additional travel lanes for transit vehicles only) could be used to prioritize transit.
Cultural Resources	• No specific mitigation measures identified.	• No specific mitigation measures identified.	• The design and appearance of the trail within the Landmark District should be compatible with its historic character and in accordance with Office of Historic Preservation requirements. • Reuse granite curbs and reset the brick pavement.	• No specific mitigation measures identified.

Summary of Cumulative Impacts

Cumulative transportation-related impacts may occur as a result of overlapping construction projects in the Ballard area. Because the timing of individual projects is uncertain, the magnitude of impact is difficult to predict, but the potential exists for multiple projects to occur simultaneously.

The Leary Alternative could conflict with plans to develop a Bus Rapid Transit route on NW Leary Way/Leary Ave NW.

Next Steps

At the conclusion of the DEIS comment period, SDOT will review and respond to all oral and written comments received on the DEIS. A Final EIS (FEIS) will be prepared that responds to all comments, as well as identifies a preferred alternative. It is anticipated that the FEIS will be published in early 2017. Following publication of the FEIS, SDOT will make a final decision regarding the alternative to be constructed, mitigation measures to be incorporated into the project, and identify funding sources.

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ACRONYMNS AND ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
ADA	Americans with Disabilities Act
ASTM	American Society for Testing and Materials
BGT	Burke-Gilman Trail
BINMIC	Ballard-Interbay Northend Manufacturing and Industrial Center
BMPs	best management practices
BTR	Ballard Terminal Railroad Company (formerly known as Seattle Lake Shore and Eastern Railroad Grade)
C1	Commercial
CAP	Climate Action Plan
CFR	Code of Federal Regulations
CH4	methane
City	City of Seattle
CM	Conservancy Management
CN	Conservancy Navigation
CO	carbon monoxide
CO_2	carbon dioxide
Corps	U.S. Army Corps of Engineers
CSO	Combined Sewer Overflow
DAHP	Department of Archaeology and Historic Preservation
DEIS	Draft Environmental Impact Statement
DPS	Distinct Population Segment
Ecology	Washington State Department of Ecology
EDR	Environmental Data Resources
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ERNS	Emergency Response Notification System
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
fbs	feet below ground surface
FEIS	Final Environmental Impact Statement
GHG	greenhouse gas
GIS	geographic information system

GMA	Growth Management Act
IB	Industrial Buffer
IC	Industrial Commercial
IG2	General Industrial 2
LOS	Level of Service
LR3	Low-Rise 3 (Multifamily)
mph	miles per hour
N2O	Nitrogen dioxide
NAAQS	National Ambient Air Quality Standards
NACTO	National Association of City Transportation Officials
NC2	Neighborhood Commercial 2
NC3	Neighborhood Commercial 3
NMFS	National Marine Fisheries Service
NO2	nitrogen dioxide
NPL	National Priorities List
NRHP	National Register of Historic Places
P1	Pedestrian Overlay
PM	particulate matter
ppb	parts per billion
ppm	parts per million
PSCAA	Puget Sound Clean Air Agency
PSE	Puget Sound Energy
PSRC	Puget Sound Regional Council
RCO	Washington State Recreation and Conservation Office
RCRA	Resource Conservation and Recovery Act
RCW	Revised Code of Washington
SCL	Seattle City Light
SDOT	Seattle Department of Transportation
SEPA	State Environmental Policy Act
SFIA	Sports and Fitness Industry Association
Ship Canal	Lake Washington Ship Canal
SIP	State Implementation Plan
SLS&E RR	Seattle Lake Shore and Eastern Railroad Grade (currently known as Ballard Terminal Railroad)
SMC	Seattle Municipal Code
SMP	Shoreline Master Program

SOV	Single-Occupancy Vehicle
SPU	Seattle Public Utilities
SWPPP	Storm Water Pollution Prevention Plan
$\mu g/m^3$	Micrograms per cubic meter
USDOT	U.S. Department of Transportation
UI	Urban Industrial
USFWS	U.S. Fish and Wildlife Service
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington Department of Natural Resources
WISAARD	Washington Information System for Architectural and Archaeological Records Data
WSDOT	Washington State Department of Transportation

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GLOSSARY

Term	*Definition*
Best Management Practices (BMPs)	A method that can be used to minimize the amount of pollution entering surface waters. BMPs may include schedules of compliance, operation and maintenance procedures, and treatment requirements.
Bike Box	A bike box is a painted green space on the road with a white bicycle symbol inside. The bike box creates space before the intersection so that people on bicycles can cross the intersection ahead of traffic. This makes bicycles more visible and predictable to approaching drivers.
Build Alternative	An alternative to develop a multi-use trail to connect the existing segments of the Burke-Gilman Trail through the Ballard neighborhood.
Critical Habitat	Critical habitat is defined as specific geographical areas that contain physical or biological features essential to conservation of a species.
Crustal Fault	Faults formed by the deformation of the earth's crust.
Curb Radius (curb radii)	Curb radius is the radius defined by two sidewalks on perpendicular streets that come together at a corner. Curb radii directly impact vehicle turning speeds and pedestrian crossing distances.
Dissolved Oxygen	A measure of the amount of oxygen in the water that is available to be used by aquatic organisms.
Distinct Population Segment (DPS)	A distinct population segment is a vertebrate population or group of populations that is discrete from other populations of the species and significant in relation to the entire species. The federal Endangered Species Act provides for listing species, subspecies, or distinct population segments of vertebrate species.
Elevated Trail	Trail is elevated such that vehicles can pass underneath.
Endangered Species	A species that is in danger of extinction within the foreseeable future throughout all, or a significant portion, of its range.
Ethnographic	The study and systematic recording of human cultures.
Evolutionarily Significant Unit (ESU)	An evolutionarily significant unit is a Pacific salmon population or group of populations that is substantially reproductively isolated from other conspecific populations and that represents an important component of the evolutionary legacy of the species.
Fecal Coliform	A type of bacteria found in the intestinal tracts of mammals. The presence of high numbers of fecal coliform bacteria in a water body can indicate the recent release of untreated wastewater and/or the presence of animal feces. These organisms may also indicate the presence of pathogens that are harmful to humans.
Glacial Till	Unstratified material deposited by a glacier, consisting of clay, silt, sand, gravel, and boulders.

Term	*Definition*
Heritage Tree	Heritage trees are a tree or group of trees given special designation by the Heritage Tree Program, co-sponsored by Plant Amnesty and the Seattle Department of Transportation. Trees can be nominated as an individual or a collection, but must have the owner's approval and meet criteria for health in addition to being selected according to one of the following categories. Specimen: A tree of exceptional size, form, or rarity. Historic: A tree recognized by virtue of its age, its association with or contribution to a historic structure or district, or its association with a noted person or historic event. Landmark: Trees that are landmarks of a community. Collection: Trees in a notable grove, avenue, or other planting.
Holocene	An epoch of time, approximately 8,000 years ago to the present time.
Impervious Surfaces	Constructed surfaces such as pavement, driveways, roads, and rooftops that do not allow rainfall to soak into the ground. Instead, water runs off of these surfaces and can enter water bodies such as streams and wetlands either directly, or by being discharged from stormwater detention ponds or other facilities constructed to manage runoff.
Intraslab	Subduction occurring within the same geologic unit.
Level of Service (LOS)	An estimate of the quality and performance of transportation facility operations in a community. The degree of congestion and delay is rated ranging from the letter “A” for the least amount of congestion, to the letter “F” for the highest amount of congestion. LOS D or better is considered acceptable for most jurisdictions. At LOS E, intersections operate at capacity.
Liquefaction	During an earthquake, saturated cohesionless soils (e.g., sands) lose frictional forces and act more like a liquid than a solid.
Midden	Archaeological deposits consisting of refuse from human activities, usually composed of a mixture of soil, charcoal, and various food remains such as bone, shell, and carbonized plant remains; may also contain human remains.
Multi-Use Trail	A multi-use trail allows for two-way, off-street pedestrian, and bicycle use. Wheelchairs, joggers, skaters, and other nonmotorized users are also welcome.
Outwash	Sand and gravel deposited by the meltwater streams of a glacier.
Peak Hour	The hour of the day when the highest traffic volumes occur at an intersection or roadway segment. The specific peak hour varies from intersection to intersection but generally occurs for a single hour between 7 and 9 AM for the AM peak hour, and 4 and 6 PM for the PM peak hour.
pH	A measure of the acidity or alkalinity of a solution. The pH scale ranges from 0 to 14. A pH of 7 is neutral. More alkaline or basic solutions have a higher pH, while more acidic solutions have a lower pH.
Pleistocene	An epoch of time, beginning approximately two to three million years ago until the start of the Holocene (approximately 8,000 years ago).

Term	*Definition*
Primary Constituent Element	A physical or biological feature essential to the conservation of a species for which its designated or proposed critical habitat is based on, such as space for individual and population growth, and for normal behavior; food, water, air, light, minerals, or other nutritional or physiological requirements; cover or shelter; sites for breeding, reproduction, rearing of offspring, germination, or seed dispersal; and habitats that are protected from disturbance or are representative of the species' historic geographic and ecological distribution.
Projectile Point	Chipped stone artifacts used to tip arrows, dart points, or spears.
Protected Bicycle Lanes	A protected bicycle lane combines the user experience of a multi-use trail with a conventional bicycle lane. They have different forms, but all share common elements — they provide space that is used for bicycles and are separated from motor vehicle travel lanes, parking lanes, and sidewalks.
Salmonid	General term for salmon, trout, and steelhead.
Seiche	An oscillation of a body of water in an enclosed or semi-enclosed basin, caused by local changes in atmospheric pressure, and aided by winds, tidal changes, and sometimes earthquakes.
Sharrow	Shared lane markings or "sharrows" guide bicyclists to the best place on the street to ride and help motorists expect to see and share the lane with bicyclists.
Shoreline Management Master Program	A shoreline plan created by a local government in compliance with the Washington State Shoreline Management Act. The plan designates what types of uses may be allowed along different portions of the shorelines within the community.
Smolts	Young salmon or sea trout about 2 years old that are at the stage of development when they assumes the silvery color of the adult and are ready to migrate to the sea.
State Sensitive Species	Any wildlife species native to Washington that is vulnerable or declining and is likely to become endangered or threatened throughout a significant portion of its range within the state without cooperative management or removal of threats.
State Species of Concern	Includes species listed as state endangered, state threatened, state sensitive, or state candidate, as well as species listed or proposed for listing by the United States Fish and Wildlife Service or National Oceanic and Atmospheric Administration Fisheries.
Subduction Zone	The long narrow belt where one lithospheric plate descends beneath another.
Subsidence	Sinking or downward settling of the earth's surface.
Threatened Species	A species that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.
Turbidity	A measure of the amount of particles suspended in water. Increasing the turbidity of the water reduces the amount of light that penetrates the water column. High levels of turbidity are typically harmful to aquatic organisms.
Wetlands	Those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

Term	*Definition*
Woonerf	A street where pedestrians and bicyclists have priority over motorists. Traffic volumes and speeds are low, less of the public right-of-way is dedicated to vehicles, and curbs may be eliminated.

CHAPTER 1: PROJECT HISTORY AND ALTERNATIVES

1.1 Project Background and History

The Burke-Gilman Trail (BGT) is a regional trail that runs east from Golden Gardens Park in Seattle and connects to the Sammamish River Trail in Bothell, except for a missing segment through the Ballard neighborhood. Currently, the regional trail ends at 30th Ave NW by the Hiram M. Chittenden (Ballard) Locks on the west, and begins again at the intersection of 11th Ave NW and NW 45th St on the east. The Seattle Department of Transportation (SDOT) proposes to connect these two segments of the BGT with a marked, dedicated route that would serve all users of the multi-trail. The proposed project to complete the regional facility is referred to as the Missing Link.

Completing this section of the BGT has been discussed and analyzed since the late 1980s. In the early 1990s, the City of Seattle (City) included the extension of the BGT in their comprehensive plan. By the late 1990s, the Seattle City Council passed a resolution outlining the guiding principles for extending the trail and developed an operating agreement between the Ballard Terminal Railroad (BTR) and the City to preserve the rail line in City ownership while continuing rail service to area businesses. The City Council adopted an ordinance, the Ballard Terminal Railroad Franchise Agreement, which granted BTR the right, privilege, and authority to construct and operate the railway in the railroad right-of-way. In the early 2000s, the City evaluated alternative routes for the trail. In 2003, the Seattle City Council adopted a resolution identifying Shilshole Ave NW as the preferred alignment for the Missing Link, with interim portions of the route to be located along Ballard Ave NW and NW Market St. In 2007, the City adopted the Bicycle Master Plan, which called for completing the trail. Environmental documentation was prepared for the Missing Link beginning in 2008 and was challenged multiple times. In 2012, after the third appeal to the City's Hearing Examiner over the project's environmental determination, the Hearing Examiner required SDOT to develop an environmental impact statement (EIS) related to traffic hazards on the Shilshole segment of the project. As a result of the ruling, SDOT decided to prepare an EIS for the entire project and to include an evaluation of alternative routes. SDOT began preparation of an EIS in 2013. Figure 1-1 provides a general timeline of the Missing Link project history.

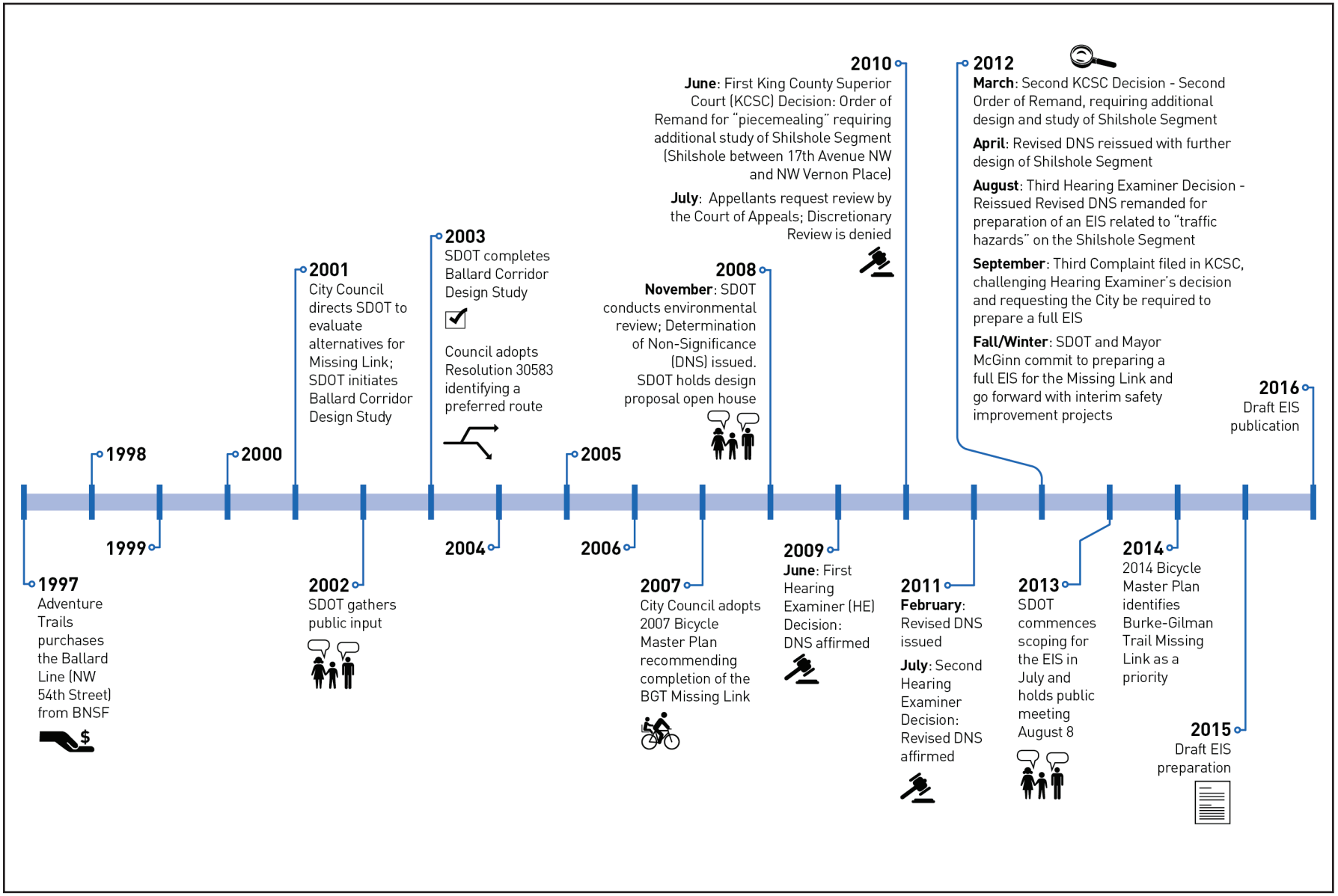

Figure 1-1. Missing Link Project History Timeline

1.2 Objective

The BGT currently serves a large portion of Seattle and the region as a highly used nonmotorized transportation and recreational facility. The City has identified a need for recreational and commuter users of the Burke-Gilman Trail to have a safe, direct, and defined way to traverse through the Ballard neighborhood from either end of the existing trail (SDOT, 2007, 2009, 2015). There are a number of barriers between the existing trail ends for people walking and biking. Some streets lack sidewalks or other demarcated areas for pedestrians, and intersection and railroad crossings are substandard for bicycles. Many people have commented during public meetings and open houses that they do not feel comfortable riding bicycles or walking in the roadway, and some activities such as skateboarding are not allowed on city streets. Traffic surveys have shown that the lack of a direct and defined route between trail ends results in people dispersing along various streets through Ballard, which in turn increases the opportunity for conflicts between vehicles and nonmotorized activities (SDOT, 2014, 2015). SDOT has determined that a multi-use trail is needed to accommodate the expected range of users in a safe manner. A multi-use trail allows for two-way, off-street pedestrian and bicycle use, as well as for wheelchairs, joggers, skaters and other nonmotorized users.

The primary objective of the proposed project is to connect the roughly 1.2-mile gap between the existing segments of the BGT through the Ballard neighborhood. The project is intended to create a safe, direct, and defined multi-use trail for persons of all abilities, for a variety of transportation and recreational activities, and to improve predictability for motorized and nonmotorized users along the project alignment. Another objective of the project is to provide connections to the proposed nonmotorized networks shown in the Pedestrian Master Plan (SDOT, 2009) and Seattle Bicycle Master Plan (SDOT, 2014), while maintaining truck and freight facilities and access that support industrial and water-dependent land uses within the shoreline and the Ballard-Interbay Northend Manufacturing and Industrial Center (BINMIC).

1.3 SEPA Process

This Draft EIS (DEIS) has been prepared consistent with the State Environmental Policy Act (SEPA) (Washington Administrative Code [WAC] 197-11) and Seattle Municipal Code (SMC) 25.05. It is an analysis designed to help elected officials, community leaders, and the public understand the full range of environmental impacts that could result from the proposal. The City, as the SEPA lead agency, is responsible for fulfilling SEPA's procedural requirements. The DEIS describes potential adverse impacts of each alternative and describes proposed mitigation measures to reduce potential adverse impacts. The public is encouraged to comment on the DEIS; those comments will be responded to in the Final EIS (FEIS). The City will identify a preferred alternative in the FEIS that best meets the project's objective. Ultimately, City officials will weigh the information presented in the EIS along with other factors before deciding upon the preferred alternative.

The intent and purpose of this DEIS is to satisfy the procedural requirements of SEPA (Revised Code of Washington [RCW] 43.21c) and City Ordinance 114057. This is a project-level EIS that encompasses all of the regulatory, transactional, and other actions necessary to complete the Missing Link. This document is not an authorization for an action, nor does it constitute a decision or a recommendation for an action.

1.3.1 **Scoping**

Scoping is the process of determining the elements of the environment and alternatives to be evaluated in the EIS. SDOT received public comments between July 17 and August 16, 2013, including an open house

held on August 8, 2013 at Ballard High School. The focus of the open house was to receive comments related to trail location.

A total of 1,138 comment letters (including oral comments) were received during the scoping period. Two themes were dominant in the comment letters: trail location and safety. Shilshole Ave NW was the location most often indicated as preferred for the trail. When reasons were given for this preference, the most common reason was that it is the most direct route between the two ends of the existing BGT. However, many comment letters were opposed to Shilshole Ave NW as a route because it is an industrial corridor. These responses indicated the need to consider alternative routes to Shilshole Ave NW in order to examine the relative merits of routes that avoid or reduce impacts to the industrial area.

Both advocates and opponents of the trail expressed concern regarding the safety of bicyclists, but stated different opinions about the likelihood that safety concerns could be addressed adequately. Safety is not itself an element of the environment to be reviewed under SEPA. In addition, the analysis in an EIS is conducted at an early stage of project development, such that it is not possible to examine all safety issues that could be resolved through detailed design. However, the high level of concern about safety expressed in the public comments indicated that the EIS needed to include an analysis of safety considerations, such as industrial driveway crossings and traffic hazards.

Other frequently expressed concerns included the effect the trail would have on industrial land uses, particularly along Shilshole Ave NW, and the loss of parking. City and State land use policies strongly support maintaining industrial uses along the Ballard waterfront; thus, comments noted that the EIS should consider alternatives that are not immediately adjacent to industrial land uses, where feasible.

A variety of other comments were received regarding design suggestions, the environment, and other topics. Scoping is described in more detail in the *Burke-Gilman Trail Missing Link Environmental Impact Statement Public Scoping Meeting Comments Summary* available on the City website (SDOT, 2015).

All of the trail location information obtained as part of the scoping process was incorporated into the alternative development and screening process, as described in Section 1.4.1 of this document.

1.4 Alternative Development

1.4.1 Screening

SDOT received a number of suggestions during scoping in 2013 for potential routes to complete the Missing Link. SDOT mapped all possible route segments identified in the public scoping period, along with several additional segments suggested by SDOT staff and consultants. Overall routes through the project area were broken into smaller segments for review, and included a street block or number of blocks that would likely remain intact as part of a larger route. Segments were added in addition to those suggested by the public, including street blocks that could be used to connect streets in a reasonable way.

Engineers and planners from SDOT, in conjunction with their consultants (engineers, transportation planners, environmental planners, trail designers, and scientists), evaluated 55 route segments using the screening criteria listed below in a charrette-style workshop held in March 2015.

Screening criteria were developed by SDOT and their consulting team to narrow down the possible alternative segments and remove unworkable or infeasible segments from further consideration. The criteria included factors critical to the development of a safe, multi-use trail that would be similar in design and feel to the remainder of the BGT system. The screening criteria included the following factors:

- Directness of route,
- Number and types of trail crossings (driveways and intersections),
- Street and arterial classification,
- Adjacent land uses, and
- Right-of-way width.

At the workshop, each route segment was evaluated to create reasonable alignments that best meet the project objective. Using the screening criteria, the number of route segments was reduced to 31 segments. Segments that were eliminated either did not meet the criteria or did not provide a reasonable connection where another segment better met the criteria and/or provided a more direct or safe connection. The remaining segments were combined by the team to create a range of trail alignments through the project area that incorporated a broad range of options. The route segments were connected into three feasible alternative routes and seven route segments that would allow potential links to "mix and match" route segments.

Once the general alignments were determined, the route was further refined. To reduce the number of intersection crossings, the trail was located on the side of the street that resulted in fewer intersection crossings. In general, this meant that the trail would be located on the south side of east-west trending streets and on the west side of north-south trending streets.

Several team workshops were held over the next 3 months as the routes were being developed to refine the trail details and crossings. The trail alignments were named for the general east-west trending street on which they are located: the Shilshole South Alternative, the Ballard Avenue Alternative, and the Leary Alternative.

Following review of the three alternatives in June 2015, SDOT decided to include a fourth alternative, along the north side of Shilshole Ave NW, called the Shilshole North Alternative, because this alignment meets the screening criteria and does not result in more intersection crossings than the Ballard Avenue or Leary Alternatives.

This document evaluates the four Build Alternatives described above, along with the No Build Alternative. Refer to Section 1.6 and Figures 1-2 through 1-6 for descriptions and depictions of the alternative alignments and connector segments.

1.5 No Build Alternative

Under the No Build Alternative, no new multi-use trail would be constructed to connect the existing segments of the regional Burke-Gilman Trail. Trail users would continue to use the existing surface streets and sidewalks to travel between the existing trail segments, a distance of approximately 1.2 miles. Currently, trail users tend to use the most direct route, which is along Shilshole Ave NW. Pedestrians may opt for a street with sidewalks such as Ballard Ave NW or NW Leary Way. The No Build Alternative serves as the baseline condition, against which the Build Alternatives are compared over time to their 2040 design year. Over that time period, population and employment growth is expected to continue in the Ballard neighborhood, leading to an increase in traffic congestion, parking demand, and the number of people walking and biking.

1.6 Build Alternatives

1.6.1 Shilshole South Alternative

Under the Shilshole South Alternative, the multi-use trail would be primarily routed along the south side of Shilshole Ave NW (Figure 1-3). There would be changes to parking, lanes, and intersection configurations on both sides of the street along this alternative alignment. The trail would accommodate users on a newly paved surface for most of its length.

Beginning at the existing western trail end at the Ballard Locks, the trail would continue east along the north side of the unimproved NW 54th St right-of-way until the intersection with Shilshole Ave NW, just east of 24th Ave NW. The trail would then proceed along the south side of Shilshole Ave NW, continuing onto the south side of NW 45th St to the eastern project end at 11th Ave NW. From the existing western trail end at the Ballard Locks, the trail would be north of the BTR tracks until just before 17th Ave NW, at which point the trail would cross to the south of the tracks. A signal would be installed at the intersection of Shilshole Ave NW and 17th Ave NW for trail users crossing Shilshole Ave NW to access 17th Ave NW.

The trail width would vary somewhat throughout the corridor due to existing conditions and constraints, but would generally be between 8 and 12 feet wide. Based on the design concepts, the typical right-of-way on Shilshole Ave NW for this alternative would include a barrier or buffer zone adjacent to the railroad tracks and vehicle travel lanes, a multi-use trail, two vehicle travel lanes, and preservation of parking areas where feasible (Figure 1-3). See Chapter 7, Transportation, for additional detail on this and for all other Build Alternatives.

1.6.2 Shilshole North Alternative

Under the Shilshole North Alternative, the multi-use trail would be primarily routed along the north side of Shilshole Ave NW (Figure 1-4). Beginning at the existing western trail end at the Ballard Locks, the trail would continue east along the south side of NW 54th St until it turns into NW Market St. The trail would continue along the south side of NW Market St, until it crosses 24th Ave NW and turns south on the east side of 24th Ave NW. The trail would then proceed east along the north side of Shilshole Ave NW to the intersection with NW 46th St. A signal would be installed at the intersection of Shilshole Ave NW and 17th Ave NW for trail users crossing 17th Ave NW. It would continue along the north side of NW 46th St underneath the Ballard Bridge to 11th Ave NW. At this point the trail would turn south along the east side of 11th Ave NW until it connects to the eastern end of the existing trail at NW 45th St.

There would be changes to parking, vehicle travel lanes, and intersection configurations on both sides of the streets in this alternative. The typical right-of-way on NW Market St would include sidewalks on both sides of the street, the multi-use trail, a buffer zone, parallel parking or bus zone on both sides of the street, two vehicle travel lanes, and center turn lane (Figure 1-4). The typical right-of-way on Shilshole Ave NW for this alternative would include a barrier or buffer zone and informal parking adjacent to the railroad tracks, two vehicle travel lanes, parallel parking area, buffer area, multi-use trail, and sidewalk. The existing gravel shoulder on the south side of Shilshole Ave NW would be maintained (Figure 1-4). These elements would vary along the trail due to the existing road configuration and structures. See Chapter 7, Transportation, for additional detail on this and for all other Build Alternatives.

1.6.3 Ballard Avenue Alternative

Under the Ballard Avenue Alternative, the multi-use trail would be primarily routed along the south side of Ballard Ave NW (Figure 1-5). Beginning at the existing western trail end at the Ballard Locks, the trail

would continue east along the north side of the unimproved NW 54th St right-of-way until 28th Ave NW. At this point the trail would turn north along the east side of 28th Ave NW until it reaches NW 56th St. The trail would then turn east along the south side of NW 56th St to the intersection with 22nd Ave NW. At 24th Ave NW and NW 56th St, a new pedestrian-activated signal would be installed to facilitate the trail crossing of 24th Ave NW. The trail would turn south along the west side of 22nd Ave NW, cross NW Market St, and proceed south to Ballard Ave NW. At this point the trail would turn southeast along the south side of Ballard Ave NW and continue east on the south side of NW Ballard Way to the intersection with 15th Ave NW. The trail would then turn south onto the one-way road on the west side of 15th Ave NW, which could potentially be converted to trail only use (no vehicles). The trail would cross to the south side of NW 46th St at a newly signalized intersection and proceed east across 11th Ave NW. It would then turn south along the east side of 11th Ave NW to the eastern trail end at NW 45th St.

There would be changes to parking and vehicle travel lane configurations on all streets traversed by this alternative (Figure 1-5). The typical right-of-way on Ballard Avenue would include pedestrian sidewalks on both sides of the street, buffer zone, two vehicle travel lanes, and parallel parking area on the north side of the street. These elements would vary along the trail due to the existing road configurations and structures. See Chapter 7, Transportation, for additional detail on this and for all other Build Alternatives.

1.6.4 Leary Alternative

Under the Leary Alternative, the multi-use trail would be primarily routed along the south side of Leary Ave NW (Figure 1-6). Beginning at the existing western trail end at the Ballard Locks, the trail would continue east along the south side of NW 54th St until it turns into NW Market St. The trail would continue east along the south side of NW Market St, crossing 22nd Ave NW. At 22nd Ave NW, the trail would turn southeast on the south side of Leary Ave NW. The trail would continue east along the south side of Leary Ave NW, which becomes NW Leary Way, to 11th Ave NW. At this point, the trail would turn south along the east side of 11th Ave NW to the current trail end at NW 45th St.

There would be changes to parking, vehicle travel lanes, and intersection configurations on both sides of the street along this alternative. The typical right-of-way on Leary Ave NW would include buffer zones on both sides of the street, a multi-use trail, parking areas on both sides of the street, sidewalks on both sides of the street, two vehicle travel lanes, and one two-way center left turn lane (Figure 1-6). The typical right-of-way on NW Market St would include a sidewalk, the multi-use trail, a buffer zone, two vehicle travel lanes, center turn lane, and parking areas on both sides of the street (Figure 1-6). These elements would vary along the trail length due to the existing road configuration and structures. See Chapter 7, Transportation, for additional detail on this and for all other Build Alternatives.

1.6.5 Connector Segments

The alternatives above are conceptual routes designed to provide distinct alternatives for the DEIS. The route that is selected as the preferred alternative could be any one of these or a combination of portions of any of them, using connector streets to provide one continuous trail. There are a number of possibilities to connect segments of the routes, and six segments have been identified as the most likely connectors (Figure 1-2). These segments may be used as connections between portions of the previously identified alternative routes and could be on either side of the road.

- Ballard Avenue NW;
- NW Vernon Place;
- 20th Avenue NW;

- 17th Avenue NW;
- 15th Avenue NW; and
- 14th Avenue NW.

If NW Vernon Pl is used as a connector segment, then a signal at NW Vernon Pl and Shilshole Ave NW may also be warranted, depending on whether the trail would continue on the north or south side of Shilshole Ave NW.

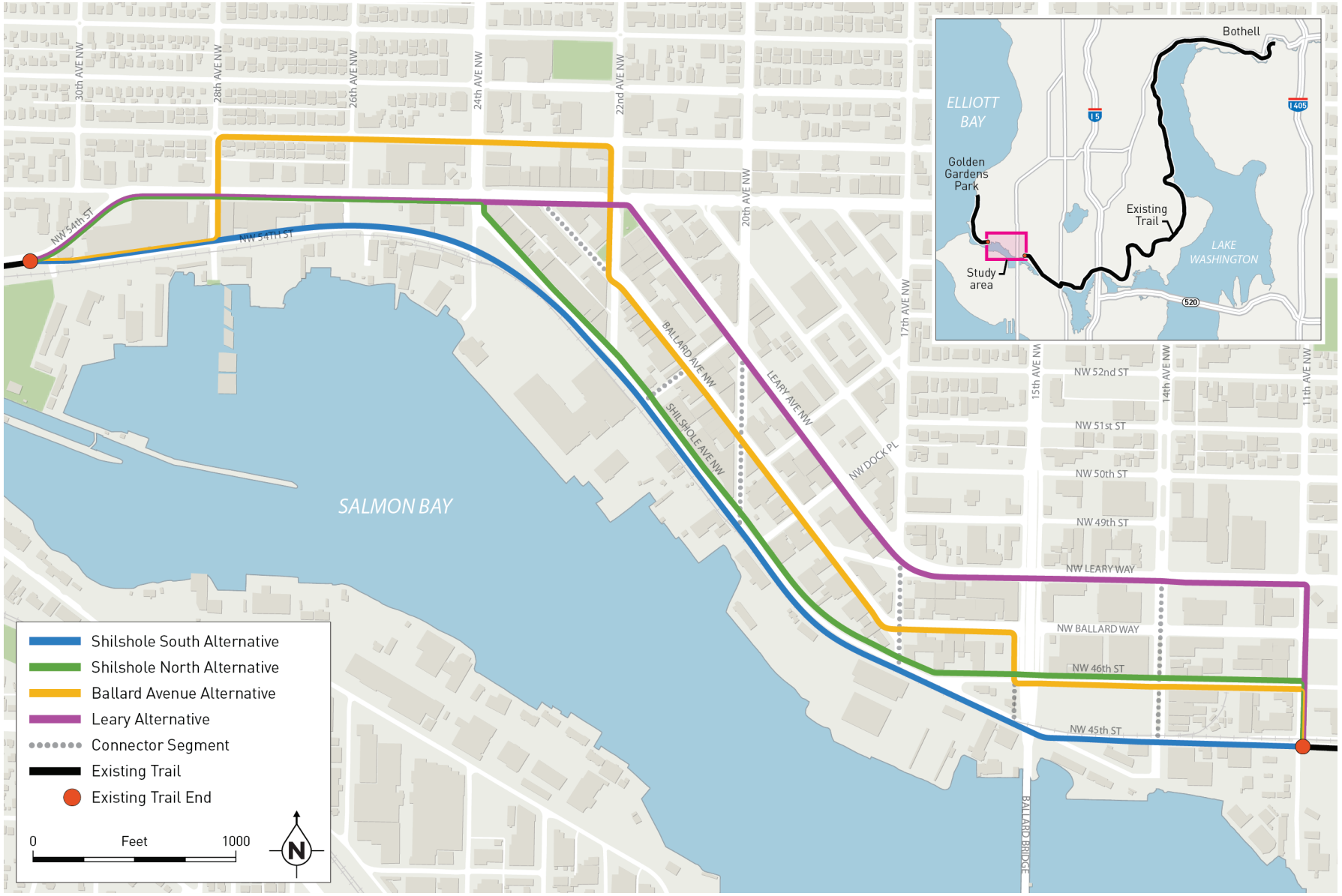

Figure 1-2. Proposed Alternatives

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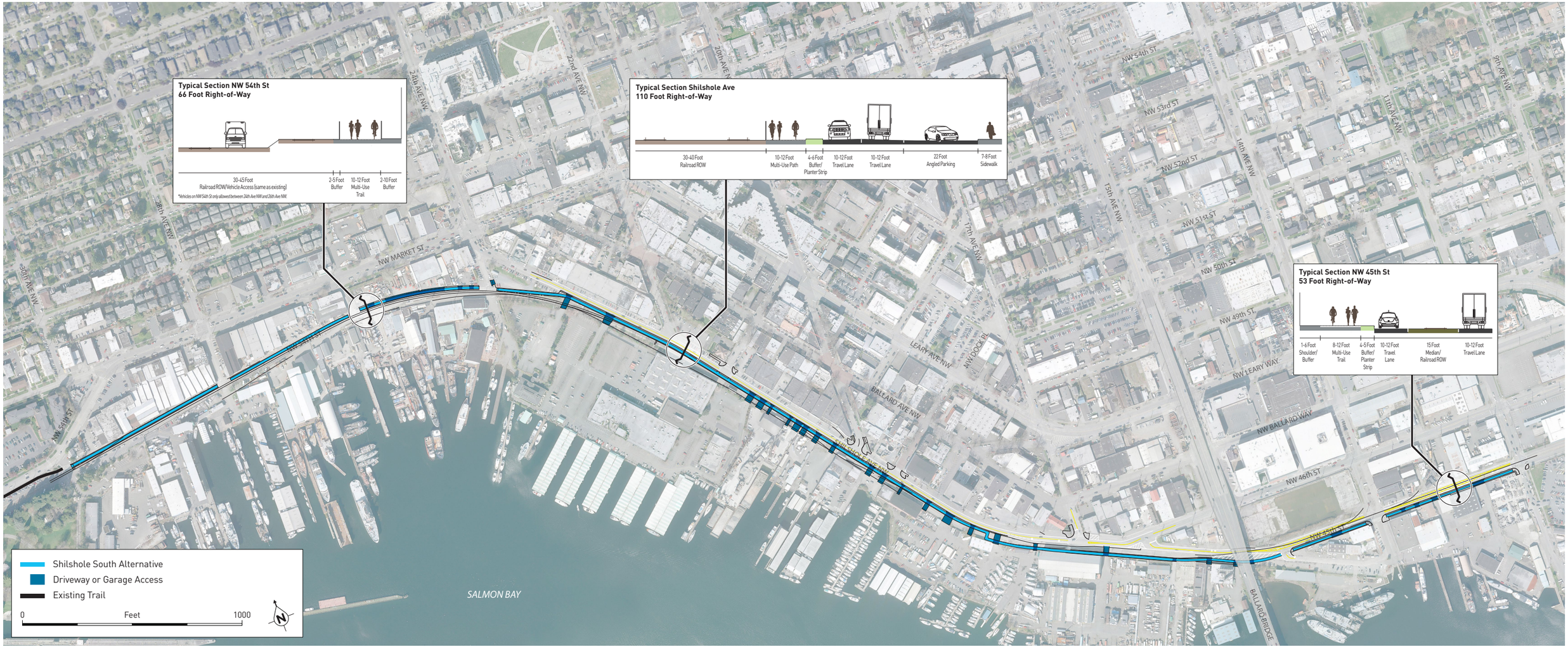

Figure 1-3. Shilshole South Alternative

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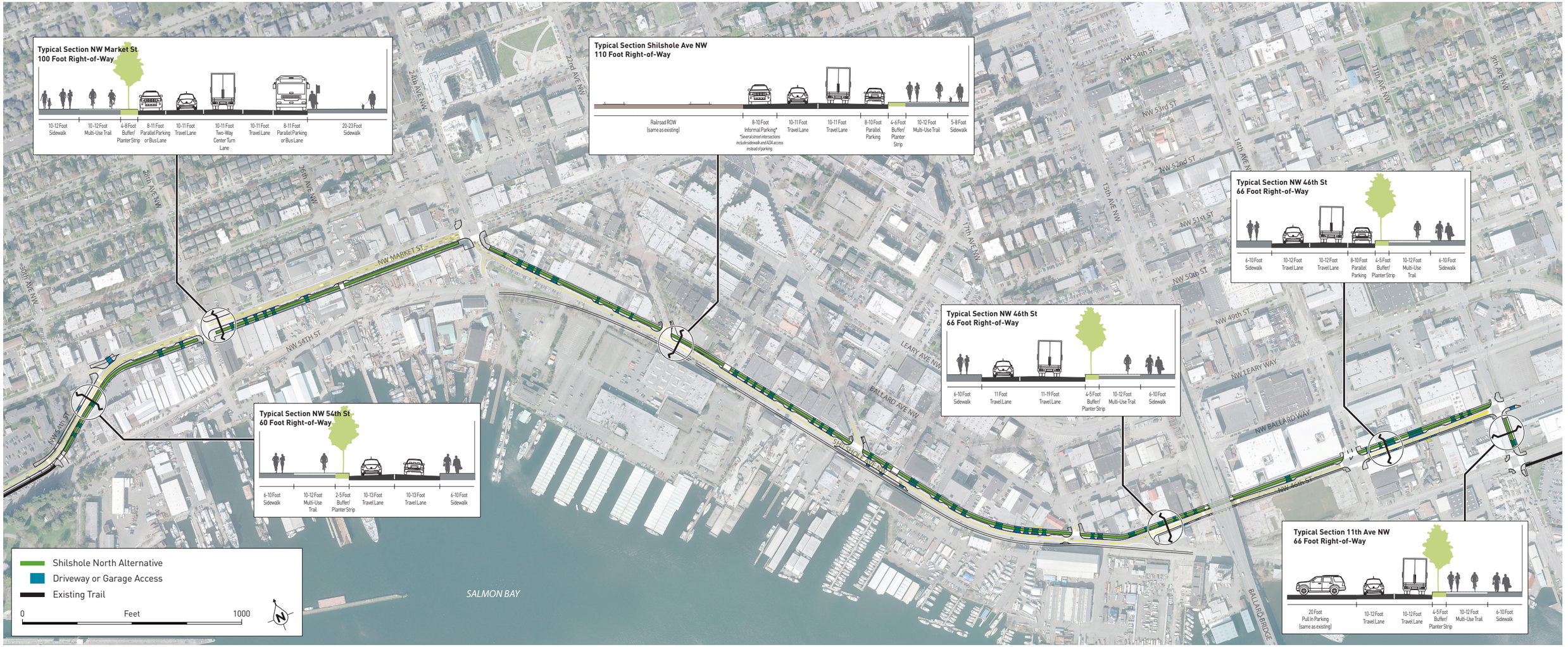

Figure 1-4. Shilshole North Alternative

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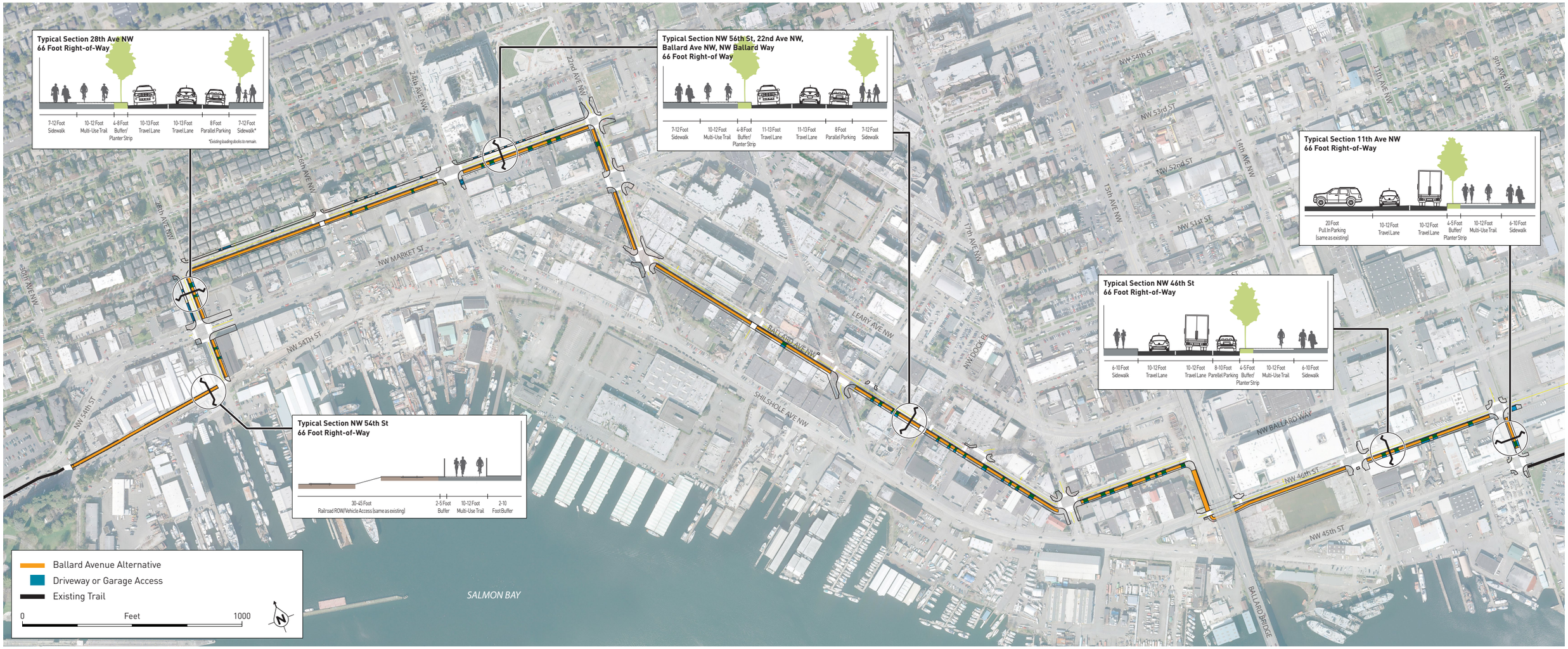

Figure 1-5. Ballard Avenue Alternative

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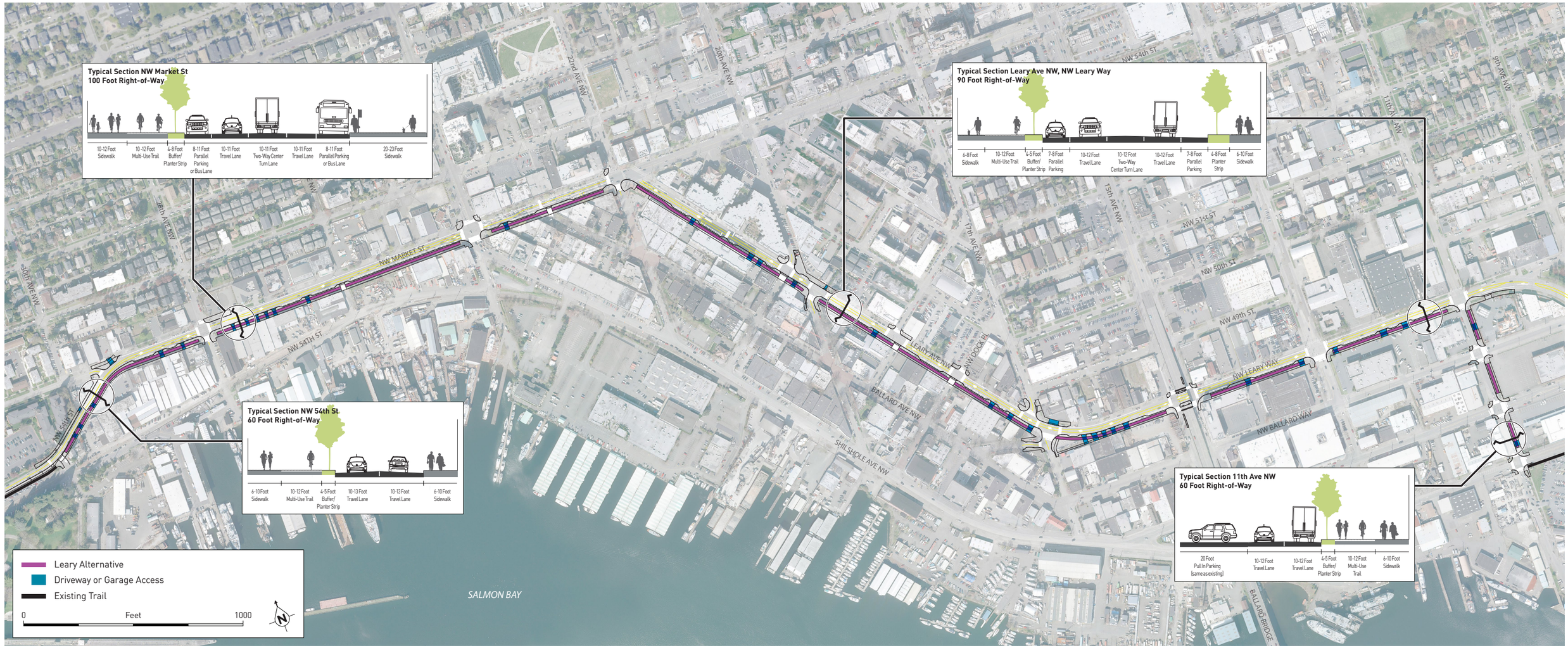

Figure 1-6. Leary Alternative

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1.7 Features Common to All Build Alternatives

1.7.1 Roadway Design Considerations

Roadway designs would vary for each alternative based on factors such as intersection geometry, vehicle volumes, nonmotorized users, and types of vehicles. This section describes roadway modifications, intersection treatments, driveway design, and parking lot changes that could be incorporated during the final design phase of the project to address safety, access, nonmotorized users, and vehicle types. Similar concepts can be found throughout the city and in design documents such as the Urban Bikeway Design Guide (National Association of City Transportation Officials [NACTO], 2015) and Guide for Development of Bicycle Facilities (American Association of State Highway and Transportation Officials [AASHTO], 2012). These features are common to all Build Alternatives, but the location and other specifics would vary by alternative. Chapter 7, Transportation, provides additional detail related to these design considerations.

Roadway Design

Adding a trail to the street system would require roadway modifications for vehicles to co-exist with nonmotorized users. These changes could include geometric changes to create perpendicular intersections, changes to roadway lane configurations, alterations of curb radii, and design details that provide sight lines between vehicles and nonmotorized users:

- Perpendicular Intersections–Modification of diagonal streets to create perpendicular intersections may be included in the designs. Several streets along the alternative alignments intersect at diagonals rather than at a preferred perpendicular angle. Adjusting the geometry of the intersections would allow crosswalks to be shorter and provide more consistent sight distance for all users. Figure 1-7 depicts a perpendicular intersection configuration.
- Lane Configurations–Lane configurations could be modified to create additional space within the roadway for the multi-use trail. These changes could include the removal of parking or vehicle lanes as well as the removal or addition of intersection or center turn lanes.
- Curb Radii–Curb radii may be modified to accommodate the turning requirements for different vehicles. Different intersections may have different types of vehicles that typically use the street, including passenger vehicles, single unit trucks (delivery-style trucks), buses, emergency vehicles, or semi-trucks. Appropriate curb radii would be chosen to accommodate the differing vehicles and roadway geometry at each location. Figure 1-8 illustrates a modification of curb radii.
- Sight Lines–Sight lines are important for safety and would be considered throughout the corridor. Trees, vegetation, and other obstructions would be cleared from intersections and from the back of sidewalks to avoid obstructing sight lines. Parking would also be restricted near driveways and intersections to preserve sight lines. Because of the developed nature of the project area, sight lines may not meet industry standards in all locations.

Intersection Design

Intersections would be designed to more clearly identify crossings of the multi-use trail. These improvements could include the following:

- Curb Extensions or Curb Bulbs–Curb extensions or curb bulbs may be used at intersections where parallel parking and bus stops are located along the street. In these cases, the sidewalk is extended into the parking lane such that the curb is adjacent to the lane of travel. This design

shortens the crossing length for pedestrians and provides additional space for curb ramps. Figure 1-9 provides an example of curb extensions.

- Pavement Markings–Pavement markings distinguish space for nonmotorized users. Pavement markings could include colored pavement such as white markings for crosswalks and bike symbols or green for bicycle lanes, similar to other locations in Seattle. These treatments could be used to demark where the BGT crosses streets or driveways, for "bike boxes" at intersections to provide safe zones for bicycles crossing paths with turning vehicles, and for other signed bicycle routes or greenways as they intersect the BGT. Figures 1-7 and 1-8 illustrate varied pavement markings.
- Raised Crosswalks–Raised crosswalks could be used as a traffic calming measure to slow vehicles down in the vicinity of the crossing. The roadway pavement is raised 3 to 6 inches within the crosswalk and would be coupled with a stop sign or signal-controlled intersection. The roadway is typically enhanced with additional markings and signage for the raised crosswalk and could include alternative pavement treatments for the crossing. Figure 1-10 illustrates a raised crosswalk.
- Driveway-Style Entrances–Intersections could be converted to driveway-style entrances. This design concept was recently completed on Bell St in downtown Seattle. This design feature would make the trail continuous across an intersection. Curbs and gutters would also be modified to be continuous across the intersection, with the curb lowered to create a driveway-style approach to enter the street. Figure 1-11 illustrates a driveway-style intersection.
- Signalized Intersections–Signalized intersections may be used to clearly direct both nonmotorized trail users and vehicles. Existing signalized intersections in the corridor would be maintained but improved to meet current design guidelines. Furthermore, additional signals could be added to congested intersections to address safety concerns and improve traffic flow. All signalized intersections would include pedestrian-activated signals. These signals could include leading-pedestrian walk or all-way walk phases where pedestrians could cross diagonally through intersections. They could also include bicycle signals that would allow bicycle movement through an intersection separate from motor vehicle travel. Signalized intersections in the corridor may include No-Right-On-Red restrictions to eliminate right turn conflicts with nonmotorized users.
- Rapid Flashing Beacons–Road crossings of the trail could include rapid flashing beacons or flashing amber lights at mid-block trail crossings.
- Medians–Medians could be used either to improve the street crossing for pedestrians or to restrict left turns across the trail.
- Barriers, Fences, and Buffers–In some locations, barriers, fences, or buffers could be used to separate nonmotorized trail users from moving vehicular traffic or the railroad. Figures 1-7 through 1-11 illustrate various buffer possibilities, such as vegetation buffers.
- Alternative Pavement–Alternative pavement types could be used to warn pedestrians and bicyclists of upcoming driveways and intersections. An example of alternative pavement treatments is inserting concrete strips within the asphalt trail. The strips could be colored concrete or could have texture added to increase awareness. It could also include using concrete for crosswalks in addition to pavement striping.

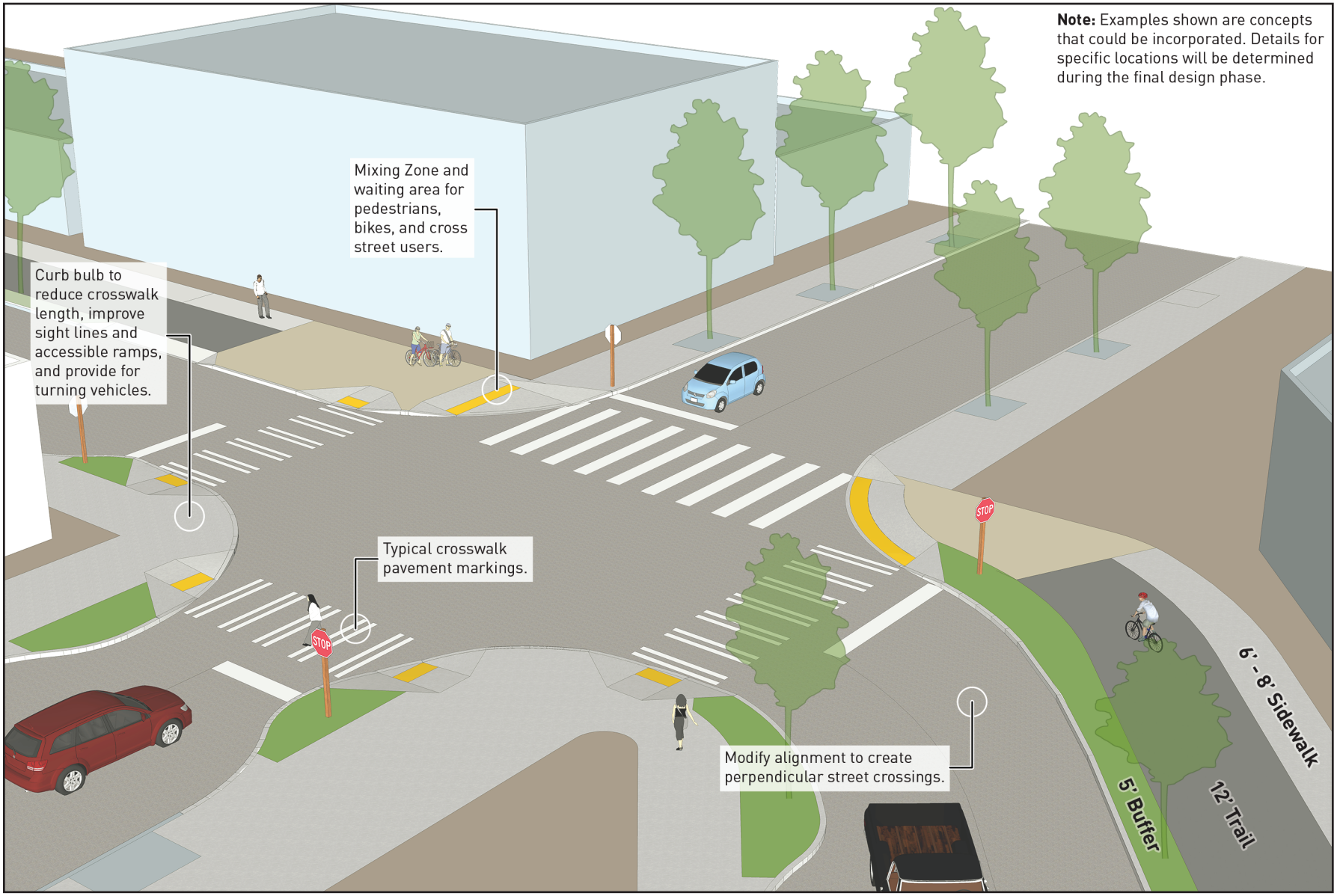

Figure 1-7. Intersection Design Options: Perpendicular Intersection

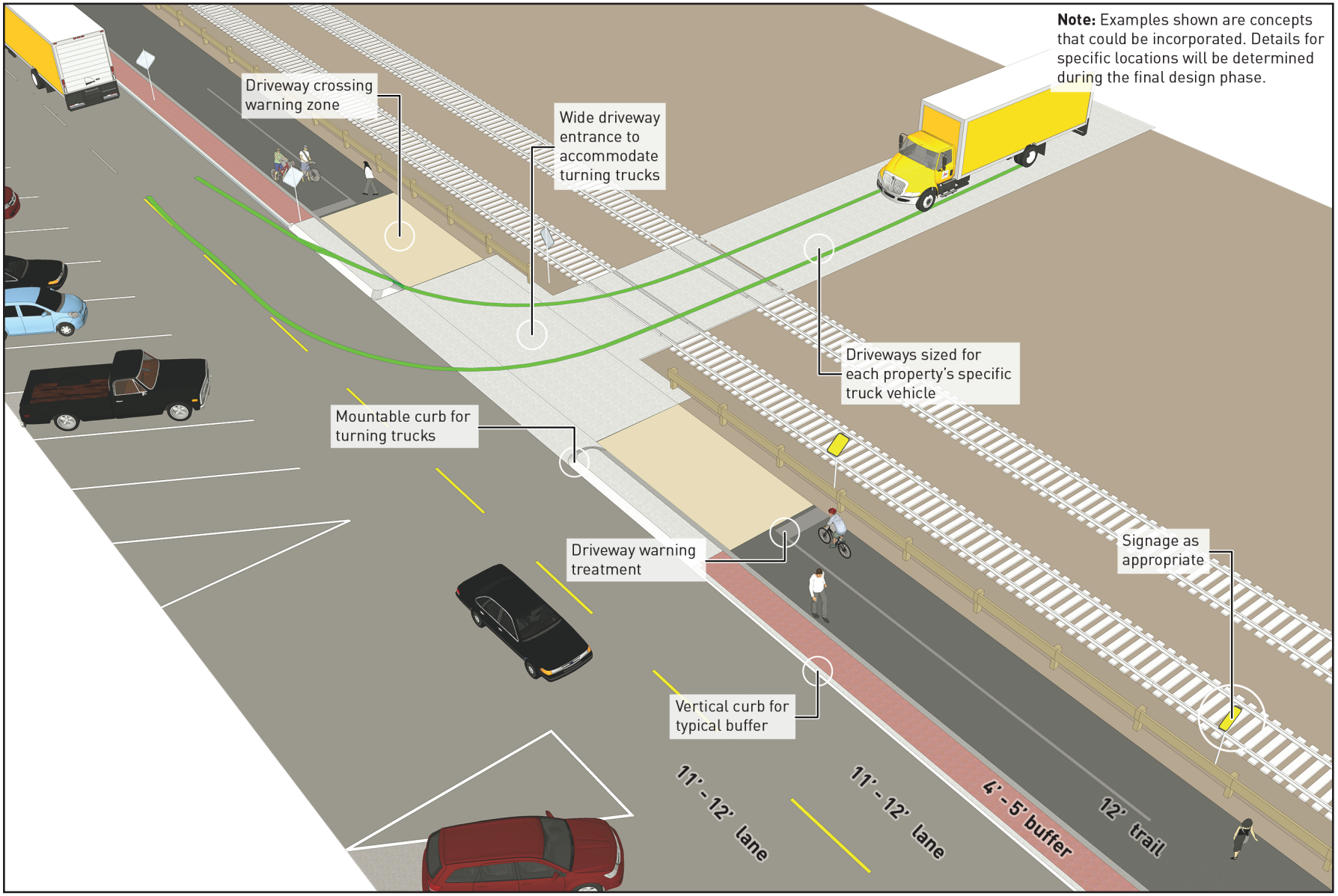

Figure 1-8. Intersection Design Options: Curb Radii Modification

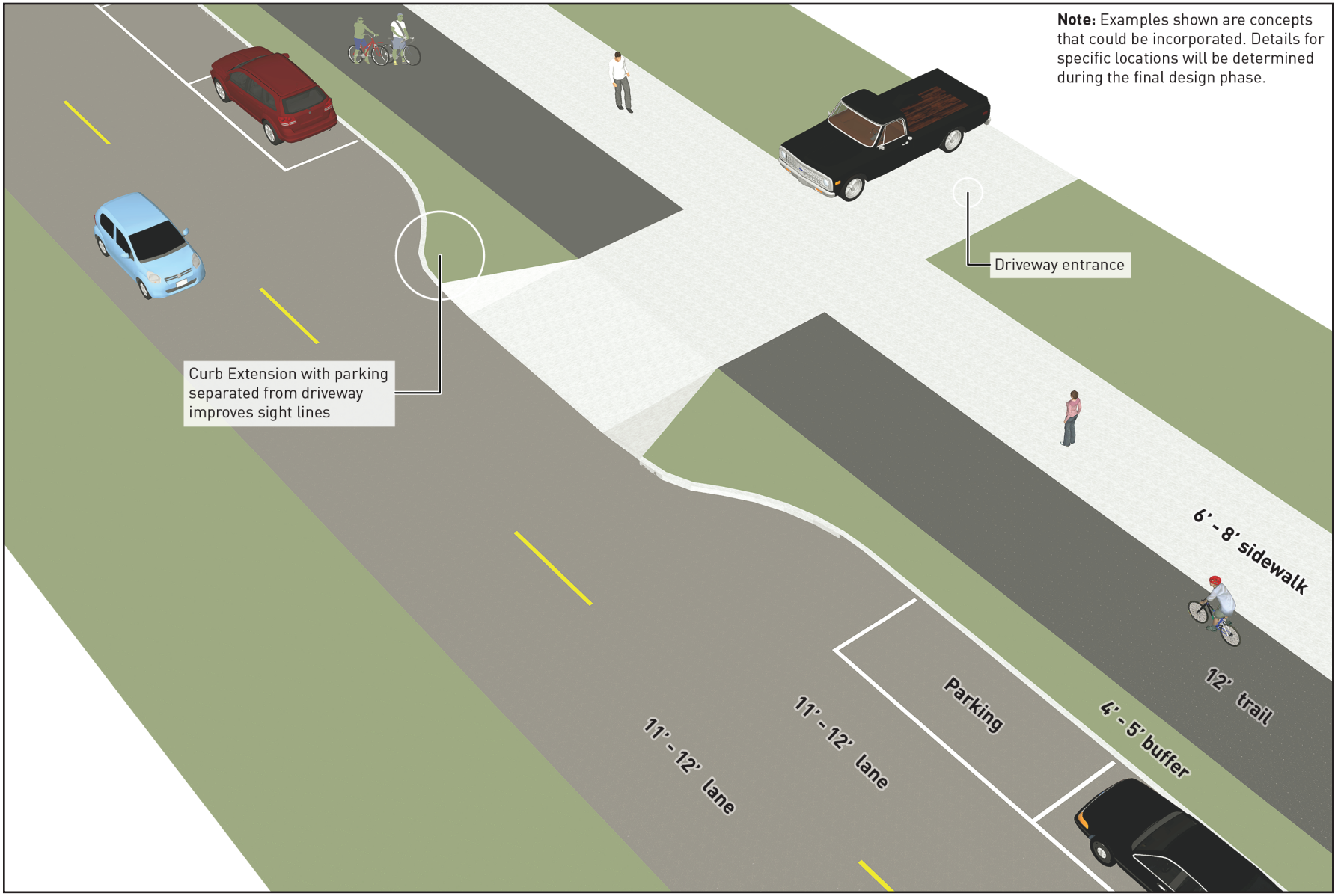

Figure 1-9. Intersection Design Options: Curb Extension

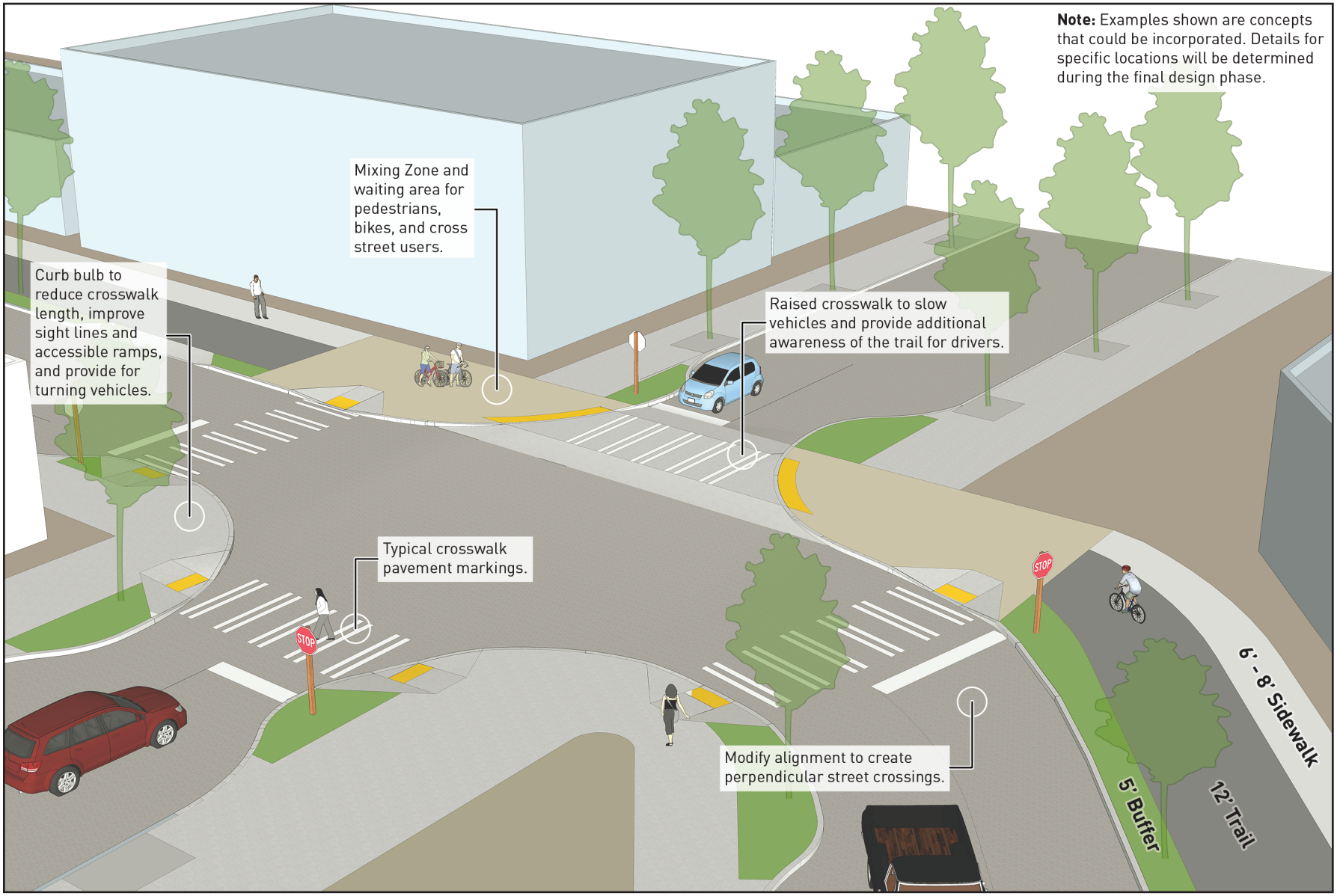

Figure 1-10. Intersection Design Options: Raised Crosswalk

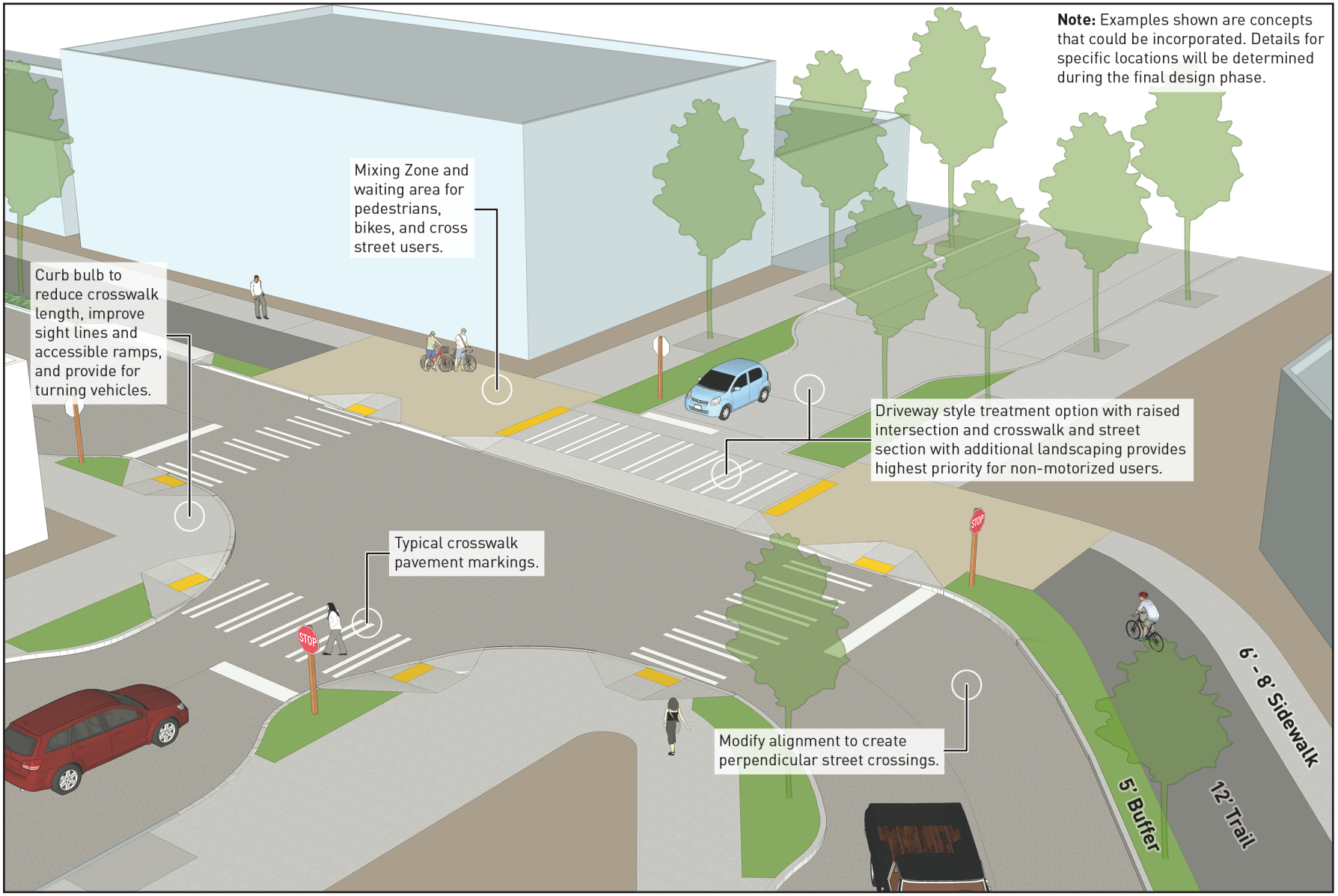

Figure 1-11. Intersection Design Options: Driveway Style Intersection

Driveway Design

Driveways that cross or intersect with the multi-use trail would also be evaluated for possible design changes following selection of a preferred alternative. Design changes could include many of the intersection elements described above, including curb bulbs, pavement markings, and restricted parking. Driveways and loading docks could be reconfigured so that parked vehicles would not block the trail. Some driveways may be eliminated, relocated, or consolidated in the case of multiple driveways at a single property. Additional detail is provided in Chapter 7, Transportation, by Build Alternative related to possible driveway design changes.

Access Modifications

Parking in some private lots may be affected due to changes to property access from the multi-use trail. For example, striping in parking lots may need to be modified to prevent vehicles from blocking the trail when parked, which may reduce the number of parking spaces in some lots.

1.7.2 Stormwater Management

Stormwater management would conform with the City of Seattle Stormwater Manual (City of Seattle, 2016) and Seattle Municipal Code (SMC 22.800). Stormwater management varies widely by alternative alignment and would be designed after the preferred alternative is chosen. Additional description is provided in Chapter 6, Utilities.

1.7.3 Construction Methods

This section describes the construction methods that the City currently anticipates using for the Build Alternatives. Because of the dynamic nature of construction, the sequencing, extent, and timing of construction activities would vary to some degree from what are described here. However, this description represents a reasonable scenario that allows an understanding of the range of potential methods that could be used as the project is built.

Overall construction of any of the Build Alternatives would last 12 to 18 months. The duration would vary depending on the extent of utility relocations, storm drainage improvements, and existing roadway reconfigurations including bus stop relocations. Construction would likely occur in segments, and one segment would be completed before moving on to the next segment to minimize the construction duration at any given location.

Construction Activities and Durations

Construction of any of the Build Alternatives would consist of the following general activities:

- Demolition, including removal of pavement, curbs, sidewalks, driveways, trees, signs, bus shelters, fencing, or other features located in the new trail area.
- Construction of new roadway elements including pavement, curbs and gutters, sidewalks, driveways, trees, bus shelters, fencing, signs, and buffer elements. Buffer elements include such things as paving, landscaping, barriers, fencing, and signage.
- Utility relocations, ranging from moving fire hydrants, stormwater catch basins, and overhead utility and power poles to the installation of new drainage facilities.

Construction Staging

Construction staging and scheduling are typically determined by the contractor; however, the City would specify some restrictions that the contractor must adhere to. Demolition would likely be limited to a certain length of the trail; as such, the contractor would not be allowed to demolish the work space along the entire length of the trail. Rather, the project would be constructed in multiple smaller segments.

The project would generally use areas within or near the project footprint for construction staging and storing materials and equipment, including vacant lots, parking lots, and unused rights-of-way. Temporary construction offices (such as trailers) could also use these areas. Alternatively, construction offices may be located in a rented office space. All staging areas would be restored to their pre-construction condition or better.

Construction Timing and Road Closures

As noted above, depending on the alternative and specific design features selected, construction would likely occur over a 12- to 18-month duration. Construction work would primarily occur during typical daylight weekday work hours. However, night and/or weekend work could be scheduled for construction at high-volume intersections and driveways and would comply with all applicable permit conditions for work during non-weekday timeframes.

Throughout construction, the City would maintain access to private property to the maximum extent feasible, and would notify property owners in advance of activities that might temporarily limit access. If properties have multiple access points, one driveway could be closed while the other remains open. Pedestrian access would also be maintained, such that commercial businesses remain open and residential and industrial properties are accessible. Temporary pedestrian access would be Americans with Disabilities Act (ADA) compliant. Options include temporary asphalt paths, steel plates, fabricated timber walkway with handrails, or a cordoned section of the roadway. Specific methods would be determined by the contractor, subject to review and approval by SDOT.

Construction activities could result in the temporary removal of on-street parking and restrictions in travel lanes, such as full lane closures or flagger-controlled travel through the construction zone. Clearly signed detour routes would be provided around construction areas.

Construction Sequencing

The sequence of construction activities is typically determined by the contractor in consultation with, and concurrence from, the City.

Worker Access and Parking

The contractor would establish a job site office, which could be located in existing office space within the project vicinity or elsewhere along the preferred alternative route in a trailer. While a limited number of construction workers would park at the job site, other construction workers may be required to park away from the construction site to preserve parking for local businesses and customers to the greatest extent feasible.

Construction Traffic and Haul Routes

Construction would generate traffic to transport materials and equipment to the work site and to remove demolition debris and excess soil. The contractor would require access to the site for heavy vehicles (such as dump trucks and concrete trucks), light vehicles (such as pickup trucks), and heavy equipment (such as excavators and compactors). Construction materials would be transported by truck. The contractor would determine the best construction methods as permitted by the City and in conformance with the project

construction plans and specifications. The exact number of truck trips per day during construction cannot yet be determined because project design is not complete. However, preliminary estimates indicate that the highest number would be approximately 20 round-trip truck trips per work day during a paving operation, spread uniformly throughout the day. City streets that could be used as haul routes include Shilshole Ave NW, NW 46th St, NW Leary Way/Leary Ave NW, and 15th Ave NW.

1.8 Alternatives Considered but Not Included

1.8.1 Facility Types

The project would create a safe, direct, and defined multi-use trail for persons of all abilities, and improve predictability for both motorized and nonmotorized users along the project alignment. A number of different facility types were initially considered by SDOT, but were removed from further consideration because they did not fully meet the project objective. The facility types described below would not maintain the same look and feel as the remainder of the BGT, nor would they provide an adequate level of comfort for users of varying abilities and activities. The facilities considered, along with the reasons for no further consideration, are described below. These alternatives did not meet the project objective of a multi-use trail through the project area.

Protected Bicycle Lanes

A protected bicycle lane may have different forms, but they are designed exclusively to keep bicycles separated from motor vehicle travel lanes, parking lanes, and sidewalks. A protected bicycle lane does not provide safe accommodations for pedestrians or other nonmotorized users.

Elevated Trail

During public scoping, it was suggested that the trail be elevated such that vehicles can pass underneath, thereby reducing any potential conflict with industrial uses and truck traffic (particularly along Shilshole Ave NW). This alternative was eliminated from further consideration as there is insufficient space to construct a facility that would meet fire code and ADA requirements due to existing development. Furthermore, the cost estimate to construct an elevated structure of sufficient length to avoid potential conflicts along Shilshole Ave NW or other segments would be 400 to 500% higher than an at-grade structure. Additionally the ramps (at a 5% maximum grade) needed to access an elevated trail would be a minimum of 75 feet long and would require additional right-of-way, greatly reducing the advantages of elevating the trail in proportion to making it accessible to users.

Sharrow

Shared lane markings or “sharrows” guide bicyclists to the safest place on the street to ride and help motorists expect to see and share the lane with bicyclists. Sharrows do not fulfill the objective of the project to develop a multi-use trail for persons of all abilities. Similar to protected bicycle lanes, it meets the needs of some people bicycling, but does not provide safe accommodations for people walking or jogging, or people not comfortable riding in streets, unprotected from adjacent motor vehicle traffic.

Woonerf

A woonerf is a street where pedestrians and bicyclists have priority over motorists. Originally a Dutch concept, woonerfs are gaining popularity in the United States. Traffic volumes and speeds are low, approximately 5 mph, a minimal amount of public right–of–way is dedicated to vehicles, and curbs may

be eliminated. Traffic volumes and speeds within the project area are too high for this type of facility to be appropriate within the Missing Link corridor.

1.9 Next Steps

Following issuance of the DEIS, there will be a 45-day comment period when comments on the document can be submitted to SDOT.

1.9.1 Comments

Comments will be accepted via email at: BGT_MissingLink_Info@seattle.gov

Written comments can be mailed to:

Scott Kubly, Director
Seattle Department of Transportation
c/o Mark Mazzola, Environmental Manager
P.O. Box 34996
Seattle, WA, 98124-4996

Public Meetings

In addition, two public meetings will be held to provide a project status update presentation and to collect oral comments. The meetings will be held at the Leif Erikson Hall, located at 2245 NW 57th Street in Ballard. A court reporter will be available to collect oral testimony on the DEIS.

Meeting 1: Thursday July 14, 2016

6:00 PM to 9:00 PM

Meeting 2: Saturday July 16, 2016

10:00 AM to 1:00 PM

At the conclusion of the DEIS comment period, SDOT will review and respond to all oral and written comments received on the DEIS. The Final EIS (FEIS) will be prepared that responds to all comments, as well as identifies a preferred alternative. It is anticipated that the FEIS will be published in early 2017. Following publication of the FEIS, SDOT will make a final decision regarding the alternative to be constructed, mitigation measures to be incorporated into the project, and identify funding sources.

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CHAPTER 2: GEOLOGY, SOILS, AND HAZARDOUS MATERIALS

2.1 Introduction

In this section, the regional and local geologic setting is described for the study area, including an overview of the geologic hazards that could be encountered. In addition, environmental databases were reviewed to evaluate the study area for sites that currently store hazardous materials or have had a documented release to the subsurface.

The following data sources were reviewed:

- Various past geotechnical investigations for multiple sites in the study area;
- King County Hazard Vulnerability Analysis (King County, 2009);
- Hazardous Materials Discipline Report for the study area (Environmental Data Resources [EDR], 2015); and
- Department of Planning and Development geographic information system (GIS) (City of Seattle, 2015).

2.2 Affected Environment

2.2.1 Regional Setting

The study area is located in the central portion of the Puget Sound basin. This is an elongated, north-south trending depression in western Washington, between the Olympic Mountain Range to the west and the Cascade Mountain Range to the east. The regional topography is characterized by a series of north-south trending ridges separated by deep troughs that are now Puget Sound, Elliott Bay, Lake Washington, and Lake Sammamish.

The regional topography was formed by the movement of glaciers over thousands of years. The glaciers were up to several thousand feet thick, and soils that were present beneath them are generally very hard and compacted as a result of the weight of the glaciers. More recently, erosional processes and landform changes resulting from human development have modified the regional topography. Geology in the region generally includes recent surficial soils over a thick sequence of glacially consolidated soils and then bedrock. Subsurface conditions may vary greatly and unpredictably over short distances due to changes in depositional history and urban development. Today, the topography of the region is characterized by rolling hills interrupted by troughs that were carved by the ice sheet and later occupied by large freshwater lakes and rivers (Liesch et al., 1963; Galster and Laprade, 1991; Troost and Stein, 1995; Yount et al., 1993).

2.2.2 Geology

The project is located along the north shore of Salmon Bay in a glacially exposed and eroded trough that is filled with glacial till, outwash, and lacustrine (lake) sediments. These glacial sediments were deposited directly by the glacial ice and by glacial meltwater and can be well over 1,000 feet thick in areas. As the

glaciers retreated, glacial meltwater accumulated in lowland troughs, forming large bodies of deep fresh water, such as the pre-historic Glacial Lake Russell and Glacial Lake Bretz. The study area was under water within these large glacial lakes while they existed.

Increased contribution of glacial meltwater into the oceans at the end of the Pleistocene caused sea level to rise around the world until the land rebounded from the weight of the glacial ice. As a result of rebound, relative sea level in the Puget Lowland dropped below the modern shoreline during the early Holocene, about 11,000 years ago, exposing the study area (Dragovich et al., 1994). During historical times, deposition of industrial fill was commonplace along the Salmon Bay shoreline in the 1890s. Canal spoils were later placed along the shoreline during construction of the Lake Washington Ship Canal (Ship Canal). As a result, the wetlands along the coast were filled and the Salmon Bay shoreline was extended south of its original position.

Numerous previous geotechnical investigations have occurred within the study area, and the logs of 38 borings from 25 previously completed geotechnical investigations were reviewed to identify the underlying materials.[1] The boreholes from these investigations show that there is between 1 and approximately 17 feet of mixed clayey, gravelly, silty, sandy fill immediately beneath the study area. The fill is reportedly thickest along the Shilshole North and Shilshole South Alternatives within the area of the historical shoreline. Table 2-1 details the thickness of the fill along each alternative at various cross-streets.

Table 2-1. Estimated Fill Thickness in Feet from East to West Along Each Alternative Corridor

	Alternative		
	Shilshole South and Shilshole North	*Ballard Avenue*	*Leary*
11th Avenue NW	8.5	9	12
14th Avenue NW	15	7.5	9.5
15th Avenue NW	17	6	5
17th Avenue NW	15.5	6	3
20th Avenue NW	14.5	9.5	7
22nd Avenue NW	7	3.5	9.5
24th Avenue NW	7	1	7.5
26th Avenue NW	11	8	13
28th Avenue NW	10.5	10.5	8
30th Avenue NW	N/A	9.5	8.5

[1] Aspect Consulting, 2002; Associated Earth Sciences, Inc., 2000; Converse Consultants NW, 1994a, 1994b; Converse, Davis and Associates, Inc., 1975; Dames and Moore, 1968, 1971, 1980; Dodds GeoSciences, Inc., 2003; Fowler, 2000; Geotech Consultants, Inc., 1998, 2004; Huckabay, 1979; Mann, 1989; Metropolitan Engineers, 1968; Rice, 1989; Seattle Department of Engineering, 1995; Seattle Public Utilities Materials Laboratory, 1969, 1970, 1972, 2002; Shannon & Wilson, Inc., 1973, 1999; Terra Associates, Inc., 2003; Tobin, 1999.

According to the borelogs, the fill includes debris such as brick, metal, and wood. The findings of these geotechnical investigations suggest that two former dump sites existed in the area, one near 11th Ave NW and NW 46th St, and the other near 28th Ave NW and NW Market St.

The fill is reportedly underlain by silty and organic-rich Holocene-aged alluvium or weathered gravelly, silty, and sandy glacial till. Where present, the Holocene-aged sand, silt, and peat beds derived from intertidal deposition are found between an average of 9.5 and 14 feet below ground surface (fbs). Holocene-aged deposits were most commonly encountered at the east and west ends of the project. Pleistocene till deposits were logged below the fill and Holocene-aged sand, silt, and peat beds across the study area.

2.2.3 Geologic Hazards

A consideration for the construction and operation of the alternatives would be the potential to encounter geologic hazards, erosion, seismicity, and settlement due to soft or unstable soils.

Erosion Hazards

Erosion hazards occur where soils may experience severe to very severe erosion from construction activities, or through changes in surficial conditions that expose soils to new erosive forces. Erosive forces can come from precipitation, changes in drainage patterns, removal of vegetation, wind, or wave action. Certain types of soil, such as silts, are generally more prone to erosion hazards.

Seismic Hazards

The Puget Sound basin is located within a seismically active area dominated by the Cascadia subduction zone, which forms the boundary between two tectonic plates: the North American plate and the Juan de Fuca plate. The project vicinity has been subject to earthquakes in the historic past and will undoubtedly undergo shaking again in the future.

Earthquakes in the Puget Sound region result from one of three sources:

- The Cascadia subduction zone off the coast of Washington,
- The deep intraslab subduction zone located approximately 20 to 40 miles below the Puget Sound area, or
- Shallow crustal faults.

The closest active crustal source is the Seattle Fault Zone, which runs roughly east-west approximately 6 miles south of the study area. A fault is considered active when it has shown evidence of displacement within the last 11,000 years. An earthquake on the Seattle Fault poses the greatest risk to the Seattle urban region (City of Seattle, 2015).

Deep quakes are the most common large earthquakes that have occurred in the Puget Sound region. Quakes larger than magnitude 6.0 occurred in 1909, 1939, 1946, 1949, 1965, and 2001 (City of Seattle, 2015). However, shallow quakes are the type expected on the Seattle Fault Zone, which can create more damage than deep quakes because of the proximity to the epicenter. However, damage from earthquakes depends on many factors including distance to epicenter, soil and bedrock properties, and duration of shaking.

Seismic hazards include the primary effects of earthquakes, such as ground displacement from fault rupture and ground shaking, as well as secondary effects including liquefaction, settlement, tsunamis, and seiche waves.

Earthquake-Induced Ground Rupture/ Ground Shaking. Earthquake-induced ground rupture is defined as the physical displacement of surface deposits in response to an earthquake's seismic waves. The magnitude, sense, and nature of fault rupture can vary for different faults or even along different strands of the same fault. Strong ground shaking from a major earthquake can produce a range of intensities experienced at any one location. Ground shaking may affect areas hundreds of miles distant from the earthquake's epicenter. The ground shaking can result in slope failure, settlement, soil liquefaction, tsunamis, or seiches, all of which pose a risk to the public.

Liquefaction. Liquefaction is of particular concern because it has often been the cause of damage to structures during past earthquakes. Liquefaction occurs where soil consistency is primarily loose and granular and located below the water table. Saturated loose soils within 50 feet of the ground surface are at most risk of liquefaction. The consequences of liquefaction include loss in the strength and settlement of the soil. The loss of strength can result in lateral spreading, bearing failures, or flotation of buried vaults and pipes.

Tsunamis/Seiche Waves. Tsunamis or seiches are possible secondary effects from seismic events. Tsunamis, often incorrectly described as tidal waves, are sea waves usually caused by displacement of the ocean floor. Typically generated by seismic or volcanic activity or by underwater landslides, a tsunami consists of a series of high-energy waves that radiate outward like pond ripples from the area in which the generating event occurred. For the Puget Sound region, either a large subduction zone quake off the coast or along the Seattle Fault could produce a tsunami. However, while a tsunami generated by a distant or Cascadia subduction earthquake could result in much damage to the coast, the impact in King County would not be as great. In the case of a subduction zone quake, a tsunami would travel from the coast through the Strait of Juan de Fuca into Puget Sound, and then south to Seattle. As a result, primary concerns lie with a tsunami or seiche generated by a land movement originating on the Seattle Fault (King County, 2009).

Seiche waves consist of a series of standing waves of an enclosed body or partially enclosed body of water caused by earthquake shaking, similar to what could be described as sloshing action. Seiche waves can affect harbors, bays, lakes, rivers, and canals. Both Puget Sound and Lake Washington could experience a seiche, as they did in 1891, 1949, and 1964. The "sloshing" effect of a seiche could damage facilities close to the water.

Other Hazards

Soft soil conditions can also be a form of geologic hazard, causing subsidence or settlement over the short or long term. Soft soils have low strengths and are compressible. Without appropriate design consideration, soft soils can lead to embankment failures during construction or long-term settlement after construction if left unaddressed. The presence of soft soils or soils that are not suitable to support new loadings (i.e., placement of fill or concrete) can only be determined on a site-specific basis through observation and laboratory testing of subsurface materials.

2.2.4 Hazardous Materials Sites

Each Build Alternative would include earthwork activities to relocate utilities, remove existing concrete and asphalt, construct railway crossings and stormwater drainage controls, and reconstruct driveways as well for the installation of other improvements. These include traffic controls, warning signs, and signals.

The study area has historically been used for industrial and commercial purposes since at least the late 1800s and is currently heavily developed for commercial, retail, and industrial use. Hazardous materials use is commonly associated with these types of land uses; with the long history, there is concern for past industrial and commercial land uses to have released hazardous materials and/or wastes to the subsurface.

A regulatory database review by EDR was conducted for the areas surrounding the entire study area. The EDR report was done in accordance with the U.S. Environmental Protection Agency's (EPA) Standards and Practices for All Appropriate Inquiries (40 Code of Federal Regulations [CFR] Part 312) and the American Society for Testing and Materials (ASTM) Standard Practice for Environmental Site Assessments (E 1527-13).

The databases reviewed and the number of sites within one-eighth mile of the study area included (see Appendix A for explanation of all databases reviewed):

- Federal National Priorities List (NPL) – 0;
- Federal CERCLIS list – 0;
- Federal CERCLIS NFRAP – 6;
- Federal RCRA CORRACTS Facilities List – 0;
- Federal RCRA non-CORRACTS TSD Facilities List – 0;
- Federal RCRA Generators List – 17;
- Federal Institutional Controls/Engineering Controls Registries – 0;
- Federal Emergency Response Notification System (ERNS) List – 238;
- State- and Tribal-Equivalent NPL – 7;
- State- and Tribal-Equivalent CERCLIS – 35;
- State and Tribal Landfill and/or Solid Waste Disposal Sites – 0;
- State and Tribal Leaking Storage Tank Lists – 11;
- State and Tribal Registered Storage Tank Lists – 40;
- State and Tribal Institutional Controls/Engineering Controls Registries – 5;
- State and Tribal Voluntary Cleanup Sites – 50;
- State and Tribal Brownfield Sites – 1;
- Local Brownfield Lists – 2;
- Local Lists of Landfill/Solid Waste Disposal Sites – 2;
- Local Lists of Hazardous Waste/Contaminated Sites – 209;
- Local Land Records – 0;
- Records of Emergency Release Reports – 95;
- Other Ascertainable Records – 297;
- EDR High Risk Historical Records (e.g., gas stations, dry cleaners) – 182;
- Exclusive Recovered Government Archives – 39.

The area searched varied for these databases and ranged from a quarter mile up to 1 mile in accordance with ASTM E 1527-13. A total of 1,747 sites were identified within the 1-mile search area with 1,235 located either along the different alternative alignments or within one-eighth mile of the study area. These databases include sites that have identified releases of hazardous materials into the environment and sites that have identified the use of hazardous materials and not necessarily any known releases (e.g., the RCRA small and large generators list, solid waste disposal sites, and identified underground storage tank sites). Sites with known releases can be in varying stages of investigation and cleanup, from attempting to determine the lateral and vertical extent of contamination up to nearing completion of remediation.

2.3 Potential Impacts

2.3.1 No Build Alternative

Construction

Under the No Build Alternative, there would be no new construction activities and therefore no disturbance of soils that could lead to erosion or loss of topsoil.

Operation

Any existing geotechnical hazards, such as ground shaking or settlement of soils, would remain for existing structures and improvements. Otherwise, there would be no new trail improvements and therefore no new risks associated with any hazards that may be present within the study area.

2.3.2 Shilshole South Alternative

Construction

Earthwork activities during construction could encounter contaminated soils from past land uses that released hazardous materials to the subsurface. As described in Section 2.2, Affected Environment, the study area contains a large number of sites (1,235 somewhat evenly spread throughout the study area and immediate vicinity) associated with current hazardous materials use and past release incidents. The release sites can range from relatively minor incidents with little to no threat to human health or the environment, or they can be more extensive affecting areas beyond site boundaries and require substantial remediation efforts to get conditions to acceptable levels. According to information obtained from the database search, many of the contaminated sites are associated with leaking underground storage tanks (former automobile service stations), dry cleaning operations, industrial manufacturing, and mechanical maintenance facilities (EDR, 2015). No federal NPL sites (also referred to as Superfund) were identified in the database search (EDR, 2015).

In general, releases affect areas localized to the source (e.g., the underground storage tank) and typically only affect soils within a limited area. Many times, these affected subsurface soil areas are found within a site boundary but can extend off site. Incidents that represent large releases or small releases that occur slowly over long periods of time, such as a leaking underground storage tank, can adversely affect underlying groundwater. Depending on site-specific conditions, releases of water soluble hazardous materials such as many solvents and gasoline, for example, can migrate considerable distances from the source. For many of the identified release sites within the study area, the releases have been adequately investigated and have received the appropriate remediation such that no further threat to human health or the environment exists. Other cases are in various stages of characterization to define the lateral and horizontal extent of contamination or are in the process of remediation activities.

Therefore, based on the high volume of identified sites within the study area as well as the history of commercial and industrial land uses, there is a relatively high probability of encountering legacy contaminants. If not managed appropriately, construction workers could be exposed to these contaminants in soil or groundwater through excavation or other ground-disturbing activities. However, with implementation of a Soil Management Plan, as included in the mitigation measures below, protocols would establish appropriate methods for the identification of suspect soils, handling requirements to limit exposure, as well as any follow-up that may be required to protect the workers or the public from any adverse effects.

Operation

Operational use of the trail would have minimal impacts to soil and geology in the study area. Once construction is complete, the potential for erosion or contact with legacy contaminants would be largely eliminated through the replacement of any excavation with compacted soils or engineered fill and covered by asphalt.

Seismic activity is likely to occur during the life of the proposed improvements and could be substantial, resulting in significant damage to the region. Seismic activity can cause primary hazards such as ground shaking or secondary effects including liquefaction. Liquefaction of soils during an earthquake could result in vertical and lateral displacements of paved areas and subsurface utilities, potentially resulting in substantial damage or injury. The liquefaction potential along the alignment for the Shilshole South Alternative would be confirmed during the design stage through the preliminary geotechnical investigation phase. Design of improvements and utilities to resist seismic forces and secondary effects such as liquefaction would be required. Liquefiable soils can be addressed through excavation and replacement with engineered fill, treatment of site soils, or use of flexible utility connections.

In general, proposed improvements would be relatively minor and not very susceptible to settlement or instability. Geotechnical investigations would identify underlying materials and their engineering properties. Soils unsuitable for use as structural fill, such as expansive soils or compressible soils, could require removal and off-site disposal. However, with implementation of geotechnical recommendations by a state-licensed geotechnical engineer, the engineering properties of the underlying soils would be identified and any hazards ameliorated such that subsurface soils are suitable for the overlying improvements enabling long term stability.

Prior to commencement of construction activities, the City would be required to retain a Washington-licensed geotechnical engineer to design the project facilities to withstand probable seismically induced ground shaking at each location as well as any other geotechnical hazards that may be present. All grading and construction would adhere to the specifications, procedures, and site conditions in the final design plans, which would comply with applicable seismic recommendations.

2.3.3 Shilshole North, Ballard Avenue, and Leary Alternatives

Construction

Potential impacts under these alternatives would be similar to those described above for the Shilshole South Alternative. While the Shilshole North, Ballard Avenue, and Leary Alternatives would disturb different locations than the Shilshole South Alternative, they would all still have a relatively high probability of encountering legacy contaminants. As described in Section 2.3.2 for the Shilshole South Alternative, the implementation of the mitigation measures below would reduce potential impacts to less than significant levels.

Operation

As described in Section 2.3.2 for the Shilshole South Alternative, all grading and construction would adhere to the specifications, procedures, and site conditions in the final design plans, which would comply with applicable seismic recommendations.

2.3.4 Connector Segments

Potential impacts for the connector segments would be similar to what is described in Section 2.3.2 for the Shilshole South Alternative. The connector segments would represent a reduced area of disturbance, and thus the erosion potential would be reduced as well as the likelihood of encountering legacy contaminants.

2.4 Avoidance, Minimization, and Mitigation Measures

2.4.1 Mitigation Common to All Alternatives

The following mitigation measures could be used to minimize impacts related to soils and hazardous materials:

- Use construction best management practices (BMPs) as detailed in a Storm Water Pollution Prevention Plan (SWPPP) to minimize the potential for erosion and could include the installation of silt fences, use of hay bales, or application of soil stabilization measures.
- Implement BMPs such as dedicated refueling areas, following manufacturer's specifications on hazardous materials storage and disposal, spill containment supplies, and spill response supplies to control accidental upset conditions.
- Prepare and implement a Soil Management Plan during all earthwork activities.
- Stop construction activities upon the discovery of potentially contaminated soils or groundwater (e.g., petroleum odor and/or discoloration) and notify the City Inspector.
- Isolate, cover, and sample any suspected or identified contaminated soils to determine appropriate disposal in accordance with SDOT requirements.
- If contamination is discovered, further sampling can determine the extent of contamination and further earthwork activities conducted in accordance with a site-specific health and safety plan.
- Remove any excavated contaminated soils and dispose of at a licensed facility in accordance with transportation laws and the requirements of the receiving facility.
- Prepare a design-level geotechnical report to provide design specifications.

2.4.2 Specific Mitigation

There would be no specific mitigation measures for geology, soils, and hazardous materials associated with the different alternatives.

CHAPTER 3: FISH, WILDLIFE, AND VEGETATION

3.1 Introduction

In this section, fish and wildlife and their habitat are described, along with an evaluation of street trees. The study area includes the area where project construction activities and operation (such as noise and light, permanent loss of habitat, or permanent disturbance) could potentially affect fish, wildlife, or their habitat. The study area is approximately 500 feet from the project footprint for terrestrial species and birds and includes the Ship Canal for fish (Figure 3-1). Street trees along the roads for each alternative are also described.

The following data sources have been reviewed:

- U.S. Fish and Wildlife Service (USFWS) Critical Habitat Mapper (USFWS, 2015);
- Washington Natural Heritage Program Database (Washington State Department of Natural Resources [WDNR], 2015);
- Priority Habitat and Species Database (Washington Department of Fish and Wildlife [WDFW], 2015a);
- Salmonscape (WDFW, 2015b);
- Washington State Species of Concern Lists (WDFW, 2015c); and
- Department of Planning and Development GIS (City of Seattle, 2015).

3.2 Affected Environment

3.2.1 Fish and Wildlife

The study area is highly urbanized and made up of residential, commercial, and industrial areas as well as the Ship Canal. Within the study area, small areas of upland vegetation provide habitat for urban-adapted wildlife such as crows, some songbirds, raccoons, and rodents. Bald eagle, waterfowl, seagulls, great blue heron, and aquatic birds (such as kingfisher) are also found along the Ship Canal. The Carl S. English, Jr. Botanical Garden, on the north side of the Ballard Locks, is the largest greenspace in the study area, with the largest concentration of urban-adapted wildlife in the study area.

Federally Threatened and Endangered Fish Species

The Endangered Species Act (ESA), administered by the National Marine Fisheries Service (NMFS) and the USFWS, aims to protect and recover imperiled species and the ecosystems on which they depend. The City of Seattle is not required to enter into consultation with these agencies as there is no federal nexus associated with the project at this time (no federal funds would be used, no federal permits or approvals are required, and the project does not occur on federal land). Nevertheless, the potential impacts of the project on ESA-listed species are considered.

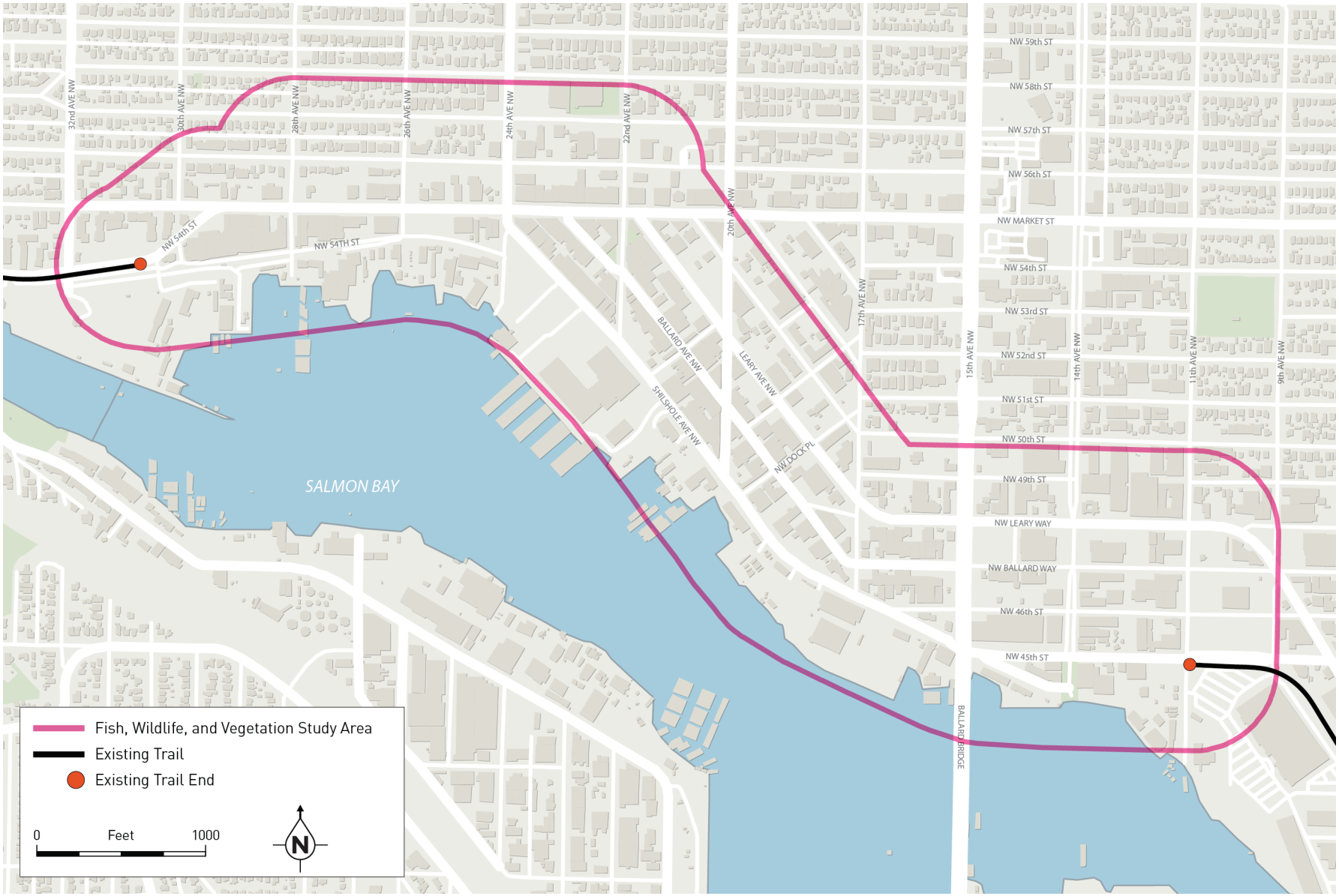

Figure 3-1. Fish, Wildlife, and Vegetation Study Area

Federally listed threatened and endangered species that potentially occur in the study area are listed in Table 3-1 (USFWS, 2015; WDFW, 2015c). No populations of threatened or endangered plant species are documented in the study area (WDNR, 2015).

Table 3-1. Federally Listed Species in the Study Area

Federally Listed Species	*Date Listed*	*Federal Status*[1]	*State Status*[1]	*Critical Habitat in Study Area*
Chinook salmon Puget Sound Evolutionarily Significant Unit (ESU)	1999	T	C	Yes
Steelhead Puget Sound Distinct Population Segment (DPS)	2007	T	none	No[2]
Bull trout Coastal-Puget Sound DPS	1999	T	C	Yes
Marbled murrelet	1992	T	T	No
Yellow-billed cuckoo	2014	T	C	No

[1] T = threatened; C = Candidate.
[2] Critical habitat is proposed for this species in the study area.
Source: USFWS, 2015; WDFW, 2015c.

Chinook, steelhead, and bull trout are listed as threatened and can be found in the Ship Canal. The Ship Canal is designated as critical habitat for Chinook salmon and contains freshwater primary constituent elements for Chinook salmon. A primary constituent element is a physical or biological feature essential to the conservation of a species upon which its designated or proposed critical habitat is based. The Ship Canal is also designated critical habitat for bull trout. There is currently no critical habitat designated for steelhead.

Water from the Cedar River, Sammamish River, and Lake Washington flow through Lake Union into Puget Sound via the Ship Canal, and thus it is the only route for migrating salmonids. The Ship Canal is an urbanized, busy corridor with high recreational and commercial boat traffic. Habitat and cover are limited in the Ship Canal as it is almost completely armored and includes many bulkheads, docks, and piers with little riparian or upland vegetation (Seattle Public Utilities [SPU] and U.S. Army Corps of Engineers [Corps], 2008).Water quality is generally good due to the volume of water flowing through the Ship Canal. In the summer, however, temperatures can be high and dissolved oxygen levels low; fecal coliform bacteria and contaminants can also be elevated (Washington State Department of Ecology [Ecology], 2015).

Adult salmonids tend to migrate quickly through the Ship Canal, with an average passage time of 1 to 4 days depending on species (SPU and Corps, 2008; NMFS, 2005). Chinook salmon smolts usually take 1 to 4 weeks to pass through the Ship Canal (SPU and Corps, 2008). Steelhead smolts move through the Ballard Locks in hours or days. Adult out-migrating salmon, in particular Chinook salmon, often hold just upstream from the locks in a cool water refuge near the saltwater drain before going through the locks (SPU and Corps, 2008).

Bull trout have been found in marine waters of Shilshole Bay and the Ballard Locks, just downstream from the study area, and have been observed infrequently in the study area. From late spring through early

fall, surface water temperatures in the Ship Canal are too warm for bull trout and probably limit their residence time (USFWS, 2004).

Federally Threatened and Endangered Wildlife

The marbled murrelet and the yellow-billed cuckoo are listed as threatened, but are unlikely to be found in the study area due to lack of suitable habitat. There is no critical habitat for either species in the study area.

Bald eagles are protected under the federal Bald and Golden Eagle Protection Act. There are no known bald eagle nests in the study area. However, bald eagles may be seen in the study area, in particular near the Ship Canal.

State Species of Concern

Washington State has regulations to protect species of concern (WAC 232-12-297). Other than the federally listed species described above, there are no state endangered, threatened, or sensitive species within the study area. A peregrine falcon (State sensitive) nest was reported just outside of the study area on the Ballard Bridge in 2011 (WDFW, 2015a).

Seattle Regulations

The City protects wildlife habitat through their Critical Areas Ordinance (SMC 25.09). The botanical gardens, and approximately 500 feet surrounding the botanical gardens, is a Fish and Wildlife Habitat Conservation Area under the Critical Areas Ordinance (City of Seattle, 2015). A great blue heron rookery on the south side of the Ballard Locks is protected by the City Director's Rule 5-2007. The rookery protected by this rule is outside of the study area, but herons may use habitat within the study area. Great blue herons have been recorded as breeding within the botanical gardens (WDFW, 2015a). The great blue heron is a State monitor species.

3.2.2 **Street Trees**

Street trees along the rights-of-way throughout the study area may be affected by the project. Street trees in Seattle are regulated under SMC 15.43. Street trees are "trees located in public places which includes public right-of-way and the space above or beneath its surface, whether or not open or improved, including streets, avenues, ways, boulevards, drives, places, alleys, sidewalks, planting strips, squares, triangles, and plazas that are not privately owned" (SDOT, 2014). All other trees in Seattle are regulated under SMC 25.11. The City of Seattle also developed an Urban Forest Stewardship Plan (City of Seattle, 2013), which conveys the value placed in urban trees and provides guidance for protecting the trees. Street trees are an important component of the urban forest. Street trees also provide habitat for urban-adapted wildlife. SDOT has mapped many of the street trees throughout the city (SDOT, 2015). Figure 3-2 shows street trees along each proposed alternative alignment (including trees on the opposite side of the road from the proposed alternatives) (SDOT, 2015).

Many of the street trees in the project area are large, but they are not designated as heritage trees (SDOT, 2014, 2015). Heritage trees are a tree or group of trees given special designation by the Heritage Tree program, co-sponsored by Plant Amnesty and SDOT.

Figure 3-2. Street Trees in Study Area

Table 3-2 lists streets with street trees and species for each alternative. There are no street trees along the Shilshole South Alternative. For the Shilshole North Alternative, along Shilshole Ave NW there also are no street trees, but there are 36 mapped trees on NW 46th St and NW Market St along the side of the street where the alternative is proposed (SDOT, 2015). The Ballard Avenue Alternative includes street trees along many portions of the alignment, including all of Ballard Ave NW and much of NW 56th St. The Ballard Avenue Alternative has 61 mapped trees along the side of the road where the alignment is proposed. The Leary Alternative has 102 mapped street trees along the side of the roads where the alternative is proposed; these roads are NW Leary Way, Leary Ave NW, and NW Market St (Figure 3-2). These numbers are estimates based on existing data; a tree survey would be conducted by a certified arborist after an alternative is chosen.

Table 3-2 also lists the connector segments and species of street trees. Since either side of the connector segments could be used at this stage of the design, the side of the road where the trees are located is indicated in Table 3-2.

Table 3-2. Mapped Street Trees Along Alternative Alignments and Connector Segments

Shilshole South Alternative	*Species*	*Side of the Road*	*Approximate Number of Trees*
No street trees	n/a	n/a	0
Shilshole North Alternative	*Species*	*Side of the Road*	*Approximate Number of Trees*
NW 54th St	Beech	Northwest[1]	7
NW Market St	Wilfred Fox Whitebeam	South	27
NW Market St	Wilfred Fox Whitebeam, Freeman (red), Bowhall maples, Pyramidal European, Westminster Globe English Oak	North[1]	18
NW 46th St	Pacific Sunset maple	North	9
Ballard Avenue Alternative	*Species*	*Side of the Road*	*Approximate Number of Trees*
28th Ave NW	Snowcone Japanese Snowbell	East	4
NW 56th St	Black Cherry, Norway maple, Little Gem magnolia, Redspire pear, Blireiana Purpleleaf plum, Littleleaf Linden	South	16
NW 56th St	Maple, birch, Kousa dogwood, cutleaf Hornbeam, sweetgum, Vanessa Parrotia, flowering plum, Camellia, Green Vase Zelkova, Red oak, Littleleaf Linden, Snowcone Japanese Snowbell	North[1]	18
22nd Ave NW	Armstrong Freeman (red) maple	West	6

Shilshole South Alternative	*Species*	*Side of the Road*	*Approximate Number of Trees*
22nd Ave NW	English maple, Littleleaf Linden, and Norway, Bowhall, Armstrong Freeman (red) maples	East[1]	12
Ballard Ave NW/ NW Ballard Way	Honey locust, Armstrong Freeman (red) maple, pin oak	Southwest	35
Ballard Ave NW/ NW Ballard Way	Honey locust, pin oak, red oak, Armstrong Freeman (red) maple	Northeast[1]	33
NW 46th St	Pacific Sunset maple	North[1]	9
Leary Alternative	*Species*	*Side of the Road*	*Approximate Number of Trees*
NW 54th St	Beech	Northwest[1]	7
NW Market St	Wilfred Fox Whitebeam, Emerald Queen Norway maple	South	30
NW Market St	Wilfred Fox Whitebeam, Pyramidal European, Westminster Globe English Oak, and Norway, Freeman (red), and Bowhall maples	North[1]	42
Leary Ave NW	Snowcone Japanese snowbell, Prospector Elm, Okame cherry, Norwegian Sunset, English, paperbark, and red maple	Southwest	33
Leary Ave NW	Norway maple, Allee Lacebark Elm, flowering plum, Emerald sunshine Elm, Okame cherry, red maple, Katsura tree	Northeast[1]	28
NW Leary Way	Norway and English maple, plum	South	29
NW Leary Way	English maple, London plane, white birch, plum	North[1]	13
11th Ave NW	Red maple, Redspire pear	East	10
Connector Segments	*Species*	*Side of the Road*	*Approximate Number of Trees*
Ballard Ave NW	Norway maple, Shumard red oak	Southwest	14
Ballard Ave NW	Red oak and Norway maple	Northeast	9
NW Vernon Pl	Pinoak and honey locust	Northwest	3
20th Ave NW	Oak, a coniferous tree	West	8
20th Ave NW	Pinoak, Shumard red oak, and red oak	East	9
17th Ave NW	Plum trees	East	11

Shilshole South Alternative	*Species*	*Side of the Road*	*Approximate Number of Trees*
15th Ave NW	No street trees	n/a	0
14th Ave NW	Mixture – maples and Frontier Elm	West	11

[1]Opposite side of the street from proposed alternative alignment.
Source: SDOT, 2015.

3.3 Potential Impacts

3.3.1 No Build Alternative

Under the No Build Alternative, no construction activities would be associated with a trail and there would be no tree removal. Routine maintenance of street trees, streets, sidewalks, and existing bicycle and pedestrian facilities would occur. There would be no impacts to fish and wildlife, including threatened and endangered species, from the No Build Alternative. Impacts to street trees are not anticipated.

3.3.2 Impacts Common to All Build Alternatives

Construction

Fish and Wildlife. Similar construction techniques and equipment would be used for each Build Alternative, including the connector segments, regardless of location. As with any construction project, there is a risk of spills of petroleum products or other fluids from construction activities, which have the potential to enter the Ship Canal and affect fish through stormwater facilities that drain directly to the Ship Canal. There is also a potential for dust and erosion from excavated areas. However, the likelihood of listed fish in the study area being affected by construction of the Missing Link is very small. There would be no in-water work associated with the construction of the Missing Link.

There would be no impacts to listed birds, as they are unlikely to be found in the study area. Urban-adapted wildlife, such as birds and rodents, may be temporarily disturbed by construction noise or activities and may temporarily leave the construction area. However, as habitat is minimal and these species are accustomed to a disturbed environment, the impacts would be minimal.

Street Trees. The exact configuration and number of trees that could be affected by the trail alignment is not known at this stage of design. Street trees listed in Table 3-2 and shown on Figure 3-2 may be affected by construction. Removal of street trees would be avoided where possible, and thus the number of trees removed would be small. A certified arborist would conduct a tree survey and assess the health of each tree and develop a tree protection plan after a preferred alternative has been chosen. For the Build Alternatives, the majority of construction would be the side of the road where the trail is proposed. In some cases, there would be work on the opposite side of the street to accommodate a new roadway configuration. This may result in impacts to street trees across the street from the alternative alignments. This is most likely to occur at the following intersections: the northwest side of NW 54th St in the Shilshole North Alternative and Leary Alternative, and the north side of NW 56th St in the Ballard Avenue Alternative. Modifications to the opposite side of the street are not anticipated along the other streets.

For the connector segments, street trees may also need to be removed during construction. Figure 3-2 and Table 3-2 show where connector segments may affect street trees. Impacts from the construction of the Shilshole North Alternative, Ballard Avenue Alternative, and Leary Alternative would be minor, but not significant. There would be no impacts to street trees from the Shilshole South Alternative because there are no trees along this alignment.

Operation

Fish and Wildlife. After the project is completed, there would be no impacts to fish and wildlife, including threatened or endangered species. There would be no changes to habitat for threatened fish species in the Ship Canal as a result of the project. The completed trail should attract users, and thus there would be more pedestrians and bicyclists along the completed corridor than there are currently. This may disturb urban-adapted species. There would be some additional landscaping and trees planted, which would provide refuge for urban-adapted species.

The completed trail would include stormwater drainage improvements that would comply with Seattle stormwater standards. In some cases, this may be an improvement over existing conditions. Any improvements would not make a measurable difference to water quality in the Ship Canal; however, it would contribute to reducing non-point source pollution.

Street Trees. There would be no impacts to street trees from the operation of the trail in any location.

3.4 Avoidance, Minimization, and Mitigation Measures

3.4.1 Measures Common to All Alternatives

Measures to avoid impacts from construction of the Missing Link would be the same for all Build Alternatives. Vegetation and wildlife habitat would be avoided where possible. Construction BMPs would be used to avoid spills, and minimize dust or erosion throughout the construction period. An SWPPP would be developed specifically for the project. Removal of street trees would be avoided where possible, and replaced following the street tree protection ordinance. Trees would be protected during construction and in accordance with the street tree protection ordinance (SMC 15.43) and the Street Tree Manual (SDOT, 2014). Street trees may also be added in areas where there currently are no street trees. In most cases new street trees would be smaller than existing conditions, and would take a number of years to grow to similar stature.

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CHAPTER 4: LAND USE

4.1 Introduction

This chapter describes the affected environment in the study area and evaluates the project's compatibility with existing, allowed, and intended land uses and the federal, state, and local regulations, plans, and policies that guide and govern land use in the study area. Adopted policies and plans are generally not regulatory in nature, but rather provide guidance regarding the current and future management of land use and other resources. Policies are therefore important considerations for decision makers but generally are not binding requirements. Decision makers must also consider that complete consistency with one policy may mean some degree of inconsistency with another. In such cases, decision makers must weigh the degree of overall consistency with adopted plans in the final decision. When a shoreline permit is required, the City must make a finding that a proposal is consistent with the policies of the Shoreline Management Act, Ecology rules, and the local shoreline master program.

Where impacts are identified, measures to mitigate or minimize impacts are described. In this evaluation, an alternative is considered to have the potential for significant adverse environmental impacts if it would likely cause the permanent loss of land uses that are preferred (such as water-dependent, water-related, and industrial uses) under adopted City of Seattle policies.

4.2 Affected Environment

4.2.1 Study Area

The study area for the land use analysis is the area where construction or operation of the project could impact current and future land uses, including business operations and existing character. The study area is bounded by 32nd Ave NW to the west, NW 56th St/20th Ave NW/Leary Ave NW to the north, 8th Ave NW to the east, and Salmon Bay to the south (Figure 4-1). The study area includes properties on both sides of the street adjacent to each of the Build Alternatives and connector segments, areas providing access for those properties, and properties whose primary access may be affected by a proposed Build Alternative.

The team also considered the greater Ballard area when it was needed to provide context and assess the project's overall compatibility with community character, neighborhood plans, and policies for future growth.

4.2.2 Land Uses

Land uses within the study area vary in type, intensity, and their relationship to other nearby uses and amenities (Figure 4-2). Commercial, industrial/manufacturing, residential, parking, parks/open space, and transportation uses are present, as well as government buildings, a hospital, a training center, and other miscellaneous uses (labeled "other" on Figure 4-2) and currently vacant or unused parcels (labeled "vacant"). Parking that is accessory to a primary use is designated as the primary use it is associated with; for example, parking accessory to a commercial use is labeled as a commercial use. Stand-alone parking is designated "parking."

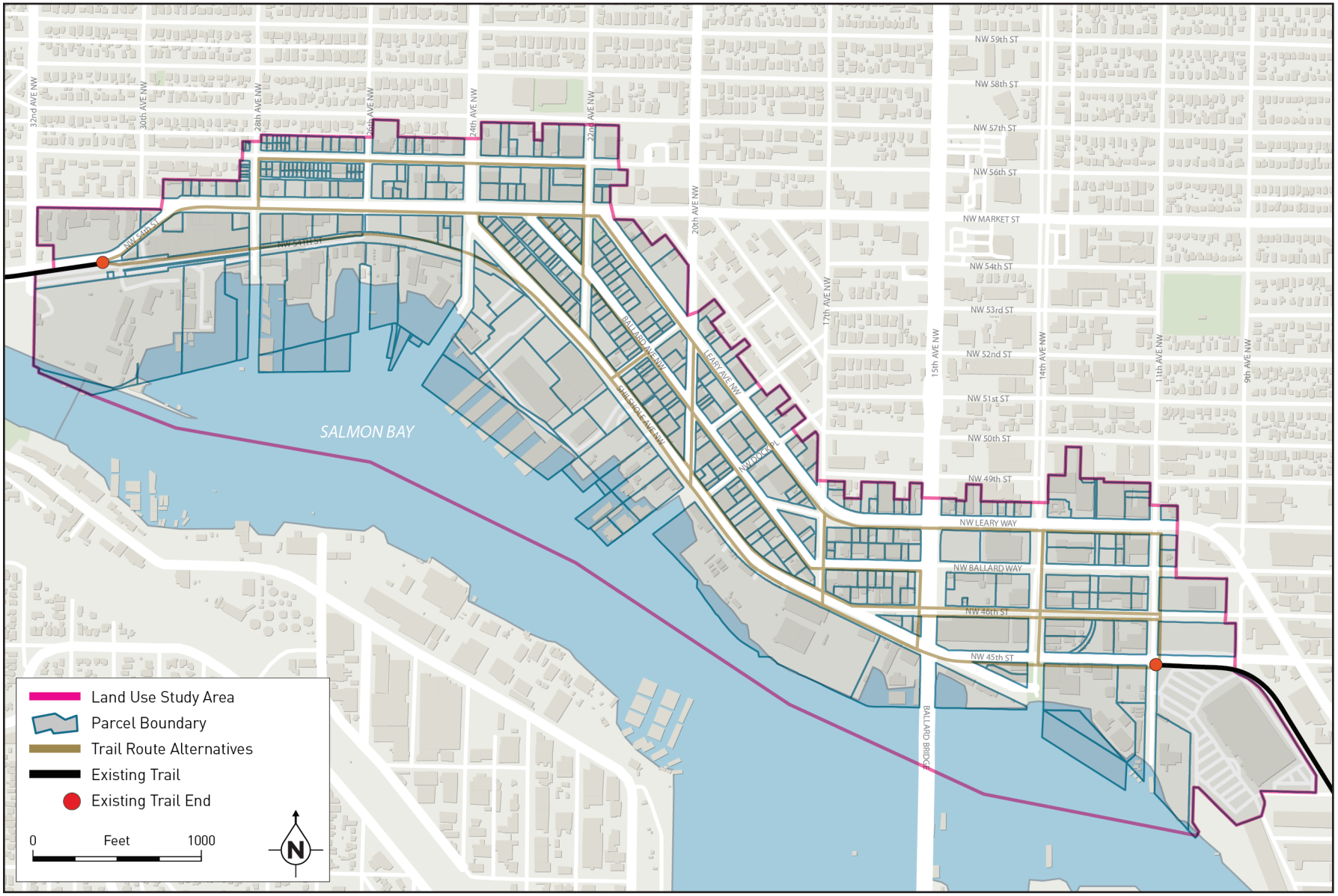

Figure 4-1. Land Use Study Area

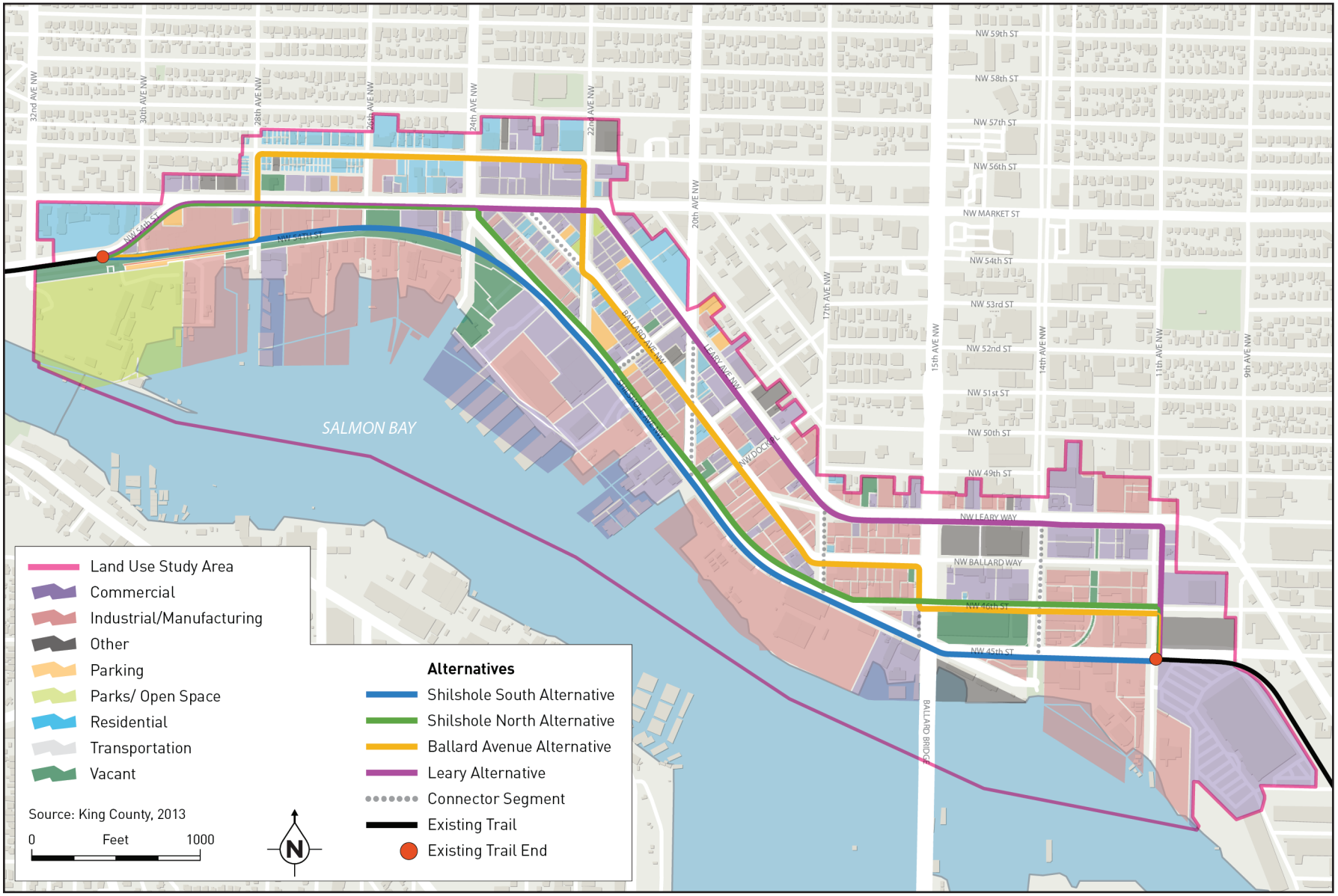

Figure 4-2. Land Uses within the Study Area

Because Ballard is experiencing rapid growth, land uses are dynamic as redevelopment and development occur. Growth pressure continually results in changes to form, type, intensity, and the presence of development in the study area. Parcels that have not maximized development potential or that are designated as vacant at the time of this report may change uses or be developed as growth occurs and new land use preferences are adopted.

Existing uses, architecture, and age of structures contribute to the character of the study area. The southern portion of the study area is the historic center of Ballard where lumber, fishing, and shipbuilding industries developed in the late 1800s, dependent on Salmon Bay to transport raw and finished products. The waterfront industry provided employment opportunities for workers who settled neighborhoods to the north, and NW Market St provided a downtown commercial core (City of Seattle, 2015a). Although most of the activity in the lumber industry has been replaced, many other industrial, manufacturing, and commercial uses remain, particularly along Shilshole Ave NW. Some of these uses continue as water-dependent uses, or support water-dependent uses with repair work or other related services and products.

The Ballard Terminal Railroad or BTR (formerly known as the Seattle, Lake Shore, and Eastern Railway) corridor extends from the Ballard Locks to 24th Ave NW. The BTR corridor is used for freight transport and provides vehicular access to several abutting parcels. Part of the corridor is used as a public parking area near the Ballard Locks. Uses adjacent to the railroad corridor extending east from the Ballard Locks are mostly industrial, along with commercial uses such as the Stimson Industrial Park offices, Salmon Bay Sand and Gravel, Covich Williams fuel dock, and Sagstad and Branchflower Marinas. Storage, parking, and other activities occur on some of the vacant railroad corridor parcels.

One of Ballard's defining features is the Ballard Avenue Landmark District, also known as "Old Ballard," located along Ballard Ave NW from NW Dock Pl to NW Market St (Figure 4-3). Buildings in the landmark district embody the distinctive characteristics of modest commercial architecture from the 1890s through the 1940s (City of Seattle, 2015b; SWCA, 2016). A variety of restaurants, shops, bars, salons, and other businesses, including some industrial and marine-related service and retail businesses, are located on Ballard Ave NW. Many of these uses are housed in historic buildings.

Near the west end of the study area on NW Market St, uses are mostly commercial along the north side of the street and industrial along the south side of the street; examples include storage, cafes, shops, and a lumberyard. Heading east, uses generally transition to mixed-use residential, and then to pedestrian-oriented commercial retail uses (restaurants, shops, bars, boutiques, etc.). Leary Ave NW near NW Market St contains mixed-use residential and commercial uses (cafes, health-related establishments, restaurants, etc.) and transitions to more concentrated industrial/manufacturing uses near the east end of the study area.

The Ballard Locks and the Ship Canal are major recreational attractions in the study area. The City of Seattle also owns and operates a number of local parks and areas designated as shoreline street ends, which provide public shoreline access and views. In addition, special events like the Ballard Farmers Market, the annual weekend-long SeafoodFest, and the Seventeenth of May Festival take place throughout the study area.

Pedestrian activity is relatively heavy along NW Market St and Leary Ave NW near 20th Ave NW, and along Ballard Ave NW, particularly in the Ballard Avenue Landmark District. This is partly attributed to nearby land uses. The area's concentration of commercial uses provides shopping, dining, and entertainment opportunities that can be accessed by foot by nearby residents living in mixed-use, multifamily, and single-family neighborhoods. The commercial opportunities and special events also attract shoppers from outside of the area. Frequent public transit that runs along NW Market St and Leary Ave NW allows visitors to walk to these destinations from transit stops. Parking is available for drivers in paid lots or on the street throughout the study area.

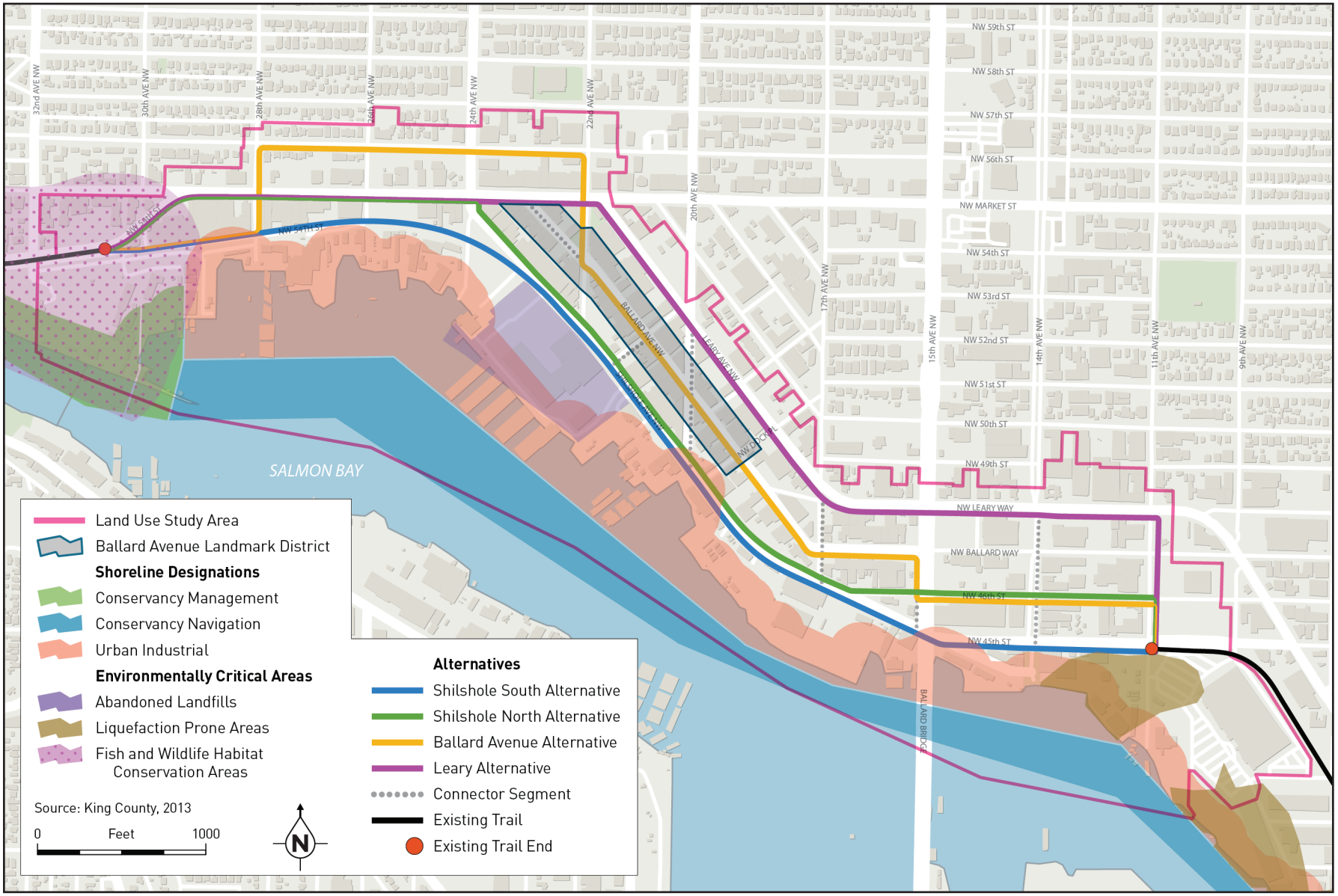

Figure 4-3. Shoreline Environments, Critical Areas, and Ballard Historic Landmark District

Existing public rights-of-way provide for freight, transportation, and recreational activity throughout the study area. Regular maintenance and improvements, as well as occasional reconfigurations of the right-of-way occur throughout the study area. Although the east and west trail ends are not currently connected, residential and commercial land uses within the study area create origination and destination points for trail users. Public transit often provides bicycle racks, which promote multi-modal trip opportunities to and from the area. In addition, recreational and commuter trail users traveling through the area to surrounding destinations use Shilshole Ave NW, as well as other rights-of-way within the study area, as the direct connection between the east and west trail ends.

Today, the diversity of land uses and activity in Ballard reflect its past, before zoning regulations were established. Over the years, changes in market demand, population, the economy, and other factors have caused individual uses to persist, adapt, grow, relocate, or discontinue operations. Seattle's current zoning and planning policies support the continuation of long-established, hard-to-site, water-related and water-dependent industrial and commercial uses as a strong employment base integral to Ballard's historic identity, while also promoting needed capacity for residential and commercial growth in established areas to the north (City of Seattle, 2015a).

Figure 4-4 displays the approximate square footage of land within the study area that is allocated to each major land use category, excluding rights-of-way. Industrial uses compose the greatest portion, approximately 40% of the total land area, with commercial uses composing approximately 33%, and residential uses accounting for about 8% of the total land area within the study area.

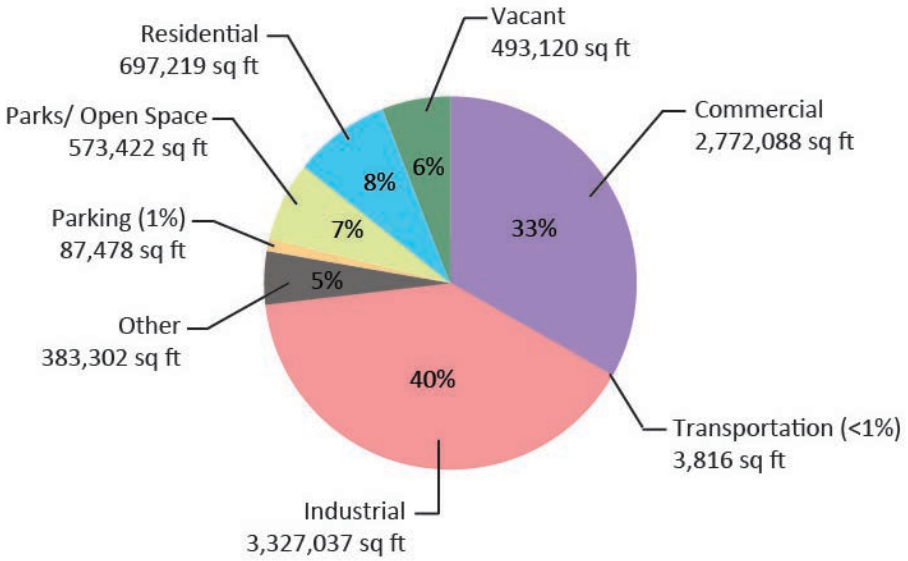

Figure 4-4. Land Area Occupied by Existing Land Uses within the Study Area

4.2.3 Regulatory Context

Land use and development in the study area are governed by the federal, state, regional, and local plans and regulations described in this section. The regulations are intended to ensure compatibility and predictability between existing and future land uses. In addition to the overview provided below, the Land Use Discipline Report (ESA, 2016) describes applicable plans and policies in more detail.

Federal and State Laws and Regulations

The study area is adjacent to Salmon Bay, which is under the jurisdiction of the Coastal Zone Management Act. The Washington State Shoreline Management Act ensures the state's compliance with the federal Coastal Zone Management Act. The Washington State Growth Management Act (GMA) also governs land use in the study area.

Local and Regional Plans and Regulations

The Puget Sound Regional Council's (PSRC's) VISION 2040 is the applicable regional plan relating to land use in the study area (PSRC 2008).

The City of Seattle has adopted a Comprehensive Plan, land use codes, and supplemental plans that guide how and where development should occur. These guidelines support the attainment of goals and objectives to manage growth, provide efficient and diverse transportation opportunities, maintain and improve economic development, encourage sustainable urban design, and protect environmental resources. The following City of Seattle plans, policies, and regulations apply to the study area:

- City of Seattle Comprehensive Plan (City of Seattle, 2015c)
    - City of Seattle Urban Village – Ballard Hub Neighborhood Plan
    - Ballard-Interbay Northend Manufacturing and Industrial Center (BINMIC) Plan
- Seattle Department of Transportation Freight Mobility Strategic Action Plan (SDOT, 2005)[1]
- Seattle Department of Transportation Bicycle Master Plan (SDOT, 2014)
- City of Seattle Parks and Recreation 2011 Development Plan (City of Seattle, 2011)
- City of Seattle Climate Action Plan (City of Seattle, 2013)
- City of Seattle Ballard Urban Design and Transportation Framework Draft Plan (City of Seattle, 2015b)
- Seattle Department of Transportation Pedestrian Master Plan (SDOT, 2009)
- Seattle Department of Transportation Move Ballard Draft Plan (SDOT, 2015)
- City of Seattle Municipal Code (SMC) (City of Seattle, 2015d)
    - Land Use Code (SMC Title 23)
        - Zoning (SMC Title 23, Subtitle III)
        - Shoreline Master Program Code (SMC 23.60A)
    - Environmental Protection and Historic Preservation (SMC Title 25)
        - Regulations for Environmentally Critical Areas (SMC 25.09)
        - Ballard Avenue Landmark District (SMC 25.16)

[1] A Draft Freight Master Plan that considers the Freight Mobility Strategic Action Plan, as well as other studies, reports, and analyses related to freight in Seattle, has been released by SDOT for public comment and will be reviewed in the FEIS for the Missing Link project.

4.2.4 **Zoning**

The City of Seattle Land Use Code implements the City's Comprehensive Plan and regulates land use in Seattle. The purpose of the Land Use Code is to allocate land uses in a compatible, efficient pattern with access to services and amenities and without major disruption to natural resources. The Land Use Code classifies land into different zoning designations, creating parameters for the types of allowed uses, as well as bulk and dimensional standards that determine intensity thresholds for allowed uses. The provisions are designed to provide adequate light, air, access, and open space; conserve the natural environment and historic resources; maintain a compatible scale within an area; minimize traffic congestion; and enhance the streetscape and pedestrian environment. As a multi-use facility, the Missing Link would provide transportation opportunities within the public right-of-way and opportunities for recreation in an open space network. Permits and approvals for allowed uses within any zoning designation may include conditions of approval to ensure that uses are compatible and meet the intent of the Land Use Code.

The location, intensity, and nature of allowed uses on any parcel of land are determined by the parcel's zoning designation. Zoning in Seattle is regulated by SMC Title 23, Subtitle III – Land Use Code. As shown on Figure 4-5, zoning classifications in the study area include industrial, commercial, multifamily, and residential-commercial zones. Additionally, the Land Use Code identifies overlay designations. The P1 pedestrian overlay designation in the study area encourages intense pedestrian interest and activity at the street level.

4.2.5 **Urban Villages**

The Urban Village Element of the City of Seattle Comprehensive Plan attempts to match growth to the existing and intended character of the city's neighborhoods. A village designation recognizes the contributions that a particular area makes to the city and provides guidance regarding the intended function, character, intensity, type, and degree of growth anticipated for an area. Urban village designations supplement state and regional growth management plans. They provide tailored guidance for further developing Seattle's established, densely developed, and complex urban neighborhoods.

Of the four categories of urban villages, the study area contains two: the Ballard Hub Urban Village and the BINMIC (Figure 4-6). The BINMIC covers the southern portion and areas adjacent to Salmon Bay. The Ballard Hub Urban Village covers the remainder of the study area.

Hub urban villages are communities that provide a balance of housing and employment, generally at densities lower than those found in urban centers but higher than single-family neighborhoods.

Manufacturing/industrial centers provide siting opportunities for industrial activity and development, and are an important regional resource. Many non-industrial uses are discouraged or prohibited in industrial areas.

4.2.6 **Shorelines**

The Shoreline Master Program (SMP) implements the Shoreline Goals and Policies of the Seattle Comprehensive Plan and includes the regulations codified in SMC 23.60A—Shoreline District. The SMP guides and regulates the development of city shorelines in order to protect shoreline ecosystems; encourage water-dependent uses; provide for maximum public use and enjoyment of the shorelines; and preserve, enhance, and increase views of and access to the water.

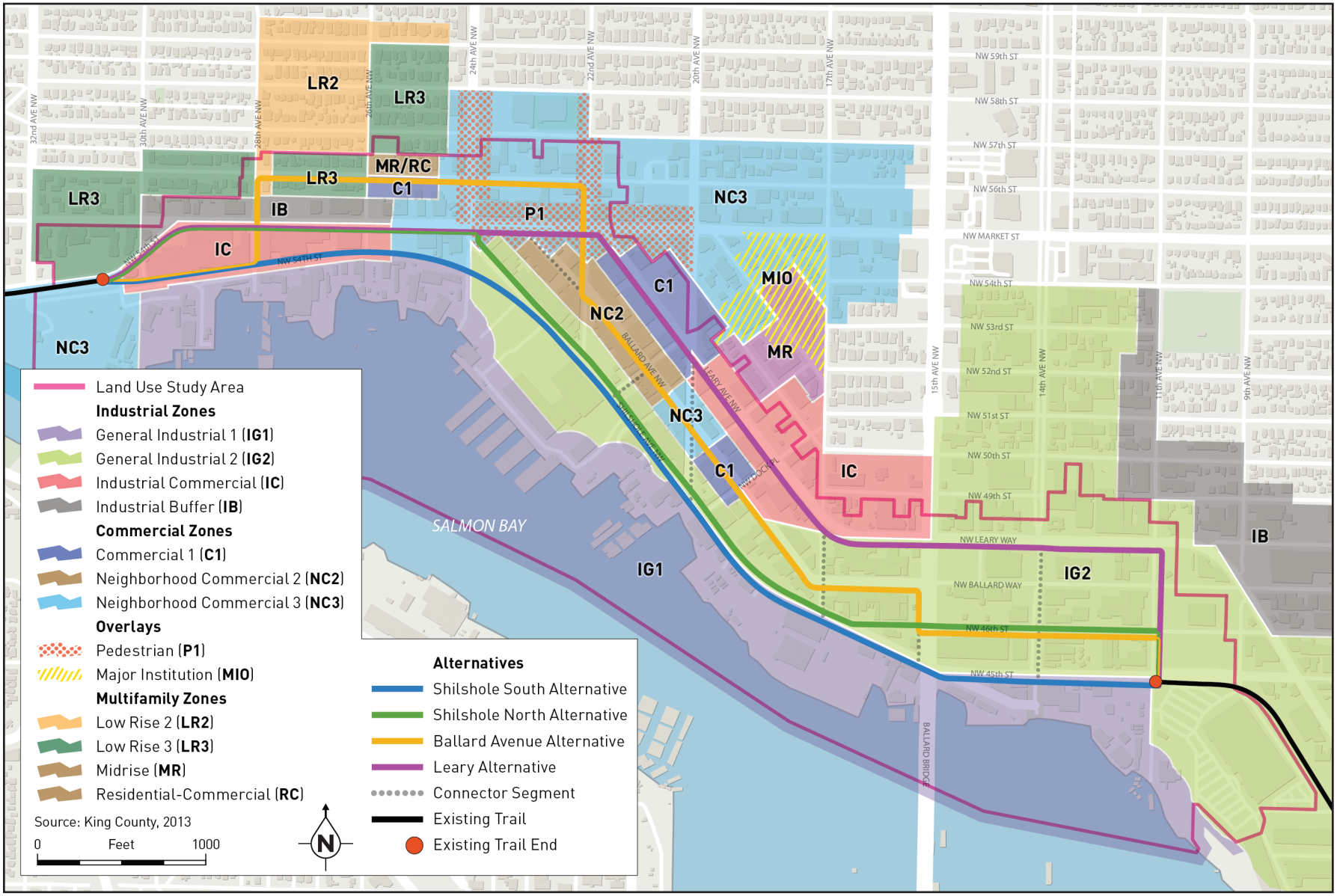

Figure 4-5. Zoning Classification of Parcels in the Study Area

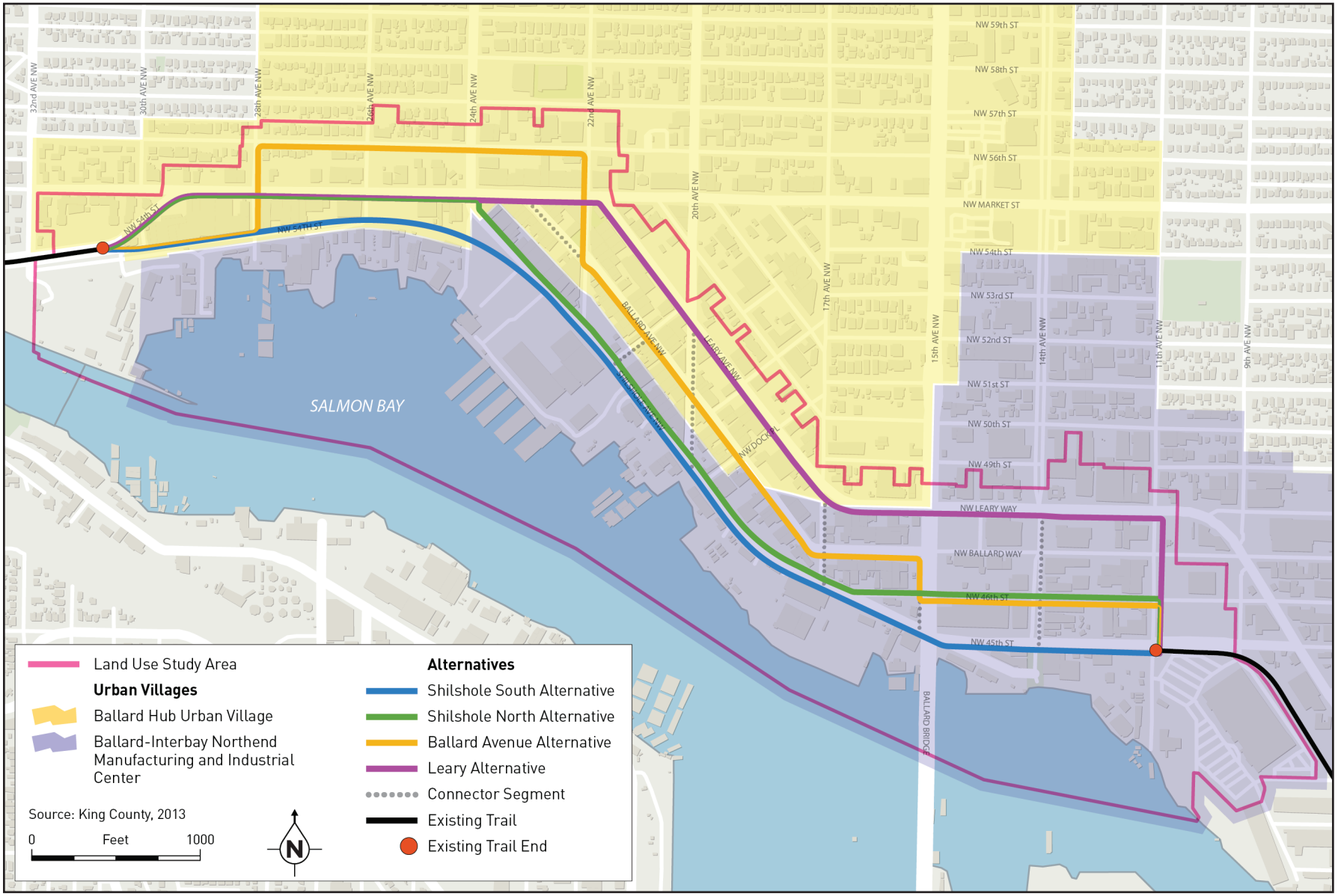

Figure 4-6. Ballard Hub Urban Village and the Ballard-Interbay Northend Manufacturing Industrial Center

Within the study area, the Ship Canal and Salmon Bay are regulated under the SMP, as are the lands within 200 feet of these waters (Figure 4-3). Portions of the study area along Shilshole Ave NW and near NW 54th St are within the shoreline district of Salmon Bay, which is a regulatory overlay established by the state Shoreline Management Act and adopted in the City's SMP. Regulations for the shoreline overlay district often influence only a portion of a parcel (i.e., only land areas with 200 feet of the ordinary high water mark). All property within the shoreline district is subject both to the standards of the applicable zone and to the requirements imposed by the SMP (as well as requirements imposed by other applicable codes).

The SMP designates "shoreline environments" within the shoreline district. Like zoning designations, each shoreline environment has unique, allowable uses and development standards, based on existing and aspirational uses, character, and function. Of Seattle's 11 shoreline environments, three are present in the study area: Urban Industrial (UI), Conservancy Management (CM), and Conservancy Navigation (CN). For further discussion, see the Land Use Discipline Report (ESA, 2016). Reconfiguration of the existing right-of-way for the Missing Link would be allowed within the shoreline jurisdiction under the SMP.

4.2.7 Environmental Protection and Historic Preservation

SMC Title 25 regulates designated historic areas and environmentally critical areas. These codes protect sensitive environmental features, buildings, landmarks, and architecture that establish the city's unique identity while allowing reasonable development. The regulations promote safe, stable, and compatible development that avoids adverse environmental impacts and potential harm to the designated areas, adjacent property, and the surrounding neighborhood.

Environmentally Critical Areas

An abandoned landfill, liquefaction-prone zones, and fish and wildlife habitat conservation areas are present in the study area (Figure 4-3).

The abandoned landfill is south of Shilshole Ave NW and the land is now used for industrial and office uses. Development within the former landfill area is subject to special engineering and construction management requirements to prevent damage from methane gas buildup, subsidence, and earthquake-induced ground shaking.

The liquefaction-prone zones are located at the southwest corner of 11th Ave NW and Shilshole Ave NW and the southeastern-most corner of the study area. Development in liquefaction-prone areas may require soil engineering studies to determine the physical properties of the surficial soils, especially the thickness of unconsolidated deposits and their liquefaction potential.

Fish and wildlife habitat conservation areas are located near the west trail end and are lands designated and managed to encourage long-term viability and the proliferation of targeted species. Areas designated by WDFW as priority habitats and species areas are considered to be fish and wildlife habitat conservation areas. Development in fish and wildlife habitat conservation areas that does not encroach within, alter, or increase environmental impacts may be exempt from the critical areas regulations. All other development proposed within fish and wildlife habitat conservation areas or associated buffers requires an application that complies with SMC Title 25. The project proponent must submit the application to the City of Seattle and obtain necessary permits and approvals prior to undertaking development.

Ballard Avenue Historic/Landmark District

A portion of the study area along Ballard Ave NW lies within the Ballard Avenue Historic/Landmark District, an area of historical significance to Ballard and Seattle. The Ballard Avenue Historic/Landmark District boundary runs along Ballard Ave NW from NW Dock Pl to the southeast to NW Market St to the northwest (Figure 4-3). All property within the district is subject both to the standards of the applicable zone and regulations concerning the district status. The district designation is intended to preserve, protect, enhance, and perpetuate cultural, social, economic, architectural, and historic heritage. The City has adopted regulations to protect or improve the aesthetic and economic vitality and values of the district; to promote and encourage continued private ownership and use of historic buildings and structures; and to promote the local identity of the area to the extent that these objectives can be reasonably attained. (For more information on the district designation, see Chapter 10, Cultural Resources.)

4.3 Potential Impacts

The land use analysis examined the potential for the project to alter land uses in the study area in a way that would be inconsistent with adopted plans and policies. Transportation, parking, and economic impacts were considered to the extent that they could affect and cause changes to existing land uses (Parametrix, 2016a, 2016b; ECONorthwest, 2016). The consistency of an alternative with adopted policies, plans, and regulations was also considered. If an alternative could change land use in a way that is inconsistent with policies and plans, this would be a potentially significant adverse impact.

4.3.1 No Build Alternative

Effect on Existing Uses

The No Build Alternative would not alter current land uses. These uses would either remain consistent or continue to adapt and change as determined by population and business growth, market conditions, and regulatory changes.

Consistency with Adopted Plans, Policies, and Codes

The No Build Alternative is inconsistent with regional and local land use plans that emphasize multimodal transportation opportunities and improved connectivity for nonmotorized transportation modes, particularly in areas experiencing rapid growth and development, such as the Ballard Hub Urban Village. Motorized and nonmotorized traffic within the study area is expected to grow between 2015 and 2040 (Parametrix, 2016a). Under the No Build Alternative, nonmotorized users would continue to travel on available sidewalks and along the street network, which lacks designated bike lanes. Particularly along Shilshole Ave NW, which nonmotorized users often use as a direct link between the two trail ends, the increase in traffic would increase user conflicts and slow freight movement. The No Build Alternative would not mitigate those conflicts through the engineering and design of a designated trail.

The No Build Alternative would be inconsistent with the following policies and plans:

- **City of Seattle Comprehensive Plan**: Goals and policies promote transportation improvements that support walking, strive to direct future development and density to areas conducive to walking and bicycling, and provide increased opportunities to walk and bicycle between urban villages by connecting trails and providing an open space network. Goals also include the facilitation of industrial traffic flow and truck mobility. The No Build Alternative would not

improve conditions for pedestrian and bicycle opportunities, and the increased potential for user conflicts would not improve traffic flow or truck mobility.

- **Seattle Department of Transportation Freight Mobility Strategic Action Plan**: Goals and policies promote the efficient and safe movement of freight and access to manufacturing and industrial areas. Increased motorized and nonmotorized congestion in the study area would result in slower freight movement, delayed goods delivery, and a greater potential for user conflicts, and would not promote increased efficiency or access.
- **PSRC's VISION 2040**: Transportation investments in regional growth centers and areas with compact, mixed-use development are an integral component of the regional strategy, particularly for nonmotorized uses. Completion of the Missing Link is included as a key project in the Transportation 2040 Update.
- **Seattle Department of Transportation Bicycle Master Plan:** The Missing Link is identified as a "catalyst project" whose completion would eliminate a critical network gap and increase user safety.
- **City of Seattle Parks and Recreation 2011 Development Plan**: The plan includes the development of new multi-use trails in accordance with the Bicycle Master Plan, which promotes completion of the Missing Link.

4.3.2 Impacts Common to All Build Alternatives

Construction

Construction impacts associated with all of the Build Alternatives include the following:

- Noise generated by construction equipment could disturb business patrons, particularly in commercial areas, or could also disturb residential uses.
- Increased traffic from construction crews could delay freight movement for commercial and industrial uses.
- Increased parking needs from construction crews and reduction of available on-street parking; the loss of parking could displace or discourage business patrons of retail and entertainment commercial uses and employees for other uses.
- Dust and debris from land-disturbing activities could inhibit pedestrians in pedestrian-oriented commercial centers and other business patrons, employees, and residents.
- Potential partial and temporary sidewalk and road closures could inhibit pedestrians in pedestrian-oriented commercial centers and other business patrons, employees, and residents.
- Roadway congestion could delay freight movement and goods delivery, and frustrate business patrons and residents.
- Temporary changes to driveway widths and locations, and temporary loss of loading zones could disrupt industrial, manufacturing, and commercial uses; could delay or disrupt traffic and access to existing uses near the project footprint; and could delay the movement of goods, although access to all uses within the study area would be maintained.

Noise, traffic, dust and debris, and sidewalk and road closures could result in a temporary loss in patronage for businesses, particularly commercial retail and entertainment that rely on auto and foot traffic. Traffic congestion could delay pick-up and delivery of goods, thus impacting normal business

activities. Nonmotorized activity would continue during construction, which would result in user conflicts; however, nonmotorized users would generally use alternative routes to avoid the construction. All construction impacts are expected to be minor and temporary, are not expected to disrupt uses to the extent of being inconsistent with adopted codes, and therefore would not have a significant adverse impact on land uses in the study area.

Operation

Effect on Existing Land Uses

All of the Build Alternatives would connect the existing trail ends, thus providing a dedicated, nonmotorized connection between the surrounding neighborhoods, and connecting trail users to parks and open space, businesses within the study area, and employment opportunities. The project would provide infrastructure improvements such as the new trail, sidewalks, landscaping, and buffers. Improvements would channel most existing BGT users to the new trail and attract new users because the trail would reduce the potential for user conflicts and link to the rest of the BGT. The improvements would also beautify the streetscape and repair sidewalk segments, attracting additional people to the project area.

The infrastructure improvements could support existing and expanding residential and commercial uses near the trail. Residential and commercial uses could benefit from trail users because new people could be potential residents, customers, and workers (ECONorthwest, 2016). However, the improvements may not support and could even discourage new and expanded industrial uses.

Alterations to the road network associated with all Build Alternatives would facilitate traffic flow at some study area intersections (Parametrix, 2016a), which could encourage ongoing activity of existing uses within the study area. However, all Build Alternatives would likely result in minor delays at some intersections, access points for uses along the alignment, and the loss of some parking and loading spaces. Additional people in the project area could also delay freight transport by crossing the roads and driveways used by freight vehicles. Because of the minor disruptions to access and loading for some of these uses within the BINMIC, a minor adverse impact could occur. The impact would not be significant and could be minimized (but not completely eliminated) through the design measures described in the Transportation Discipline Report (Parametrix, 2016a).

All Build Alternatives would also eliminate some parking spaces. The study area has the capacity to absorb parking displaced by each of the Build Alternatives. Additionally, trail completion could offset some loss of parking by encouraging people to travel to events using nonmotorized means. Elimination of some loading zones along all of the Build Alternative alignments would occur, which could negatively impact business activities, particularly for auto-oriented commercial businesses and businesses that use street space for loading and unloading.

Businesses would likely adapt to the minor delays, loss of parking, and changes to loading areas along with other changing conditions. These adaptations could increase operating costs, which could place incremental economic pressure on some businesses (ECONorthwest, 2016). However, none of the Build Alternatives would displace any existing uses.

Consistency with Adopted Plans, Policies, and Codes

The GMA and several planning documents promote the development of infrastructure for nonmotorized and multimodal transportation opportunities, particularly where the infrastructure connects population centers and existing infrastructure segments (e.g., PSRC's VISION 2040 and Transportation 2040, City of Seattle Climate Action Plan, City of Seattle Parks and Recreation 2011 Development Plan, Seattle

Department of Transportation Bicycle Master Plan, and Seattle Department of Transportation Pedestrian Master Plan). These guidance documents influence the development of local codes that regulate current land use and future development, and inform regulators' decision-making process when land use permits are submitted for approval. A project's adherence to adopted plans, policies, and codes ensures that current development is consistent with local and regional long-term plans for land use and that as land is developed, user conflicts are minimized. If a project does not adhere to adopted plans and policies, user conflicts could negatively affect community health, safety, and welfare.

In general, the project would be consistent with most policies. The BGT is used for both commuting and recreation. State, regional, and local plans and policies generally promote the development of infrastructure for nonmotorized and multimodal transportation opportunities, particularly to connect population centers and existing infrastructure segments. Completion of the Missing Link is specifically included in some plans as a priority improvement. Build Alternatives that minimize trail length in the BINMIC and maximize trail length in the Ballard Hub Urban Village are the most consistent with adopted policies, as described below.

City of Seattle Comprehensive Plan

The City of Seattle Comprehensive Plan Urban Village Element, Land Use Element, and Transportation Element generally promote transportation improvements that support walking and bicycling; the provision, expansion, and enhancement of parks and open space; and provision of amenities to support the interests of a range of uses and people. Completion of the Missing Link is specifically included in some of these plans as a priority improvement in order to provide alternatives to motorized transportation, to connect neighborhoods, and for the positive health impacts that trail recreation could provide. The Build Alternatives would be consistent with these aspects of the plan elements.

All of the Build Alternatives would serve the Ballard Hub Urban Village. Build Alternatives that locate more trail in the Ballard Hub Urban Village would be more consistent with adopted policies that support activated streetscapes in a pedestrian-oriented environment. For details about the applicable adopted policies, see the Land Use Discipline Report (ESA, 2016).

All of the Build Alternatives would locate some of the trail within public right-of-way in the manufacturing/industrial center and could impact existing manufacturing and industrial uses.

Comprehensive Plan policies for the BINMIC support commuting to work to and through the BINMIC by bicycle and walking, but policies also direct that the trail's design should consider the operational requirements of adjacent property owners and users (as determined by the City), the safety of trail users, the operational requirements of industrial users, and that through trails should be located away from industrial areas. In particular, policies discourage actions that could delay freight movement or interfere with industrial/ manufacturing uses, especially water-related or water-dependent uses. All of the Build Alternatives require some portion of the trail to be located within the BINMIC due to the location of the eastern end of the existing trail. The amount of trail that would be located in the BINMIC varies by alternative (Table 4-1). These and other differences among the alternatives are described separately in Sections 4.3.3 through 4.3.6.

Table 4-1. Summary of Urban Villages and Land Uses Affected by Build Alternatives

Build Alternative	*Length of Trail in BINMIC (approx. linear feet)*	*Length of Trail in Ballard Hub Urban Village (approx. linear feet)*	*Adjacent Land in Industrial Uses (acres and %)*	*Number of Adjacent Water-dependent and Water-related Uses*
Shilshole South	4,455	1,982	31 acres (54%)	27
Shilshole North	4,512	2,135	13 acres (67%)	20
Ballard Avenue	2,814	4,704	9.5 acres (45%)	9
Leary	2,308	4,466	5.3 acres (33%)	7

There could be minor to moderate impacts on preferred uses in the BINMIC under any Build Alternative, primarily due to impacts on access, egress, and loading. These impacts are described in greater detail in the Transportation Discipline Report (Parametrix, 2016a). However, the impacts would be localized to particular businesses and, while potentially reducing business activity at certain times, are not expected to cause any business to fail. Therefore, the vitality of the BINMIC would not be significantly adversely impacted under any Build Alternative.

All Build Alternatives would reconfigure the existing right-of-way to accommodate the project. The Missing Link would also use a portion of the BTR corridor that overlays street right-of-way. The Missing Link would serve a transportation function as a commuter route serving both nonindustrial and industrial area commuters (including marine/fishing industry employees) using nonmotorized transportation, as well as a recreation function.

The trail would be within the existing right-of-way and would not displace any existing industrial, water-related, or water-dependent uses. Therefore, all Build Alternatives would be consistent with Comprehensive Plan Policy UV 24.1.

The Comprehensive Plan also contains goals and policies that strive to improve industrial traffic flow to and through the BINMIC, facilitate truck mobility, and enhance truck connections. All of the Build Alternatives would cross or run parallel to major truck streets, but none would substantially reduce the level of service on these roadways, and some would improve the functions of these routes (Parametrix, 2016a).

Seattle Department of Transportation Freight Mobility Strategic Action Plan

The Seattle Department of Transportation Freight Mobility Strategic Action Plan incorporates sections of the Comprehensive Plan Neighborhood Planning Element that relate to freight mobility in particular neighborhoods. It strives to improve industrial and manufacturing activity, including traffic flow, truck mobility, land preservation for industrial activities, and business expansion in the BINMIC. To varying degrees, portions of all Build Alternatives (except some connector segments) are within the BINMIC and could conflict with these goals and policies, depending on freight and traffic delays caused by trail users.

The Freight Mobility Strategic Action Plan stresses the importance of preserving industrial and manufacturing areas and facilitating goods movement via truck, rail, and water. The plan aims to preserve freight movement on major truck streets. All Build Alternatives would make some traffic flow, roadway, and rail improvements that support the plan's goals and policies for efficient traffic flow and safe

movement of goods by rail. However, designated and undesignated loading zones would be altered and removed under any of the Build Alternatives, affecting the delivery and collection of goods that are integral to many industrial and commercial uses. The transportation analysis indicates that the project could cause minor increases in delays to and from industrial and manufacturing businesses under any of the Build Alternatives, with a negative impact on the delivery and collection of goods. Potential conflicts between industrial and trail users would increase under all Build Alternatives but could be reduced through engineering and design. Mitigation for these impacts is described in the Transportation Discipline Report (Parametrix, 2016a).

City of Seattle Codes: Zoning, Shoreline, Critical Areas, and Historic Preservation

The Missing Link project would be allowed in all zoning and shoreline designations within the study area. The Build Alternatives would be designed in compliance with critical areas regulations and would be subject to approval of the Department of Neighborhoods Office of Historic Preservation for compliance with the Ballard Avenue Landmark District requirements, where applicable. The Build Alternatives may make the area more attractive to development; however, any new development would be required to be consistent with uses allowed in each zone.

4.3.3 Shilshole South Alternative

Construction

In addition to the construction impacts described in Section 4.3.2, Impacts Common to All Build Alternatives, the Shilshole South Alternative could affect shorelines. Small portions of the Shilshole South Alternative are within the UI shoreline district (see Figure 4-3). Construction within the shoreline must protect shoreline resources such as water quality or any cultural resources present. As described in other chapters of this DEIS, the project would include BMPs to ensure consistency with these requirements. The project would comply with applicable critical areas and shoreline regulations.

Operation

Effect on Existing Uses

In the BINMIC, industrial uses, and especially water-dependent and water-related industrial uses, are preferred. Land uses abutting or gaining access along the Shilshole South Alternative are approximately 54% industrial, approximately 38% commercial, and about 5% vacant, with other uses composing about 3% of the total (see Figure 4-7). The abutting parcels for this alternative include about 1.34 million square feet of land in industrial use, the most of any Build Alternative. The mix of land uses abutting the Shilshole South Alternative is substantially more industrial compared to the overall study area, and is about 5% more commercial and less residential.

Of the 40 total uses abutting or gaining access along the Shilshole South Alternative, 15 (about 38%) are water-dependent and 12 (30%) are water-related. This alternative has the highest number of adjacent water-dependent uses of any Build Alternative, and has the second-highest occurrence of adjacent lands with water-related uses. Overall, water-dependent and water-related uses combined occupy the highest concentration of land (68%) along the Shilshole South Alternative. The viability of these uses depends on their proximity to water, making them particularly hard to locate. Because of their industrial nature, their operations depend on freight mobility. Freight vehicles tend to occupy more right-of-way to conduct business activities, which could conflict with the multi-use trail.

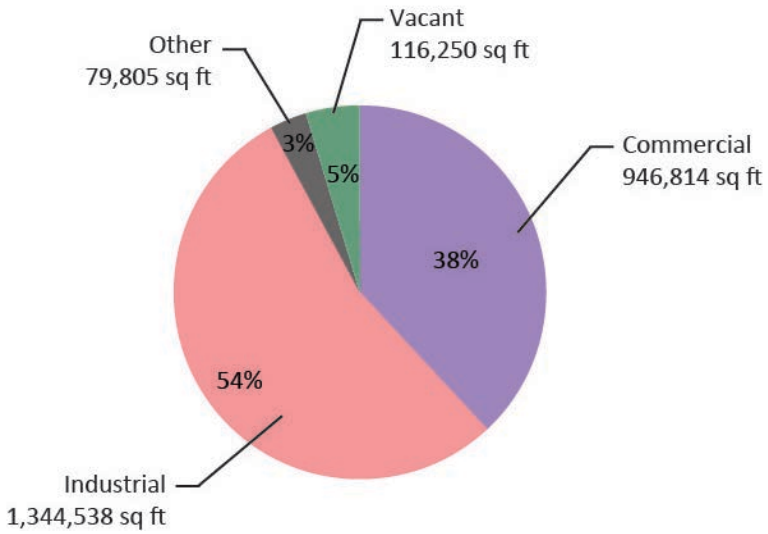

Figure 4-7. Existing Land Uses along the Shilshole South Alternative

Changes in traffic flow and access can disrupt normal activities and impact the viability of a land use. Roadway improvements included in the Shilshole South Alternative would maintain or improve traffic flow along this trail alignment (Parametrix, 2016a). This alternative would cross about 41 driveways and loading docks, similar to the Ballard Avenue Alternative (which has 42) (Parametrix, 2016a). Where the trail intersects access locations, vehicles would need to stop and check the trail for pedestrians and bicyclists before advancing, resulting in minor delays to business activities. This impact would likely occur for only short periods, mostly during commute times, and would not be significant. Some drivers would view this as an inconvenience, and it could add incrementally to operating costs for some businesses, but it is not likely to result in land use changes.

The Shilshole South Alternative is the only Build Alternative where no designated loading spaces would be permanently removed. However, some undesignated loading spaces may be removed or impacted, including driveways that cross the trail alignment where undesignated loading activities currently occur (Parking Discipline Report; Parametrix, 2016b). Several commercial and industrial uses have high truck loading, unloading, and delivery activity at driveway locations relative to other uses. Because uses are highly industrial along this alignment, the loss of loading spaces and delays during loading and unloading activities could negatively impact industrial uses. Loading activities that occur within the trail alignment would need to be relocated or the business would need to otherwise adapt because vehicles would not be allowed to block the trail while loading and unloading. Required adjustments and delays could increase costs for businesses, but are not expected to cause significant impacts because businesses would likely adjust their practices around these areas (ECONorthwest, 2016).

The Shilshole South Alternative would permanently remove about 261 parking spaces and the most non-metered parking spaces of any Build Alternative (Parametrix, 2016b). This number includes unregulated parking that is often double- and sometimes triple-parked, so this number is conservatively high. Removal of these parking spaces would impact the overall parking availability for businesses in the area, the Ballard Farmers Market, and other special events. Businesses along the alignment largely use the spaces for employee parking, and completion of the trail would require employees to use other parking areas or commute by transit or nonmotorized means. While this could result in inconvenience and increased costs for some businesses, it is not expected to significantly impact businesses. It would contribute to a trend of increased congestion in the area that may deter some customers and employees, who may choose to shop and/or work in locations with available parking.

Many nonmotorized users currently travel on the segment of the Shilshole South Alternative east of 24th Ave NW to connect the east and west trail ends because this is generally the shortest, flattest, and fastest route. The number of overall users along the entire alignment would increase under this alternative (Parametrix, 2016a). The Shilshole South Alternative also would channel many more recreational users, in addition to commuters, through the manufacturing and industrial area, particularly in the area between the Ballard Locks and 24th Ave NW, which currently has few recreational users. While other sections of the alignment currently accommodate nonmotorized uses, this segment does not, so businesses would likely experience a more dramatic shift in normal activities to accommodate the influx of new, nonmotorized trail users. This increase in nonmotorized users would likely increase the number of user conflicts with vehicles accessing their businesses, resulting in potential delays that could cause inconvenience and/or additional costs for businesses along this section of the route. These additional delays and associated costs are not expected to result in the businesses closing, but could add to general increases in costs of doing business in this area.

Along Shilshole Ave NW and NW 45th St, the volume of nonmotorized users would continue to grow under the No Build and Shilshole South Alternatives. Because nonmotorized users already use this route, there could be a less noticeable impact than at the west end of this alternative. Industrial vehicles (such as fork lifts) and heavy-duty commercial trucks are common along this alternative alignment, with small commercial trucks less common. Conflicts between vehicles and trail users along this alternative alignment could cause additional delays for freight, with associated increased costs as described above.

While additional delays in access and freight movement may occur, the trail would not prohibit access to any properties. Land use regulations would prevent a major change in land use, and the impact would not be significant. Uses consistent with plans, policies, and land use codes that have a lower need for freight and commercial access could be permitted in this area, and changes in use could occur over time.

Consistency with Adopted Plans, Policies, and Codes

The Shilshole South Alternative is consistent with adopted plans and policies, except the BINMIC policies. The primary inconsistencies with BINMIC policies relate directly to the trail being located within the BINMIC, which cannot be mitigated except by reducing the types of conflicts that the policy seeks to avoid, which are primarily related to transportation. By increasing access delays for freight vehicles, the Shilshole South Alternative could cause minor impacts on water-dependent and water-related industrial uses, which are specified as preferred uses in the BINMIC policies. None of these impacts are considered significant because they would not cause a permanent loss of a land use that is preferred under adopted City of Seattle policies.

City of Seattle Comprehensive Plan

Approximately 4,455 linear feet of the Shilshole South Alternative lies within the BINMIC, representing about 70% of the total 6,437 linear feet for this alternative (Table 4-1). The Shilshole South Alternative is generally not consistent with policies that encourage trails to be located outside of the BINMIC. (The Shilshole North Alternative has slightly more trail length within the BINMIC but is relatively similar in this regard.)

The Comprehensive Plan supports locating the trail in the Ballard Hub Urban Village, and 30% (1,982 linear feet) of the alignment is within this area. Of all the Build Alternatives, the Shilshole South Alternative provides the smallest portion of the trail directly within the urban village hub and abuts mostly industrial and auto-oriented commercial uses outside of the core of Ballard. Therefore, trail users could need to leave the trail and specifically seek out goods, services, and entertainment in other areas of Ballard.

The Shilshole South Alternative would abut the largest number of water-related and water-dependent uses of the Build Alternatives (Table 4-1). The BINMIC policies call for the highest priority to be placed on water-dependent and water-related industrial uses. The Shilshole South Alternative could cause minor disruptions to driveway operations for these types of uses, an adverse impact that could be minimized (but not completely eliminated) through the design measures described in the Transportation Discipline Report (Parametrix, 2016a).

The Comprehensive Plan contains goals and policies to improve industrial traffic flow to and through the BINMIC, facilitate truck mobility, and enhance truck connections. The Shilshole South Alternative could reduce the level of service at one intersection, and could improve traffic flow at others. While this alternative could have minor impacts on truck mobility, it would reestablish NW 45th St as a two-way street open to trucks, thus improving traffic flow and connections in that portion of the study area and continuing to support industrial land uses. A new signal at 17th Ave NW and Shilshole Ave NW could improve traffic flow, which could benefit both freight and non-freight traffic.

Seattle Department of Transportation Freight Mobility Strategic Action Plan

Because the Shilshole South Alternative fronts highly industrialized, water-related, and water-dependent uses, and because a substantial portion of it is on Shilshole Ave NW (a major truck street), conflicts could occur between trail users and existing industrial uses, which is not consistent with the Freight Mobility Strategic Action Plan. One of the functions of the project is to separate nonmotorized traffic on the trail from trucks on the roadway to reduce user conflicts that occur under the No Build Alternative, although separation would not eliminate all such conflicts.

City of Seattle Codes: Zoning, Shoreline, Critical Areas, and Historic Preservation

Land adjacent to the Shilshole South Alternative is mostly zoned to accommodate medium to heavy industrial uses. As stated for all Build Alternatives, the Missing Link would be allowed in all industrial zones, and the Shilshole South Alternative is consistent with use allowances in the zone. Unlike other Build Alternatives, the Shilshole South Alternative is completely outside of the pedestrian overlay along NW Market St, which encourages uses of this kind in the downtown Ballard area. While not specifically consistent with the goal to encourage a pedestrian-oriented streetscape within the downtown Ballard area, it is generally consistent in that it would provide pedestrian and nonmotorized access nearby.

A portion of the Shilshole South Alternative is within the UI shoreline environment (Figure 4-3). The Missing Link would be permitted in this environment. The project would be required to comply with all applicable shoreline regulations.

An abandoned landfill and a liquefaction-prone zone are adjacent to the Shilshole South Alternative, and fish and wildlife habitat conservation areas are located within the project footprint near the Ballard Locks. Development in this area would comply with critical areas regulations.

The Shilshole South Alternative lies outside of the Ballard Avenue Landmark District, and would therefore not be required to comply with development requirements for the district.

4.3.4 Shilshole North Alternative

Construction

Construction impacts that could occur are described in Section 4.3.2, Impacts Common to All Build Alternatives. In addition, small portions of the Shilshole North Alternative are within the UI shoreline

environment (see Figure 4-3). Construction within the shoreline must protect shoreline resources such as water quality or any cultural resources present. As described in other chapters of this DEIS, the project could include BMPs to ensure consistency with these requirements. The project would comply with applicable critical areas and shoreline regulations.

Operation

Effect on Existing Uses

In the BINMIC, industrial uses are preferred, especially water-dependent and water-related industrial uses. Land uses abutting the Shilshole North Alternative are approximately 67% industrial, 25% commercial, and less than 1% residential, with a small mix of other uses (see Figure 4-8). All uses along this alignment take access directly from the street frontage.

The amount of land adjacent to the Shilshole North Alternative that is in industrial use is less than half of that adjacent to the Shilshole South Alternative, even though a higher percentage of the land uses are industrial. Because of the relatively tight configuration of industrial uses along this alignment, these uses could generally have less land available to relocate displaced loading spaces or to physically reconfigure operations than those along the Shilshole South Alternative. The mix of land uses abutting the Shilshole North Alternative is highly industrial, less commercial, and less residential than the overall study area.

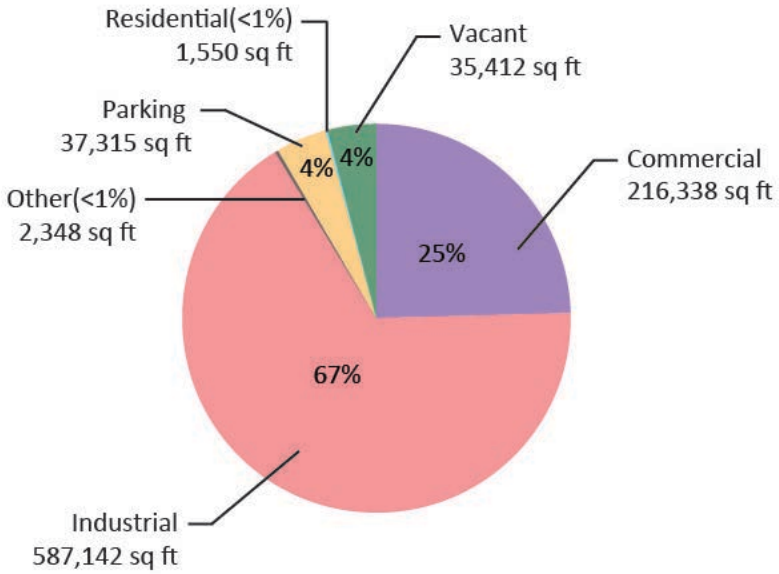

Figure 4-8. Existing Land Uses along the Shilshole North Alternative

Of the 62 total uses abutting this alternative, four uses (6%) are water-dependent and about 16 uses (26%) are water-related. Salmon Bay Sand and Gravel is a water-related use with seven parcels on the landward side of Shilshole Ave NW. This alternative has fewer water-dependent and more water-related uses than Shilshole South, and more water-related and water-dependent uses than the Leary and Ballard Avenue Alternatives.

Changes in traffic flow and access can disrupt normal activities and impact the viability of a land use. Roadway improvements included in the Shilshole North Alternative would maintain or improve traffic flow, but additional delays may be experienced at some intersections and driveways where the trail intersects with access.

Of all the Build Alternatives, the Shilshole North Alternative has the highest number of uses that are dependent on loading zone and access space along the alignment. This alternative would cross approximately 58 loading zones and driveways. This alternative also would remove the highest number of loading zone spaces (approximately 24). Because industrial and commercial uses typically have high loading, unloading, and delivery activity at driveways, the removal of loading zones and delays at access points could impact business activities. However, delays to business operations from the new trail crossings are expected to occur for only short periods, mostly during commute periods (Parametrix, 2016a, 2016b), and are therefore not expected to substantially affect business operations or viability. Businesses that use driveways crossing the trail alignment for loading activities may need to adjust their operations to ensure that the trail is not blocked by vehicles except during active ingress and egress at the access point.

The Shilshole North Alternative could permanently remove about 227 parking spaces (Parametrix, 2016b). The removal of these parking spaces could impact parking availability for businesses and special events. Generally, industrial and commercial uses have high truck loading, unloading, and delivery activity relative to other uses. Removal of these spaces could have negative impacts on business activity but is not expected to result in a significant impact to land uses along this alignment because there are other travel modes available for workers, and other off-street parking options. Loading and unloading may need to be relocated for some businesses, possibly requiring spaces to be located across the street or on side streets.

Many nonmotorized users currently use the segment of the Shilshole North Alternative between 24th Ave NW and 17th Ave NW to connect the east and west trail ends because this is generally the shortest, flattest, and fastest route. The number of overall users along the entire alignment could increase under this alternative (Parametrix, 2016a).

Consistency with Adopted Plans, Policies, and Codes

The land use impacts under the Shilshole North Alternative would be largely the same as under the Shilshole South Alternative. The Shilshole North Alternative could adversely affect fewer water-dependent industrial uses and thus may be considered slightly more consistent with BINMIC policies. No significant land use impacts are expected because no permanent land use changes are anticipated.

City of Seattle Comprehensive Plan

Approximately 4,512 linear feet of the Shilshole North Alternative is within the BINMIC, representing 68% of the total 6,647 linear feet for this alternative; this is comparable to the Shilshole South Alternative (Table 4-1). The Shilshole North Alternative is the least consistent alternative with regard to the policy that encourages the trail to be located outside of the BINMIC. The Shilshole North Alternative would place about 2,135 linear feet of trail (32% of the alignment) in the Ballard Hub Urban Village. The plan specifically supports the addition of the trail, associated right-of-way improvements, and vibrancy that the Missing Link could provide. The Shilshole North Alternative would not displace any existing industrial or water-related or water-dependent uses.

The Comprehensive Plan contains goals and policies to improve industrial traffic flow to and through the BINMIC, facilitate truck mobility, and enhance truck connections. The Shilshole North Alternative would be consistent with these policies because it could generally improve the level of service on roadways, resulting in approximately similar conditions as the No Build Alternative. Some intersection operations, such as 11th Ave NW and NW 46th St, would be improved under this Build Alternative compared to the No Build Alternative, improving freight mobility and intersection operations. Some intersections could increase in level of service, and some vehicles could experience additional delays crossing driveways.

Seattle Department of Transportation Freight Mobility Strategic Action Plan

Because the Shilshole North Alternative fronts highly industrialized, water-related, and water-dependent uses, and because a substantial portion of it is on Shilshole Ave NW, a major truck street, conflicts could occur between trail users and existing industrial uses, which is not consistent with the Freight Mobility Strategic Action Plan. As with the Shilshole South Alternative, separation of nonmotorized traffic on the trail from trucks on the roadway could limit but not completely eliminate such user conflicts.

City of Seattle Codes: Zoning, Shoreline, Critical Areas, and Historic Preservation

Land adjacent to the Shilshole North Alternative is mostly zoned to accommodate medium to heavy industrial and commercial uses. A portion of the Missing Link along NW Market St would be in the NC3 zone, which supports pedestrian-oriented uses. A nominal segment of the alignment at the intersection of 24th Ave NW and NW Market St is in a pedestrian overlay, which encourages such uses in the downtown Ballard area.

Similar to the Shilshole South Alternative, a portion of the Shilshole North Alternative is within the UI shoreline environment. The project would be required to comply with all applicable shoreline regulations.

No portions of the Shilshole North Alternative are within the Ballard Avenue Landmark District (Figure 4-3). Similar to other alignments, critical areas are present in the western portion of the alignment. Development in this area would comply with critical areas regulations.

4.3.5 Ballard Avenue Alternative

Construction

Construction impacts that could occur are described in Section 4.3.2, Impacts Common to All Build Alternatives. In addition to the construction impacts identified, the Ballard Avenue Alternative could affect shorelines. Similar to the Shilshole North and Shilshole South Alternatives, a small portion of this alternative is within the UI shoreline district (see Figure 4-3). Construction within the shoreline district must protect shoreline resources such as water quality or any cultural resources present. As described in other chapters of this DEIS, the project could include BMPs to ensure consistency with these requirements. The project would comply with applicable critical areas and shoreline regulations.

Operation

Effect on Existing Uses

Land uses abutting or gaining access along the Ballard Avenue Alternative are approximately 45% industrial, 25% commercial, and 13% residential, with a mix of other uses (see Figure 4-9). All uses abutting this alignment access their properties directly from the street frontage. The mix of land uses adjacent to this alternative is slightly more industrial, less commercial, and more residential than the overall study area. Of the 90 total uses adjacent to the alternative, five uses (6%) are water-dependent and four uses (4%) are water-related.

The southeast portion of the Ballard Avenue Alternative is largely industrial, and the middle and northwest segments are largely retail commercial, transitioning into more multi-family uses near the western portion (Figure 4-2). The north and west portions are heavily commercial, retail, and service uses with some offices. The parcels are relatively small and most have no off-street parking. The Ballard

Avenue Landmark District largely inhibits redevelopment, and existing uses depend on car, bike, and pedestrian access.

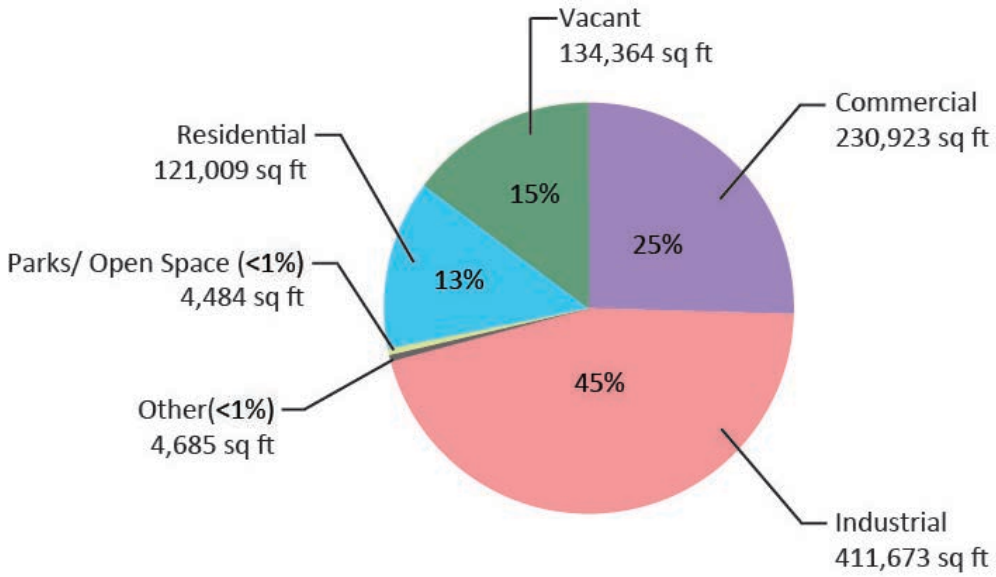

Figure 4-9. Existing Land Uses along Ballard Avenue Alternative

Existing industrial and commercial uses in the southeast portion of the alignment are mostly small-scale industrial on relatively small parcels compared to the Shilshole North and South Alternatives. Future uses in the Ballard Avenue Landmark District could accommodate a mix of industrial, office, commercial, and residential development.

Changes in traffic flow and access can disrupt normal activities and impact the viability of a land use. Roadway improvements included in the Ballard Avenue Alternative would likely improve traffic flow (which could encourage business patronage), but this alternative could cause additional vehicle delays at some intersections and where the trail intersects with driveways (Parametrix, 2016a). This could negatively impact the flow of freight and business operations; however, the delays at driveways are expected to be very minor (approximately 10–12 seconds, or about 3 seconds of additional delay during commute times compared to the No Build Alternative, on average) and would not significantly impact business uses. The Ballard Avenue Alternative could also permanently remove about 14 loading zone spaces (Parametrix, 2016b), which could impact business uses and the Ballard Farmers Market.

The Ballard Avenue Alternative could remove about 198 parking spaces that serve adjacent land uses and special events (Parametrix, 2016b). This loss of on-street parking is not expected to significantly affect land uses along the Ballard Avenue Alternative.

The Ballard Avenue Alternative could channel many more recreational users through areas of commercial, retail, and entertainment uses than the Shilshole North and Shilshole South Alternatives. Delivery vehicles associated with business activity along this alternative alignment are largely small to medium commercial vehicles, except in the industrial area near the southeast end of the alignment. The nature of many of the commercial, retail, and entertainment uses along this alternative may be more consistent with trail user patronage than industrial uses. Nearby residential and commercial uses could serve as starting points and destinations for trail users.

Consistency with Adopted Plans, Policies, and Codes

The Ballard Avenue Alternative is consistent with adopted plans and policies, except the BINMIC policies described for the other Build Alternatives. However, it is more consistent with BINMIC polices than the Shilshole South and Shilshole North Alternatives because less of the trail would be within the BINMIC. The Ballard Avenue Alternative could affect far fewer water-dependent and water-related industrial uses than the Shilshole South or Shilshole North Alternatives. As with other Build Alternatives, none of the impacts to land use from the Ballard Avenue Alternative would be significant because the alternative is not expected to cause any land uses to change.

City of Seattle Comprehensive Plan

The Ballard Avenue Alternative is more consistent with Comprehensive Plan policies and goals that promote the expansion of open space networks in high-density areas targeted for residential growth with high pedestrian, bicycle, or transit use than the Shilshole South and Shilshole North Alternatives, which run predominantly through industrialized areas not as well served by transit.

Approximately 2,814 linear feet of the Ballard Avenue Alternative is within the BINMIC, representing 37% of the total 7,518 linear feet for this alternative. This is the second-least of any alternative and similar to the Leary Alternative (Table 4-1). This alignment contains the most linear feet of trail (4,704 feet) within the Ballard Hub Urban Village, consistent with the goals and policies in the Comprehensive Plan that encourage development of nonmotorized infrastructure, and the BGT specifically.

The Ballard Avenue Alternative abuts far fewer water-dependent and water-related uses than the Shilshole North or South Alternative. It has more water-dependent uses but fewer water-related uses than the Leary Alternative, and is somewhat similar to the Leary Alternative in total water-dependent and water-related uses.

Seattle Department of Transportation Freight Mobility Strategic Action Plan

The Ballard Avenue Alternative would be more consistent with the freight goals and policies than the previously described alternatives because it locates less trail in the BINMIC than the Shilshole South and Shilshole North Alternatives. However, the removal of loading spaces would not be consistent with the policies and goals that support the need for deliveries and collection of goods.

City of Seattle Codes: Zoning, Shoreline, Critical Areas, and Historic Preservation

Zoning adjacent to the Ballard Avenue Alternative allows for a broad mix of activity, including industrial (IC), mixed- and light-industrial (IG2, IB), commercial (C1, NC2, NC3), and multifamily (LR3). The southern and eastern portions of the alternative are industrial, and the zones allow a mix of industrial uses including IC that could accommodate large offices and other nonindustrial uses. The C1 zone is generally applied to areas with limited pedestrian and transit services. (Under this alternative, the City could reassess the zoning designation of the C1 properties along the multi-use trail.) The NC2 and NC3 zones specifically support active and attractive pedestrian-oriented experiences, and the alignment follows pedestrian overlays on 22nd Ave NW, NW Market St, and 24th Ave NW (Figure 4-5).

A portion of the Ballard Avenue Alternative is within shoreline district, where the proposed use would be permitted. Similar to other alternatives, the western portion of the alignment is within critical areas (Figure 4-3), and development in this area would need to be consistent with critical areas regulations.

A portion of the alternative, from NW Market St to NW Dock Pl, is within the Ballard Avenue Landmark District. This area is particularly sensitive to changes in character, culture, social, and historic use. The project could be consistent with the Ballard Avenue Landmark District, subject to compliance with additional regulations and approvals.

4.3.6 Leary Alternative

Construction

Construction impacts that could occur are described in Section 4.3.2, Impacts Common to All Build Alternatives.

Operation

Effect on Existing Uses

Land uses abutting the Leary Alternative are approximately 33% industrial, 37% commercial, and 5% residential, with a mix of other uses (see Figure 4-10). All uses abutting this alignment take access directly from the street frontage. The mix of land uses along this alternative is less industrial, more commercial, and similarly residential compared to the study area as a whole. This alternative contains the lowest proportion and least land area occupied by industrial uses of any of the alternatives. Of the 58 total uses, one use (2%) is water-dependent and about six uses (10%) are water-related.

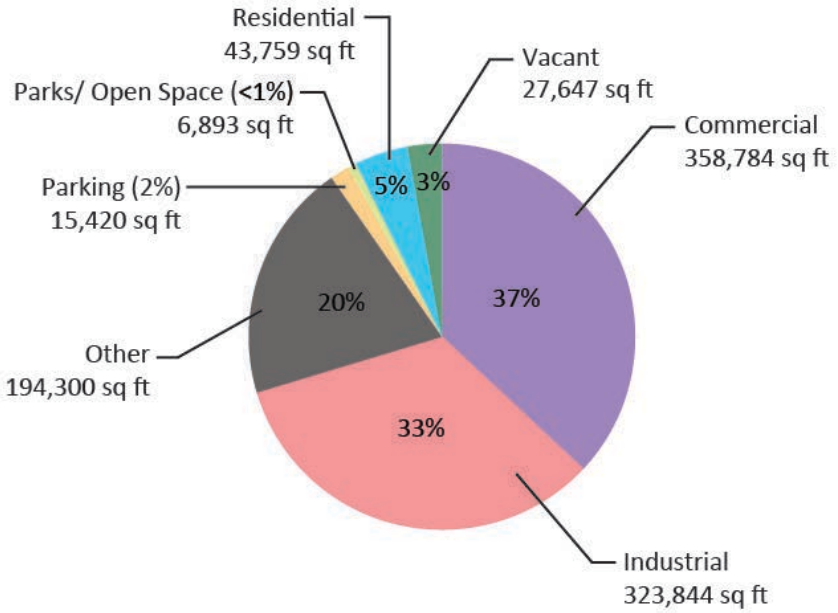

Figure 4-10. Existing Land Uses along the Leary Alternative

Changes in traffic flow, access, and the ability of a land use to continue normal activities can impact its viability. Under the Leary Alternative, level of service could be worsened at about six intersections compared to the No Build and other Build Alternatives (Parametrix, 2016a). This could negatively impact the delivery of goods to and from the area, and other vehicle movement. However, some intersection operations could also be improved and could offset some of this impact.

Approximately 33 driveways and loading docks are located along the Leary Alternative alignment, the least of any Build Alternative. About 15 loading zone spaces could be removed with construction of this alternative (Parametrix, 2016b). Similar to other alternatives, vehicles crossing the trail could experience minor delays as drivers stop and check for pedestrians and bicyclists before advancing to the roadway (Parametrix, 2016a, 2016b). This impact would likely occur for only short periods, mostly during commute times, and is not expected to be significant.

The Leary Alternative could remove approximately 103 parking spaces, the fewest of any of the Build Alternatives (Parametrix, 2016b). Similar to other Build Alternatives, businesses and residential uses could be impacted by the reduction in parking spaces. Fewer spaces may be available for special events in the study area. This loss of on-street parking is not expected to significantly affect land uses along the Leary Alternative alignment.

The Leary Alternative would locate the trail along an alignment with the lowest proportion of industrial uses (Table 4-1). Commercial uses along this alternative are proportionately similar to the Shilshole South Alternative. Many of the uses along the Leary Alternative within the Ballard Hub Urban Village rely on small to medium commercial trucks for the delivery of goods. In the southeast corner of the alignment, uses include several car dealerships and repair businesses that use NW Leary Way for loading, unloading, and towing. Completion of the trail could require businesses to adjust loading locations and activities to ensure that trail users are able to pass without obstruction. Commercial uses outside of the commercial/ industrial area to the southwest are largely retail-oriented. The Leary Alternative could benefit retail markets by expanding them to trail users, and trail users could have increased retail opportunities.

Consistency with Adopted Plans, Policies, and Codes

As with all other Build Alternatives, the Leary Alternative is consistent with plans and policies, except the BINMIC policies. However, it is more consistent with BINMIC polices than the other alternatives because less of the trail would be located within the BINMIC. The Leary Alternative could affect far fewer water-dependent and water-related industrial uses than the other alternatives. As with other Build Alternatives, none of the impacts to land use from the Leary Alternative are expected to be significant.

City of Seattle Comprehensive Plan

Approximately 2,308 linear feet of the Leary Alternative alignment is within the BINMIC, representing about 34% of the total 6,774 linear feet of this alternative (Table 4-1). (The proportion of this alternative within the BINMIC is comparable to the Ballard Avenue Alternative, but the Leary Alternative is slightly shorter.) Additionally, the Leary Alternative is second only to the Ballard Avenue Alternative for linear feet of trail within the Ballard Hub Urban Village (4,466 linear feet). Completion of the trail within this area would support plans and policies for the Ballard Hub Urban Village. Of all the Build Alternatives, the Leary Alternative would locate the least amount trail through the BINMIC, thereby minimizing disruptions to driveway operations and loading within the industrial center. The disruption could be minimized (but not completely eliminated) through the design measures described in the Transportation Discipline Report (Parametrix, 2016a). The Leary Alternative would not displace any existing industrial uses or other uses.

Seattle Department of Transportation Freight Mobility Strategic Action Plan

Similar to the Ballard Avenue Alternative, the Leary Alternative would be more consistent the Freight Mobility Strategic Action Plan than the Shilshole North and Shilshole South Alternatives because it locates less trail in the BINMIC and adjacent to industrial uses whose operations could be affected. Additionally, many of the water-related and water-dependent uses along the alignment are outside of the

BINMIC. However, the removal of loading spaces and minor delays to operations at access points would not be consistent with the policies and goals that support the need for deliveries and collection of goods.

City of Seattle Codes: Zoning, Shoreline, Critical Areas, and Historic Preservation

Zoning adjacent to the Leary Alternative allows for mixed-industrial/commercial (IG2, IC) and commercial (C1, NC3). The NC3 zone specifically supports active and attractive pedestrian-oriented experiences. The C1 zone is generally applied to areas with limited pedestrian and transit services. Under this alternative, the City could reassess the zoning designation of C1 properties along the multi-use trail. The Leary Alternative passes through Ballard's downtown "core" on NW Market St, capitalizing on the P1 designation's intent of an intense pedestrian-oriented experience in this area. Consistent with the Land Use Code's intent for this overlay, this portion of the alignment is developed with mixed street-level uses that concentrate retail and service opportunities.

No part of the Leary Alternative is within the shoreline district or the Ballard Avenue Landmark District (Figure 4-3). Construction within critical areas near the existing west trail end would need to comply with critical areas regulations.

4.3.7 Connector Segments

As with the primary Build Alternatives, the connector segments are consistent with adopted plans and policies, except the BINMIC policies. Virtually all of these segments are located at least partially within the BINMIC. However, these segments could be used to reduce the total length of trail in the BINMIC by connecting to either the Ballard Avenue or Leary Alternative outside of the BINMIC.

Ballard Avenue NW

The Ballard Avenue NW connector segment is entirely outside of the BINMIC designation; it lies within the NC2 and NC3 zoning designations, and is outside of the Ballard Avenue Landmark District. This segment would be consistent with adopted plans, policies, and codes.

NW Vernon Place

Approximately 50% of the NW Vernon Place connector segment is within the BINMIC and would be inconsistent with the same plan goals and policies as previously described. The segment lies within the IG2 and NC2 zoning designations. A portion of the segment is within the Ballard Avenue Landmark District. The project could be consistent with the Ballard Avenue Landmark District, subject to compliance with additional regulations and approvals.

20th Avenue NW

Approximately 25% of the 20th Avenue NW connector segment is within the BINMIC and would be inconsistent with the same plan goals and policies as previously described. The segment lies within the IG2, NC3, IC, and C1 zoning designations. A portion of the segment is within the Ballard Avenue Landmark District. The project could be consistent with the Ballard Avenue Landmark District, subject to compliance with additional regulations and approvals.

17th Avenue NW

The 17th Avenue NW connector segment is entirely within the BINMIC and would be inconsistent with the same plan goals and policies as previously described. The segment is within the IG2 zoning designation.

15th Avenue NW

The entire 15th Avenue NW connector segment is within the BINMIC and would be inconsistent with the same plan goals and policies as previously described. The segment is within the IG2 zoning designation.

14th Avenue NW

The entire 14th Avenue NW connector segment is within the BINMIC and would be inconsistent with the same plan goals and policies as previously described. The segment is within the IG2 zoning designation.

4.4 Avoidance, Minimization, and Mitigation Measures

The following measures are common to all Build Alternatives.

4.4.1 Construction

Construction of the Missing Link would cause traffic delays and disruptions to residential and business uses in and around the project footprint. The following measures could be used to minimize those impacts:

- Construction and staging plans could be required to minimize impacts to business and residential access, maintain traffic flow, and maintain business visibility to encourage continued patronage.
- The public and business owners could be provided information about the construction schedule, hours of operation, location and duration of lane closures, and changes to parking provisions. This information would allow sensitive businesses to coordinate business operations such as delivery times, hours of operation, and other activities accordingly, as well as to provide information to customers to encourage continued patronage.
- The construction schedule and hours of operation could be timed and coordinated with other construction projects to minimize impacts to adjacent and surrounding uses so that potential user conflicts.
- Additional measures, such as flaggers, could be employed to minimize freight delays in areas heavily used by freight, consistent with City policies promoting efficient transportation flow in industrial areas and to minimize impacts to industrial and manufacturing uses.
- To the extent feasible, loading zones and access could be maintained or alternative loading locations identified to minimize impacts to uses that rely on the delivery and shipment of goods.

4.4.2 Operation

The alternatives evaluated for the Missing Link are all partially located within industrial zoned areas and the BINMIC. City plans and policies focus on the preservation of land in this area for water-dependent and industrial activities. Therefore, minimizing the extent of the trail within the BINMIC could minimize impacts. Connector segments could be utilized to channel trail users into the Ballard Hub Urban Village, where zoning and policies encourage trail completion, connection, and user activity during day and evening hours. Additional mitigation measures described in the Transportation Discipline Report (Parametrix, 2016a) could also reduce trail impacts on adjacent land uses.

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CHAPTER 5: RECREATION

5.1 Introduction

This section describes existing recreation in the study area and potential recreation impacts. The study area includes the project footprint and the surrounding recreational areas that may be affected by construction or operation of the project. Figure 5-1 shows recreational areas within and adjacent to the project footprint. Recreational sites and uses that are accessible from the trail network but outside of the immediate vicinity are also included within the study area and are shown in Figure 5-2.

5.2 Affected Environment

5.2.1 Regional and National Recreation Use and Trends

In 2012, the Washington State Recreation and Conservation Office (RCO) conducted a survey of residents of the Seattle-King Region (as defined by RCO) on recreation trends. The survey found the following information about bicycle riding in King County:

- 38% of residents in King County engage in bicycle riding;
- The average bicycle rider does so on 29.1 days a year;
- 27.6% of bicyclists ride on trails;
- 27% of bicyclists ride on roads and streets; and
- 22.5% of bicyclists ride on rural trails.

The survey also found that 78% of King County residents walk without a pet; 44% jog or run; and 44% walk with a pet. Survey respondents with children were asked which activities their children participate in and responded that 49% walk, 29% bicycle, and 27% jog or run. Survey respondents were also asked how they get to recreation areas, and results indicated that 57% walk or jog to recreation areas, and 23% bicycle to recreation areas. The survey information shows that connectivity of multi-use trails like the BGT is a key recreational benefit not only for users of the trail itself, but also for users of other recreational sites who travel to those sites by walking or bicycling (RCO, 2012; City of Seattle, 2014).

Also in 2012, the Sports and Fitness Industry Association (SFIA) published a Sports, Fitness, and Leisure Activities Participation Report. The report found that nationwide, walking for fitness was the most common recreational activity, with 110.9 million participants annually. Running and jogging were the second most common activity, with 44.3 million participants. Bicycling on roads or paved surfaces was the fourth most common, with 39.2 million participants. The survey also found that, nationwide, running, jogging, walking for fitness, and bicycling on roads and other paved surfaces are all increasing in participation annually (as cited in City of Seattle, 2014).

Figure 5-1. Recreation Areas in the Study Area

Figure 5-2. Recreation Site Accessible from the Trail Network

5.2.2 **Bicycling, Jogging, and Walking in the Study Area**

The Missing Link project would create a multi-use trail segment to be used primarily by bicyclists, walkers, and joggers. Bicycling, walking, and jogging are major recreation activities in the study area. People interested in bicycling, walking, and jogging use the existing segments of the BGT, King County's Regional Trail System (accessed through the BGT), the SDOT bikeway network in Ballard, Shilshole Ave NW to connect the two existing segments of the BGT, and other streets and sidewalks in the area.

The existing BGT is a 19.8-mile long multi-use trail used by walkers, runner, bicyclists, and skaters. Within the City of Seattle, ownership and maintenance of the trail are shared between SDOT and Seattle Parks and Recreation. The trail is owned and operated by King County outside of Seattle. The trail runs in two disconnected segments. The shorter segment runs from Golden Gardens Park in northwest Ballard to the Ballard Locks. The main segment of the trail resumes at NW 45th St and 11th Ave NW and runs along the Ship Canal to the University of Washington campus, where it turns north and continues until reaching Bothell. User counts and information for the BGT are included in Section 7.2.4 of the Transportation Discipline Report (Parametrix 2016). The report found that pedestrian volumes are approximately 30% of bicycle volumes on the trail. Bicycle volumes are typically higher on weekdays than on weekends, indicating the high number of commuters using the BGT in addition to recreational users.

The Burke-Gilman Trail is part of King County's Regional Trail System, which includes over 175 miles of multi-use off-road trails and over 300 planned miles of trails. Other major trails in the system include the East Lake Sammamish Trail, Sammamish River Trail, and Interurban Trail.

Because it connects the two current end points of the BGT, Shilshole Ave NW is commonly used by people despite the lack of dedicated bicycle lanes or pedestrian facilities. Shilshole Ave NW is an arterial running parallel to the Ship Canal through an industrial area. Trucks use the street to access industrial businesses. Shilshole Ave NW is heavily used by visitors on evenings and weekends for free parking to commercial areas on Ballard Ave NW and NW Market St and to the Sunday Ballard Farmers Market. Throughout the study area, recreational users bicycle on public streets and jog and walk on public sidewalks.

SDOT maintains a 450-mile bikeway network in the city made up of separate pathways, marked streets, and connectors. The BGT is part of this network. The network also includes the NW 58th St Greenway and the 17th Ave NW Greenway. A greenway is a street right-of-way that, through a variety of design and operational treatments, gives priority to bicyclist and pedestrian circulation and open space over other transportation uses. The treatments may include sidewalk widening, landscaping, traffic calming, and other bicyclist- and pedestrian-oriented features. Among their many functions, greenways create open space opportunities in residential areas that may otherwise lack public open spaces. Neighborhood greenways are designated through neighborhood plans or other City adoption processes.

The NW 58th Street Greenway features pavement markings, a traffic-calming "safety island" at the intersection with 15th Ave NW, new crosswalks with bicycle-accessible signal buttons, and a widened sidewalk on Seaview Ave NW to allow access to the BGT.

Construction on the 17th Ave NW Greenway began in September 2015 and was completed in early 2016. The greenway stretches from NW 90th St to the intersection of 17th Ave NW and NW Dock Pl, from which it follows NW Dock Pl to Ballard Ave NW. The greenway features new curb ramps, crosswalks, crossing beacons, curb extensions, crossing improvements, natural drainage systems, and vehicle restrictions at various intersections. In addition, the 17th Ave NW and NW Dock Pl intersection will be reconfigured.

5.2.3 Existing Parks and Recreational Areas in the Project Vicinity

Major Recreational Attractions in the Study Area

In addition to City of Seattle-owned parks, the study area includes two major regional recreational sites (the Ballard Locks and the Ship Canal) and the Ballard Avenue Landmark District.

Ballard Locks

The Ballard Locks are operated by the Corps to allow boat passage between Lake Washington and Puget Sound and to regulate the water levels in Lake Washington. Recreational boaters travel through the Ballard Locks. The grounds of the Ballard Locks are operated as a park, with walking paths, lawn areas, a visitor's center, viewing windows to a fish ladder, and the Carl S. English, Jr. Botanical Garden. Boat watching is a major visitor use of the Ballard Locks. Visitors can cross the Ballard Locks by foot, and bicyclists and pedestrians often cross the Ballard Locks to travel between Magnolia and Ballard as an alternative to the Ballard Bridge. The Ballard Locks are a major tourist destination for the Ballard neighborhood.

Ship Canal

The Ship Canal, which connects Lake Washington to Puget Sound, is used for in-water recreation by boaters, kayakers, paddle boarders, and others. Many marinas are located along the shores of the Ship Canal in the vicinity of the study area.

Ballard Avenue Landmark District

Another major recreational activity in the study area is visiting historic areas of Ballard Ave NW. Ballard Ave NW between NW Market St and NW Dock Pl constitutes the historic Ballard Avenue Landmark District. The majority of buildings in the district were constructed from the 1890s to 1940s, and the historic character adds to the recreational quality of the district. The district features restaurants, coffee shops, boutiques, bars, and galleries. The historic aspects of the Landmark District are described in further detail in Chapter 10, Cultural Resources.

City of Seattle Parks

The City of Seattle Parks and Recreation operates 430 parks throughout the city, including athletic fields, tennis courts, neighborhood play areas, community centers, off-leash areas, swimming pools, and golf courses. City parks range from pocket parks and neighborhood parks primarily designed for local residents to large parks that attract tourists and visitors from other areas of the city and the region. City parks cover approximately 11% of the city's land area (City of Seattle, 2015). City parks along the alignments of the proposed Missing Link include Bergen Place Park and Marvin's Garden. Other parks in the vicinity of the study area include Ballard Playground and Community Center, Ballard Commons Park, Thyme Patch Park, and Gilman Playground.

Bergen Place Park

Bergen Place Park is located in Ballard between Leary Ave NW, 22nd Ave NW, and NW Market St. The park features benches, a community information kiosk, and a series of sculptures named "Witness Trees" created by artist Jenn Lee Dixon. The park is named after Bergen, Norway, a sister city of Seattle, and features a plaque in honor of the sister city relationship. Bergen Place Park was dedicated by King Olaf of Norway when it first opened in 1975. Bergen Place Park is frequently used as a location for events held in

Ballard, including the Ballard SeafoodFest, Syttende Mai, and the weekly Ballard Farmers Market (Section 5.2.5).

Marvin's Garden

Marvin's Garden is a 0.1-acre park at the corner of Ballard Ave NW and 22nd Ave NW. The park features benches, landscaping, and the Ballard Centennial Bell Tower.

Ballard Playground

The Ballard Playground and Community Center is located at 26th Ave NW and NW 60th St. The Community Center features an indoor pool. The playground features fields for soccer and baseball/softball as well as an ADA-compliant play area.

Ballard Commons Park

Ballard Commons Park is located at 22nd Ave NW and NW 57th St. The park is adjacent to the greenway on NW 58th St. The park features a skatepark, public art, lawns and benches, and ADA-accessible walkways. The park also features a spray park. The Ballard Branch of the Seattle Public Library and Ballard Customer Service Center (also commonly known as the Neighborhood Service Center) are located across the street from the park. The park was opened in 2005 and is 1.38 acres.

Thyme Patch Park

Thyme Patch Park is a small 0.11-acre park on NW 58th St near 28th Ave NW. The park was built on a vacant property acquired in 1998 to meet the gap in open space identified in the Crown Hill/Ballard Open Space and Recreation Plan (Seattle Parks and Recreation, 2016). The park features a P-Patch community garden, lawn, benches, and walkways.

Gilman Playground

Gilman Playground is a large (3.9-acre) park located at 9th Ave NW and NW 54th St. Amenities include restrooms, an ADA-compliant play area, and a water feature. The park also has a basketball court, an outdoor tennis court, and fields for soccer and baseball/softball.

Soundview Playfield, Salmon Bay Park, and Loyal Heights Playfield

The 17th Ave NW Greenway ends at Soundview Playfield at NW 90th St. Soundview Playfield is a 10.5-acre park owned and operated by Seattle Parks and Recreation featuring two baseball fields, a soccer field, a playground, walking trails, a water feature, and restrooms. The greenway also runs within two blocks of Salmon Bay Park and within three blocks of Loyal Heights Playfield, both owned and operated by Seattle Parks and Recreation. Salmon Bay Park is a 2.8-acre neighborhood park with picnic tables, benches, a playground, and restrooms. Loyal Heights Playfield is a 6.7-acre park featuring the Loyal Heights Community Center, a basketball court, fields for football and baseball/softball, a play area, and restrooms.

Shoreline Street Ends

Designated shoreline street ends throughout the Ballard neighborhood provide public shoreline access and views. Some street ends feature piers or boat ramps, while others simply feature a public space adjacent to the Ship Canal providing views of the water. The Seattle City Council adopted Resolution Number 29370

in June 1996 calling for the development of public access improvements to shoreline street ends. SDOT's Shoreline Street Ends Project is working to improve shoreline street ends throughout the city, adding additional public access and recreational opportunities. Street ends within or near the study area are described below.

11th Avenue NW Street End

The 11th Ave NW street end features native plantings, a shoreline viewing platform, a bench swing, and birdhouses. These features were installed in spring 2015 through collaboration between SDOT and the University of Washington Landscape Architecture Program.

Public Access Ramp at 14th Avenue NW

The 14th Avenue NW street end in Ballard features a free public boat ramp providing access to the Ship Canal. The site has two piers, two launch ramps, handicap parking spaces, and a portable restroom. Unlike other shoreline street ends, the public access ramp at 14th Ave NW is owned and operated by Seattle Parks and Recreation.

20th Avenue NW/Dock Pl NW Street End

Shoreline access is also available at a street end on the Ship Canal side of Shilshole Ave NW. The street end is not developed for recreational use, but it is accessible.

24th Avenue NW Street End

SDOT owns an existing pier at the 24th Avenue NW street end. The pier is used for water access and shoreline viewing. The pier is also used for public vessel moorage, which is limited to 2 hours. Moorage limits are enforced by the Harbor Patrol. This site has been proposed for a potential new park called the Threading the Needle Park, would include a pedestrian greenway, restored waterfront beach, upgraded dock, and stormwater gardens. The proposed Threading the Needle Park is currently unfunded.

28th Avenue NW Street End

The 28th Avenue NW street end was recently improved by SDOT to provide enhanced recreational opportunities and fish habitat. The 28th Avenue NW street end features native plantings, water access, a kayak launch, and a basketball hoop.

34th Avenue NW Street End

The 34th Avenue NW street end features a viewpoint with views of Salmon Bay, Magnolia Bluff, and the Salmon Bay Bridge, a railroad trestle bridge built in 1914. The park also features a 17-foot-tall bronze "welcome figure" statue sculpted by artist Marvin Oliver.

NW 57th Street End

The NW 57th street end is accessible from the Burke-Gilman Trail and is the site of an SPU pump station and combined sewer overflow outfall. The site features a staircase down to a small beach area on the shore of the Ship Canal.

Recreation Accessible from the Disconnected Segment of the Burke-Gilman Trail

The segment of the Burke-Gilman Trail running from the Ballard Locks to Golden Gardens Park is directly adjacent to several parks that are disconnected from trail users using the BGT in other portions of the city and county. As described in Section 5.2.1, 49% of King County residents access recreational areas by walking and 23% access recreational areas by bicycling. Recreational areas accessible from the disconnected segment of the trail include:

- Golden Gardens Park, a major City of Seattle park drawing users from around the city and region. The park is 87.8 acres and features a Puget Sound beach with views of the Olympic Mountains. Amenities at the park include a hand-carry boat launch, picnic sites, fire pits, paths and hiking trails, restrooms, play areas, a basketball court, beach volleyball net, and an off-leash dog area. The park also features a rental facility used for weddings and ceremonies, among other events.
- Northwest 60th Viewpoint, a small 0.5-acre City of Seattle park with benches facing Shilshole Bay. Views from the park include Magnolia Bluff, the Olympic Mountains, Bainbridge Island, and Puget Sound.
- Private marinas, including the Shilshole Bay Marina and Shilshole Bay Yacht Club.

In addition, recreational users can cross the Ballard Locks on foot (and hand-carry bicycles across) to access recreation sites on the Magnolia side of the Ship Canal. Commodore Park is directly adjacent to the Ballard Locks and features paths, views of the Ship Canal, and restrooms. The park is 3.9 acres. From the Magnolia side of the Ballard Locks, it is a short walk or bicycle ride to Discovery Park, at 534 acres the largest park in Seattle. Discovery Park is located on the former site of Fort Lawton and features 2 miles of beaches, 11.8 miles of walking trails, the United Indians of All Tribes' Daybreak Star Cultural Center, the West Point Treatment Plant, the historic West Point Lighthouse, the Discovery Loop Trail (a National Recreation Trail), the Fort Lawton Historic District, and the Discovery Park Environmental Learning Center. The Seattle Bicycle Master Plan shows a recommended off-street trail and cycle track that would connect Discovery Park to Commodore Park and the Ballard Locks (SDOT, 2014).

5.2.4 Recreational Events in the Project Vicinity

Several annual recreational events are held within the study area. In addition, the weekly Ballard Farmers Market is located within the study area.

Ballard Farmers Market

The Ballard Farmers Market is a year-round weekly farmers market on Sundays from 10:00 AM to 3:00 PM. The event is owned and operated by the Seattle Farmers Market Association, a registered non-profit corporation. The Farmers Market is located on Ballard Ave NW between Vernon Pl NW and 22nd Ave NW. Each Sunday, Ballard Ave NW is closed to traffic for the length of the Farmers Market. The Farmers Market also uses Bergen Place Park for artisan booths each Sunday.

Seventeenth of May Festival

The Seventeenth of May Festival, also known as Syttende Mai, occurs annually in Ballard. The event is organized by the Norwegian Seventeenth of May Committee, a nonprofit organization. The event celebrates the Norwegian Constitution Day holiday. The Seventeenth of May has been celebrated in Seattle since 1889, and the community parade in Ballard has been held annually since 1974. The Ballard event is recognized as the third largest annual Seventeenth of May event in the world (after Oslo and Bergen). The annual event includes entertainment at the Leif Erikson Hall located at 2245 NW 57th St, a

music stage at Bergen Place Park at NW Market St and Leary Ave NW, and a parade. The parade route starts at 24th Ave NW and NW 62nd St and follows 24th Ave NW south to NW Market St. The parade then follows NW Market St east to 22nd Ave NW, where it turns south to Ballard Ave NW, then continues southeast along Ballard Ave NW to NW Ione Pl.

SeafoodFest

SeafoodFest is an annual event on the second weekend of July. The first event was held in 1974. Attractions typically include multiple music stages, food vendors, arts and crafts booths, a beer garden, and a big purple slide. Attractions are located along 22nd Ave NW between NW 58th St and Ballard Ave NW; NW Market St from 24th Ave NW to 20th Ave NW; Leary Ave NW between NW Market St and 20th Ave NW; Ballard Ave NW between NW Market St and 22nd Ave NW; and at Ballard Commons Park. Many of the streets featuring attractions are closed to traffic during the event.

5.2.5 Relevant Recreation Plans

Seattle Bicycle Master Plan

The Seattle Bicycle Master Plan, adopted in 2014 (SDOT, 2014), sets out five goals:

1. Ridership: Increase the amount and mode share of bicycle riding in Seattle for all trip purposes.
2. Safety: Improve safety for bicycle riders.
3. Connectivity: Create a bicycle network that connects to places that people want to go, and provides a time-efficient travel option.
4. Equity: Provide equal bicycling access for all; through public engagement, program delivery, and capital investment.
5. Livability: Build vibrant and healthy communities by creating a welcoming environment for bicycle riding.

Strategy 4.1 in the plan is to "Implement the off-street (multi-use trail) bicycle facility network." Actions under Strategy 4.1 include:

- 4.1.1: Develop new multi-use trails. Developing off-street bicycle facilities outside the public right-of-way will require additional feasibility analysis and agreements with land owners.
- 4.1.2: Incorporate best practice crossing design treatments into every new multi-use trail project.
- 4.1.3: Develop multi-use trails "etiquette" signs, and other creative means, to educate users traveling along the trail.
- 4.1.4: Assess multi-use trail lighting needs and work with Seattle City Light (SCL) to provide adequate trail lighting.
- 4.1.5: Install wayfinding with all off-street bicycle facility projects.

The Plan includes a bicycle network map, which recommends bicycle network improvements throughout the city, including 32 miles of recommended off-street bicycle trails. The Missing Link is shown as a recommended off-street trail on the bicycle network map. The bicycle network map also shows two recommended off-street trails linking directly to the Missing Link alignment, including a trail segment across the Ballard Bridge connecting to the existing off-street Ship Canal Trail and a trail segment across the Ballard Locks.

The Plan also identifies "catalyst projects," which are those projects "located at choke points in the network that pose significant challenges to implementation due to physical constraints." Catalyst projects also "Reduce critical barriers to bicycling by closing network gaps and increase safety by building all ages and abilities friendly bicycle facilities to the maximum feasible extent." The Missing Link project is specifically mentioned as a catalyst project.

Seattle Pedestrian Master Plan

The Seattle Pedestrian Master Plan was adopted in September 2009 (SDOT, 2009). The mission of the plan is to make Seattle the most walkable city in the nation. The plan identifies six objectives:

- Objective 1: Complete and maintain the pedestrian system identified in the Pedestrian Master Plan.
- Objective 2: Improve walkability on all streets.
- Objective 3: Increase pedestrian safety.
- Objective 4: Plan, design, and build complete streets to move more people and goods.
- Objective 5: Create vibrant public spaces that encourage walking.
- Objective 6: Get more people walking for transportation, recreation, and health.

The plan includes a map of priority areas for prioritization of infrastructure projects for improving pedestrian conditions, and the study area is shown as a high priority area.

Parks and Recreation 2011 Development Plan

In 2011, the City of Seattle adopted the Parks and Recreation 2011 Development Plan (City of Seattle, 2011), which identifies goals, objectives, and policies for the park and recreation system and identifies priorities for acquisition and development projects through 2017. The Development Plan includes the 2011 Open Space Gap Analysis, which identifies areas of Seattle that do not meet the City's goals for parks and open space. The Plan also includes the 2011–2016 Capital Improvement Program, which includes over 100 capital projects at City parks, from minor maintenance projects to major renovation and development of new parks.

In the 2011 Open Space Gap Analysis, Ballard is identified as a Hub Urban Village that does not meet open space goals. The Gap Analysis states that Ballard has one of the largest open space gaps in the northwest sector of the City (along with Fremont and Bitter Lake). The map "Gaps in Usable Open Space in the Northwest Sector" shows that both Leary Ave NW and Ballard Ave NW within the study area are mapped as areas with a gap in usable open space, as is NW Market St to the west of 24th Ave NW. Shilshole Ave NW is not included within the Ballard Urban Village.

As part of the Development Plan process, Seattle Parks and Recreation held public meetings, solicited written testimony, and conducted an online survey in 2011. Public feedback indicated that providing more walking trails was one of the four top priorities for outdoor recreation and open spaces, and that walking trails were one of the three park facilities that people felt there should be more of in Seattle (along with sports fields and beach and waterfront land). The Plan also notes that "providing linkages between parks, boulevards, and trails to allow more connections for walking, running, and bicycling, and developing multi-purpose trails like the Burke-Gilman or Interurban trails and completing the 'missing link' in Ballard were suggested."

The Goals in the Parks and Recreation 2011 Development Plan include:

- Goal 1: Provide recreation and learning opportunities by providing and maintaining an adequate balance of parks, open spaces, recreational facilities, and programs tailored to their need to promote respite, socialization, and education.
- Goal 2: Steward Seattle's parks and open spaces for long-term sustainability by conserving, restoring, and maintaining substantial open space, natural areas, shorelines, and wildlife, and by demonstrating a strong conservation ethic.
- Goal 3: Acquire property for parks and open space to fill the identified gaps in usable open space and to manage future growth and change consistent with the City's growth management goals and policies as outlined in the City's Comprehensive Plan.
- Goal 4: Maintain Parks and Recreation's land and facilities. Emphasize good management and fiscal responsibility by making the most effective use of limited resources, evaluating programs and services, protecting the public interest, being accountable for achieving adopted objectives, and guarding against unrealistic expectations.
- Goal 5: Actively engage and build relationships with Seattle's diverse population, the Seattle School District, the Seattle Housing Authority, other departments or agencies, and community-based organizations to bring together a range of services in response to neighborhood priorities.

Specific objectives relevant to the Missing Link project include:

- Objective 2.7: Undertake boulevards and trail improvements with consideration for natural and historic resources associated with such facilities and provide special landscaping, signage, or other design elements that reflect the importance of boulevards and trails as a major link in the City's comprehensive open space system.
- Objective 3.4: In general, priority for the expansion of the open space network shall be given to areas of the city subject to population growth, including urban villages targeted for the largest share of residential growth and those areas not adequately served at present according to the population-based goals for open space.
- Objective 4.3: Coordinate planning and design for park improvements with other City departments.

Additionally, the Distribution Guidelines in the Plan state, "New multi-use trails will be developed in accordance with the Bicycle Master Plan, with a goal of having an interconnected system of primary and secondary trails throughout the city (and as coordinated with Seattle Transportation) as well as a variety of trails within all appropriate parks and green spaces." The Distribution Guidelines also state that "priority will be given to adding park amenities in underserved areas of the City undergoing population growth, particularly those with expected and actual growth in urban center and urban village locations."

City of Seattle Comprehensive Plan

The City of Seattle Comprehensive Plan was adopted in 2005 (City of Seattle, 2005). The plan is currently in the process of being updated, and the July 2015 Draft Comprehensive Plan is described below. In addition, portions of the plan were updated during a 2014–2015 amendment process. The 2005 Comprehensive Plan includes two elements relevant to the project: the Urban Village Element and the Neighborhood Planning Element.

Urban Village Element

The Comprehensive Plan Urban Village Element defines Ballard as a Hub Urban Village. The Ballard Hub Urban Village does not include Shilshole Ave NW or the shore of the Ship Canal; these areas are included in the BINMIC. The Urban Village Element of the plan establishes goals for an Open Space Network, including UVG39, to "Enhance the urban village strategy through the provision of… connections linking urban centers and villages, through a system of parks, boulevards, community gardens, urban trails, and natural areas … [and] a network of connections to the regional open space system."

Policy UV53 states that urban villages targeted for the largest share of residential growth will be prioritized for expansion of the open space network. The policy also states that types of open space acquisitions and development will include "critical open space linkages, connectors, and corridors that are highly accessible for active use within or directly serving urban villages, high density and/or high pedestrian, bicycle, or transit use areas" and "open space linkages, connectors, and corridors that are highly accessible for active use serving other high pedestrian, bicycle, or transit use areas."

Neighborhood Planning Element

The Comprehensive Plan also includes a Neighborhood Planning Element that sets goals and policies for the Ballard Hub Urban Village. Several goals and policies are relevant to the Missing Link project, including:

- Transportation Goal CH/B-G4: "A transportation system that supports residential, commercial and civic activity in the core of the Ballard and Crown Hill urban villages, and encourages people to use transit and non-motorized transportation modes."
- Transportation Policy CH/B-P9: "Emphasize accessibility by transit, bicycle and pedestrians in the downtown Ballard area."
- Recreation & Open Space Goal CH/B-G5: "A neighborhood with open space, parks and recreation sites connected by a network of 'green links,' that offer a full range of active and passive recreational opportunities to area residents and visitors, throughout Crown Hill/Ballard."
- Recreation and Open Space Policy CH/B-P13: "Increase the range of recreation opportunities and types of open space available in the neighborhood. Encourage the development of new facilities, including, but not limited to passive parks, tennis courts, basketball courts, ballfields, play areas, marine and shoreline parks, pedestrian-friendly walkways, trails (including the Burke-Gilman), and gateways."
- Recreation and Open Space Policy CH/B-P14: "Enhance existing open space and recreation sites and facilities throughout Crown Hill/Ballard."
- Recreation and Open Space Policy CH/B-P15: "Create opportunities for people to experience the natural environment through the preservation of publicly-owned forested areas, encouraging community gardening (P-patches), and tree planting on private property and in the public right-of-way, and creating access to views and waterways."

The BINMIC neighborhood plan (as presented in the Comprehensive Plan) does not include policies or goals for recreation or open space.

Draft Seattle Comprehensive Plan

The City of Seattle is in the process of updating the Comprehensive Plan. A Draft Comprehensive Plan was released in July 2015 (City of Seattle, 2015). In the Draft Comprehensive Plan, Ballard remains designated as a Hub Urban Village, while Shilshole Ave NW remains within the BINMIC.

The Draft Comprehensive Plan includes a set of updated goals and policies. Policies relevant to the Missing Link project include:

- Policy P1.1: Continue to expand the City's park holdings, with special emphasis on serving urban centers and urban villages and areas that have been traditionally underserved.
- Policy P1.3: Provide urban trails, green streets, and boulevards in public rights-of-way as recreation and transportation options and as ways to connect open spaces and parks to each other, to urban centers and villages, and to the regional open space system.
- Policy P1.6: Provide public access to shorelines by using street ends, regulation, or acquisition.

The updated Comprehensive Plan is scheduled to be adopted in 2016.

5.3 Potential Impacts

5.3.1 No Build Alternative

Recreation Uses

Under the No Build Alternative, current conditions and trends in the study area would continue. Participation in recreational activities such as bicycling, running, jogging, and walking would continue to increase annually as a result of growth to the Ballard area and trends toward increases in recreational running, jogging, walking, and bicycling (as described in Section 5.2.1). Demand for off-road paved trails for these activities would continue to increase. Recreational sites such as the Ballard Locks and Golden Gardens Park would continue to be disconnected from other segments of the BGT.

Consistency with Recreation Plans

The No Build Alternative is not consistent with adopted plans and policies described in Section 5.1.5, which include goals and policies for adding new parks and open space, adding to the local and regional trail network, and, in some plans, specifically building the Missing Link project.

Trail User Conflicts and Safety Issues

Bicyclists and other recreational users would continue to use public streets (primarily Shilshole Ave NW) between the existing trail segments, many of which lack sidewalks, do not have demarcated areas for bicyclists and pedestrians, and cross railroad tracks. These streets currently suffer from user conflicts between bicyclists and cars and are known for poor safety conditions for recreational users.

5.3.2 Impacts Common to All Build Alternatives

Construction

Impacts to Existing Recreation Uses

Construction of the Missing Link along any of the alternative routes would disrupt existing recreational uses during the construction period, which would last approximately 12 to 18 months. Impacts would occur if roadways or paths providing access to existing recreational facilities were disrupted or if fugitive dust, odors from paving operations, noise, or construction light and glare affect existing recreational facilities. However, because of the short duration of construction at any given location, no significant impacts are expected. In addition, construction in the roadway or right-of-way has the potential to disrupt use of the road for existing recreational uses such as bicycling. Since construction would not disrupt any areas developed specifically for bicycle use, riders could use other nearby roadways during the construction period.

Under all Build Alternatives, construction of the west end of the Missing Link near 30th Ave NW could disrupt access to the parking lot and entrance of the Ballard Locks. However, access to the Ballard Locks would be preserved on the west end of the parking lot, and the duration of construction at this location would be relatively short.

Operation

Recreation Uses

The completed Missing Link would be used by many people, including bicyclists, skaters, joggers, and walkers. The Missing Link would improve the recreational experience over existing conditions, under which bicycling, walking, and other recreational activities take place on the sidewalk or in the street. The added mile of trail would likely increase recreational activity in the study area.

Completion of the Missing Link would connect recreational attractions like the Ballard Locks, Golden Gardens Park, and, if an off-street trail or cycle track is completed in the future as described in the Seattle Bicycle Master Plan, Discovery Park to the city-wide and regional multi-use trail system. As described in Section 5.1.1, 57% of King County residents walk or jog to recreation areas and 23% bicycle to recreation areas. Therefore, making these major recreational attractions accessible to bicycles, walkers, and joggers using the BGT would represent a positive impact to recreation. Additionally, each potential alternative routes would directly pass by recreational facilities, opening these recreational amenities to trail users. Each alternative would pass different recreational facilities as described below. The different alternative routes would also pass through different intersections, some of which are signalized. The existing segments of the BGT run through very few signalized intersections (including several on the University of Washington campus and one in the Fremont neighborhood). Signalized intersections require bicyclists and other trail users to stop, and it is generally preferable from a recreational perspective (particularly for bicyclists) to avoid routing multi-use trails through signalized intersections.

Consistency with Recreation Plans

Construction of the Missing Link project would be consistent with the 2005 City of Seattle Comprehensive Plan, as well as with the Draft Seattle Comprehensive Plan released in July 2015, by expanding recreational opportunities in the city and in the downtown Ballard area, and by expanding the city's network of trails and connections to open space. Completing the project would also be consistent with the Parks and Recreation 2011 Development Plan by filling in gaps in the open space network in

Ballard and meeting the public demand for additional trails. The Missing Link project is included in the Bicycle Master Plan as a "catalyst project" and would contribute to completion of the bicycle facility network. The project would be consistent with the Seattle Pedestrian Master Plan by improving pedestrian conditions in a high priority area.

Trail User Conflicts and Safety Issues

By design, multi-use trails accommodate a variety of trail users. Trail user conflicts can result in disruption and negative effects on trail user experiences, as well as potential safety issues. Safety issues are related to the potential for accidents, which can occur on multi-use trails result from such factors as recklessness and irresponsible behavior, poor user preparation or judgment, and unsafe trail conditions. User conflicts occur when there is competition or perceived incompatibility of use by different types of users. Types of conflicts include speed of travel and safety issues. The potential for conflicts between trail users and vehicles is described in Chapter 7, Transportation. While the potential for trail user conflicts and safety issues on the completed Missing Link exists, conditions for users would be safer than under current conditions with no dedicated multi-use trail.

Two factors that influence the safety and the perception of safety of trail users are the width of the trail and the types of intersections trail users need to cross. All Build Alternatives would have an 8- to 12-foot trail width. Alternatives vary in the types of intersections included in the route and in how many of the intersections would be signalized. Signalized crossings increase both safety and perception of safety for recreational users of the trail when it crosses busy intersections. In addition to signalized intersections, several unsignalized intersections in the project area experience high volumes of peak hour traffic. Where the Missing Link crosses these intersections, they could require signalization or some other treatment to improve safety and crossing conditions. Whether or not they were signalized, crossing busy intersections could reduce the perception of safety for trail users. Individual trail users have different levels of tolerance for risk and perceived risk. For example, an experienced adult bicyclist commuter may have a higher tolerance for perceived risk than a bicycling family with young children. The greater the number of high-traffic intersections (particularly unsignalized intersections) along a route, the less desirable it becomes for some trail users. Driveways along the trail route can also increase the perceived risk and reduce the desirably of the route for some trail users. The number of signalized intersections, busy but unsignalized intersections, and driveways along the trail route varies by alternative.

5.3.3 Shilshole South Alternative

Construction

Impacts to Existing Recreation Uses

Shilshole Ave NW is the primary route used by bicyclists traveling between the existing segments of the BGT. Construction of the Missing Link project would likely disrupt and displace bicycle users of Shilshole Ave NW during construction. This impact would be temporary, and other streets in the vicinity, including Ballard Ave NW and Leary Ave NW, could be used by bicyclists during the construction period.

The series of shoreline street ends along the Ship Canal, including the 14th Ave NW boat ramp and the public pier at 24th Ave NW, are accessible from streets included on the Shilshole South Alternative route, including NW 54th St, Shilshole Ave NW, and NW 45th St. During construction, it could be more difficult to access these street end parks, and construction activities may be audible and visible to park users. However, construction duration at any one location would be relatively short, and access to street ends would be maintained. It may not be possible to maintain access to the 20th Ave NW street end, which is

only accessible from Shilshole Ave NW. However, other street ends would be accessible within four or six blocks distance, so impacts would be minor.

Operation

Recreation Uses

As described in Section 5.2.3, completion of the Shilshole South Alternative would provide additional recreational opportunities in the project area and would improve recreational connectivity for users of the regional bicycle trail network.

The Shilshole South Alternative would be the most disconnected from commercial areas of Ballard with high pedestrian circulation. Therefore, it would provide a similar recreational experience to existing segments of the BGT. This route would not cross through any intersections that are currently signalized, which would be preferable for trail users, particularly bicyclists.

This alternative would run the closest to the Ship Canal and Salmon Bay. The trail would run within one block of the 14th Ave NW boat ramp, the 24th Ave NW pier, and the recently developed 28th Ave NW street end. The trail would run directly adjacent to the currently undeveloped 15th Ave NW street end and the 20th Ave NW street end. SDOT's Shoreline Street Ends Program is dedicated to preserving and improving public use of shoreline street ends. This alternative would support that program by increasing access to the street ends.

Consistency with Recreation Plans

As described in Section 5.2.2, the Missing Link project would be consistent with a variety of recreation plans. However, Shilshole Ave NW and the rest of the proposed Shilshole South Alternative route are not within the Ballard Hub Urban Village in the City of Seattle Comprehensive Plan. The Ballard Hub Urban Village has a variety of goals and policies related to improving recreation and open space. Shilshole Ave NW is mapped within the BINMIC, which does not have any policies or goals for recreation or open space. Although the Shilshole South Alternative would technically be outside of the Ballard Hub Urban Village, it would still meet the recreation and open space goals of the neighborhood by linking the existing trail segments and connecting recreational and open space areas within the neighborhood.

Trail User Conflicts and Safety Issues

The Shilshole South Alternative route would likely be a preferable route for bicyclists and commuters, as there would be no signalized intersections. The route would cross four unsignalized intersections. Although this route would run through fewer intersections (both signalized and unsignalized) than the Ballard Avenue and Leary Alternatives, it would pass 41 driveways and loading docks. While construction of the Missing Link along the Shilshole South Alternative would greatly increase safety for trail users, some users may choose not to use this trail segment due to the perception of risk from busy intersections and driveways, and prevalence of industrial traffic.

5.3.4 **Shilshole North Alternative**

Construction

Impacts to Existing Recreation Uses

Impacts would be the same as for the Shilshole South Alternative (Section 5.2.3), although disruption to shoreline street end recreational sites would be lower; the route would be an additional block removed from the 28th Ave NW and 14th Ave NW street ends and would be across the street from the 20th Ave NW street end.

Operation

Recreation Uses

The Shilshole North Alternative would provide a similar recreational experience to the Shilshole South Alternative (Section 5.2.3), but trail users who want to access shoreline street end parks would need to cross Shilshole Ave NW, a busy road with only one dedicated crossing point (at NW Vernon Pl). Therefore, this alternative would not provide as much connectivity to existing recreational sites as the Shilshole South Alternative. The route would also run through three or four signalized intersections (24th Ave NW and NW Market St; 28th Ave NW and NW Market St; NW 46th St and 11th Ave NW; and potentially a new signal at 17th Ave NW and Shilshole Ave NW), which could affect the recreational experience of the trail for bicyclists.

Consistency with Recreation Plans

Impacts would be the same as for the Shilshole South Alternative (Section 5.2.3).

Trail User Conflicts and Safety Issues

Impacts would be similar to the Shilshole South Alternative (Section 5.2.3), but the route would run through 10 additional intersections. Three of the intersections (24th Ave NW and NW Market St; 28th Ave NW and NW Market St; and NW 46th St and 11th Ave NW) are signalized, while the intersection at 17th Ave NW and Shilshole Ave NW would likely be signalized. Trail users would be required to turn left at the 24th Ave NW and NW Market St intersection. This route would also cross 58 driveways and loading docks, more than would be crossed by the other three Build Alternatives. Individual trail users are likely to have different levels of comfort with the intersections and driveways along each potential Shilshole alternative.

5.3.5 **Ballard Avenue Alternative**

Construction

Impacts to Existing Recreation Uses

Construction of the Ballard Avenue Alternative would impact recreation along the construction route, including Marvin's Garden at 22nd Ave NW and Ballard Ave NW, which it would directly pass; and Bergen Place Park at 22nd Ave NW and NW Market St, which it would run past on the opposite side of 24th Ave NW. Construction would be audible and visible to park users at these parks during the construction period, which would be relatively short at these sites. Construction could also disrupt access to Marvin's Garden for some park users, but the park would remain open during the construction period

and accessible from Ballard Ave NW. Construction of the Ballard Avenue Alternative along 22nd Ave NW and NW 56th St could be audible from Ballard Commons Park at 22nd Ave NW and NW 57th St. These impacts would be minor due to the short construction period and because the parks would remain open to the public.

Construction along Ballard Ave NW would be audible and visible to shoppers, diners, and other visitors to the historic Ballard Avenue Landmark District. Construction between NW Dock Pl and 22nd Ave NW would be relatively short. The Ballard Farmers Market would continue to be held on Sundays during the construction period. The contractor would be required to contain the construction zone in order to provide unimpeded access to the Farmers Market and to ensure the area is safe and hazard free.

Operation

Recreation Uses

As described in Section 5.2.3, completion of the Ballard Avenue Alternative would provide additional recreational opportunities in the project area and would improve recreational connectivity for users of the regional bicycle trail network.

The Ballard Avenue Alternative would run through the Ballard Avenue Landmark District, which would provide a different recreational experience than the Shilshole alternatives and other existing segments of the BGT. This route is likely more desirable for pedestrians, particularly those visiting the historic Landmark District for recreational purposes.

Ballard Ave NW between 22nd Ave NW and NW Vernon St is currently closed on Sundays for the Ballard Farmers Market, which runs from 10:00 AM to 3:00 PM. During the Farmers Market, the trail could be heavily congested. It is possible that some bicyclists would continue to ride through the Market. It is likely that walkers and joggers using the trail would continue on the same route through the Farmers Market, contributing to congestion. The Farmers Market is typically very crowded with customers, often with strollers, dogs, and small children. The conflict between the BGT and the Farmers Market would be likely to decrease the recreational experience of both. SDOT would consider options for avoiding this conflict, including detouring the trail around the Market on Sunday, coordinating with the Farmers Market to reconfigure the layout of the Market, or moving the Market to a new location. These options would have the potential to alter the recreational experience of the Farmers Market, the BGT, or both.

The Ballard Avenue Alternative would cross signalized intersections at 11th Ave NW and NW 46th St; 22nd Ave NW and NW Market St; and 28th Ave NW and NW Market St. In addition, the route would cross intersections at 15th Ave NW and NW 46th St and 24th Ave NW and NW 56th St, which would be signalized as part of the project. Crossing five signalized intersections in a short portion of the BGT would decrease the desirability of this portion of the route for bicyclists and other BGT users and would provide a substantially different recreational experience than provided by existing portions of the trail.

Consistency with Recreation Plans

As described in Section 5.2.2, the Missing Link project would be consistent with a variety of recreation plans. Unlike the Shilshole alternatives, the Ballard Avenue Alternative would run through the Ballard Urban Hub Village and would meet the recreational goals of that neighborhood.

Trail User Conflicts and Safety Issues

The Ballard Avenue Alternative is likely to be a desirable trail segment for pedestrians, particularly those visiting the Ballard Avenue Landmark District. An increase in pedestrian use of the BGT along this segment would likely increase trail user conflicts between pedestrians and bicyclists.

During the Farmers Market, BGT users would likely continue along the BGT route through the Farmers Market, creating user conflicts between BGT users and Farmers Market attendees. Particularly if bicyclists choose to ride through the Farmers Market, there could be safety issues as described in Chapter 7, Transportation. While the BGT would not be closed, some trail users would likely use adjacent streets to travel between segments of the BGT to avoid congestion, most likely traveling on Leary Ave NW or Shilshole Ave NW. Bicyclists and other trail users using adjacent roads that are not part of the multi-use trail system would experience lower safety levels than they experience while using the multi-use trail system. This would be particularly true when trail users are diverted from the trail as traffic from cars increases from visitors to the Farmers Market.

The Ballard Avenue Alternative would cross approximately 42 driveways and loading docks, and the route would cross 16 intersections. While five intersections would be signalized (as listed above), some trail users could still perceive risk crossing these intersections, making this portion of the trail undesirable to them.

5.3.6 **Leary Alternative**

Construction

Impacts to Existing Recreation Uses

Construction impacts of the Leary Alternative would be the same as for all Build Alternatives, as described in Section 5.2.2.

Operation

Recreation Uses

The Leary Alternative would provide a different recreational experience than the Shilshole or Ballard Avenue Alternatives. Leary Ave NW and NW Market St are currently major arterials with four lanes of traffic, although both roads along the trail alignment would be reduced to one lane in each direction with a center two-way left turn lane. NW Market St between 22nd Ave NW and 24th Ave NW is a busy commercial district, but the other portions of the route feature less pedestrian foot traffic. The Leary Alternative route would include eight signalized intersections, the most of any of the alternative routes and substantially more than any existing portion of the BGT, potentially making it a less desirable route for bicyclists and other trail users.

Consistency with Recreation Plans

Impacts would be the same as for the Ballard Avenue Alternative as described in Section 5.2.5.

Trail User Conflicts and Safety Issues

The Leary Alternative would cross 33 driveways and loading docks, fewer than the other alternatives. However, the Leary Alternative would also cross 13 intersections. While eight of these intersections are

signalized, it is still possible that some trail users would find the route undesirable due to a perceived lack of safety when crossing these intersections. There may be increased trail user conflicts on the portions of the route adjacent to NW Market St as more pedestrians use the trail.

5.3.7 Connector Segments

Construction

Impacts to Existing Recreation Uses

Impacts from construction of connector segments would be the same as for all Build Alternatives, as described in Section 5.2.2.

Operation

Operational impacts associated with connector segments would be the same as for all Build Alternatives, as described in Section 5.2.2. The NW Vernon Street connector segment would require signalization of the intersection of NW Vernon St and Shilshole Ave NW, potentially reducing the recreational quality for some bicyclists but increasing perception of safety for others. Some connector segments would require trail users to make left turns at intersections, such as at 14th Ave NW and NW Leary Way; 17th Ave NW and NW Leary Way; 20th Ave NW and Leary Ave NW; and Ballard Ave NW and NW Market St. These left turns could make these routes undesirable for some trail users due to safety concerns.

5.4 Avoidance, Minimization, and Mitigation Measures

5.4.1 Mitigation Common to All Alternatives

The following mitigation measures could be used to minimize impacts on existing recreational activities:

- Utilize construction BMPs such as wetting and covering disturbed soils, washing vehicle tires and undercarriages, and shutting off idling equipment to control fugitive dust and vehicle emissions.

The following mitigation measures could be used to minimize trail user conflicts and enhance safety:

- Install signage indicating limits of the trail right-of-way, trail etiquette, and yield protocols.
- Provide signage warning trail users they are approaching signalized or unsignalized intersections.
- Design the trail to meet applicable accessibility guidelines, including current design standards for curves and sight distance, based on a design speed for the fastest users, bicyclists.

5.4.2 Specific Mitigation

For the Ballard Avenue Alternative, SDOT would coordinate with the Ballard Farmers Market to determine the best method of coordinating trail use through the Market.

CHAPTER 6: UTILITIES

6.1 Introduction

This section describes the public utilities present in the Missing Link project area, potential impacts related to construction and operation, and potential mitigation measures. Utilities addressed in the analysis include water, wastewater, storm drainage, solid waste, electricity, natural gas, and telecommunication services.

6.2 Affected Environment

Numerous utilities are located in the highly industrialized project area. This section describes the utilities currently identified within or adjacent to the alternative alignments. Additional site-specific identification of utilities would be required prior to any construction activity. Only the locations of utilities that would potentially be disrupted or relocated by the project are described.

SCL provides electrical service within the project area. Electrical lines run along and across all roads included in the four Build Alternatives and connector segments. Natural gas service is provided by Puget Sound Energy (PSE).

SPU provides sanitary sewer and potable water service within the project area. Wastewater and water lines run along and across all roads included in the four Build Alternatives as well as the connector segments. SPU also provides storm drainage and solid waste collection. The project area drains to the combined sewer system. In a combined sewer system, stormwater is diverted with other wastewater to the sanitary sewer system and then onto a wastewater treatment plant. During wet weather conditions, stormwater runoff from streets, parking lots, and roof drains can exceed the capacity of the sewer system. If flow rates in the combined sewer exceed the capacity of the system, the excess flow of stormwater and untreated sewage is discharged into water bodies through permitted outfalls, resulting in a combined sewer overflow event. SPU has adopted the *Plan to Protect Seattle's Waterways* (SPU 2015) and is pursuing projects to reduce combined sewer overflow events in the project area.

Telecommunication services in the project area are provided by private companies including CenturyLink and Comcast.

6.3 Potential Impacts

6.3.1 No Build Alternative

Under the No Build Alternative, a multi-use trail segment would not be constructed in the study area. There would be no disruption or relocation of any public or private utility lines or facilities related to the BGT.

6.3.2 Impacts Common to all Build Alternatives

Construction

Construction of the Build Alternatives has the potential to impact utilities. Construction would occur in segments. Construction duration in any one location would depend on the extent of utility relocations required, storm drainage improvements needed, and the existing roadway reconfigurations. During construction, temporary utility outages could occur. Utility relocations during construction could include movement of fire hydrants, stormwater catch basins, and overhead utilities as well as the installation of new drainage structures. Because all utilities are present on all streets in the Build Alternatives, all utilities have the potential to be impacted by construction activities.

The Missing Link project could require the relocation of overhead power lines, light poles, or fire hydrants in some locations where the roadway would shift into areas that are currently occupied by a parking strip or parking areas. Areas where this could occur are described below under each alternative. Where this would occur, SDOT would coordinate with SPU and/or SCL and would relocate any affected utilities. Long-term operation of the utilities would not be impacted.

In some locations, solid waste, recycling, and yard waste receptacle placements may need to be temporarily relocated to accommodate construction equipment. SPU would identify temporary locations and communicate with property and business owners.

Operation

The trail would not impact the long-term operation of utilities. In some locations, solid waste, recycling, and yard waste receptacle placements may need to be permanently relocated. SPU would identify new locations and communicate with property and business owners.

6.3.3 Shilshole South Alternative

Construction

Construction impacts would be the same as described in Section 6.3.2 for all Build Alternatives.

Operation

Operational impacts to utilities from the Shilshole South Alternative are not anticipated.

The Shilshole South Alternative would result in new impervious surface area as some of the gravel shoulder would be paved to accommodate the trail. Additional impervious surface area would increase stormwater runoff to the combined sewer system. However, the additional area would be relatively small compared to the overall area draining to the combined sewer system, so the impact would not be significant.

6.3.4 Shilshole North Alternative

Construction

The following above-ground utilities may need to be relocated:

- Street lights on the north side of NW 46th St;
- Utility poles and overhead power lines on the north side of Shilshole Ave NW;
- Utility poles, overhead power lines, and street lights on the south side of NW Market St; and
- Street lights and a fire hydrant on NW 54th St.

Operation

Operational impacts would be the same as described in Section 6.3.2 for all Build Alternatives.

6.3.5 Ballard Avenue Alternative

Construction

The following above-ground utilities may need to be relocated:

- Utility poles and overhead lines on both sides of NW 56th St;
- Utility poles and overhead lines on the east side of 28th Ave NW;
- Utility poles, overhead power lines, and street lights on the south side of NW Market St; and
- Street lights and a fire hydrant on NW 54th St.

While each Build Alternative would require the installation of new stormwater management facilities, stormwater management would be particularly necessary on Ballard Ave NW. Because Ballard Ave NW is crowned, the roadway portion that includes the BGT would likely need to be built up above its current level. Without changing the existing storm drainage system, it would be too far below the grade of the new trail segment to work properly, and water would likely pond on the sidewalk.

Residential property owners along the south side of NW 56th St between 26th Ave NW and 28th Ave NW could be required to place garbage, recycling, and yard waste receptacles on the other side of the street on pick-up days. This impact would only occur when construction activities were directly adjacent to their properties.

Operation

Operational impacts would be the same as described in Section 6.3.2 for all Build Alternatives.

6.3.6 Leary Alternative

Construction

The following above-ground utilities may need to be relocated:

- Utility poles on the east side of 11th Ave NW;
- Street lights on the south side of NW Leary Way;
- Street lights and utility poles on the southwest side of Leary Ave NW;
- Utility poles, overhead power lines, and street lights on the south side of NW Market St; and
- Street lights and a fire hydrant on NW 54th St.

Operation

Operational impacts would be the same as described in Section 6.3.2 for all Build Alternatives.

6.3.7 Connector Segments

Construction

Most connector segments have utility poles and/or street lights that may need to be relocated, depending on trail design.

Operation

Operational impacts would be similar to those described in Section 6.3.2 for the Build Alternatives.

6.4 Avoidance, Minimization, and Mitigation Measures

6.4.1 Measures Common to All Alternatives

Avoidance, minimization, and mitigation measures related to utilities could include the following:

- Close coordination with utility providers to identify and physically locate utilities prior to any construction activity.
- Communication with property owners prior to any construction activity to obtain input on the locations of utility connections that may not be documented.
- Notification of property owners in advance of disruptions in service to affected utilities.
- Compliance with code requirements to install stormwater systems and storm drainage improvements as well as to relocate stormwater catch basins to manage runoff from the trail, which may also improve existing stormwater drainage problems.

CHAPTER 7: TRANSPORTATION

7.1 Introduction

This chapter describes the potential effects of the Missing Link project on the transportation system in the study area. Topics addressed include the roadway network, traffic volumes and operations, motorized freight corridors, nonmotorized users (bicyclists and pedestrians), public transportation, freight rail, and safety.

The primary sources of information used to prepare this analysis include the following:

- **Roadway Characteristics**: Lane configuration, intersection control, and industrial and residential driveway information as collected during fieldwork; previous technical analyses in the study area; and data provided by SDOT.
- **General-Purpose Traffic:** Traffic counts and turning movement data provided by SDOT and collected in the field.
- **Freight Truck:** Freight truck volumes, turning movement data, and truck route information provided by SDOT and collected from field counts and previous technical analyses in the study area.
- **Nonmotorized Users:** Pedestrian and bicycle volumes and circulation data provided by SDOT and collected in the field within the study area, as well as BGT user volumes in other areas of the city.
- **Public Transportation**: Public transportation service operating in the study area and travel route information provided by King County Metro.
- **Freight Rail:** Train volumes and routes that traverse the study area, as reported by the Federal Railroad Administration and the BTR.
- **Safety:** Accident data and incident response data in the project vicinity provided by SDOT and the Seattle Fire Department.

The quantitative traffic analysis is based on traffic conditions during the PM peak hour—the hour during which traffic volumes are at their highest. For additional details on study methods, see the Transportation Discipline Report (Parametrix, 2016).

7.2 Affected Environment

7.2.1 Study Area

The transportation study area was defined as the area bounded by 32nd Ave NW to the west, NW 56th St/20th Ave NW/Leary Ave NW to the north, 11th Ave NW to the east, and Shilshole Ave NW/NW 45th St to the south (Figure 7-1). The study area boundaries encompass the areas where the function of transportation modes could be affected by project construction or operation. Analysts used estimated traffic volumes and construction phasing to identify potentially affected areas.

Figure 7-1. Transportation Discipline Study Area and Study Intersections and Driveways

Figure 7-1 also shows the 13 intersections and 10 driveways evaluated as part of the affected environment analysis. Seven of the intersections (Intersections 1, 2, and 4 through 8) have full signals and are referred to as signalized intersections. Intersection 3 has a pedestrian-activated signal, which remains green for traffic on the major street until activated by a pedestrian. This intersection is described as having a pedestrian half signal. The remaining intersections (Intersections 9 through 13) are controlled by stop signs and are referred to as unsignalized intersections.

Driveways (identified in Figure 7-1 as numbers 14 through 23) provide access to businesses in the study area and are unsignalized. The driveways chosen for this analysis are a sample of representative driveways in the study area with a range of traffic volumes and represent industrial and commercial driveways.

7.2.2 **Roadway Network**

The roadway network within the study area consists of principal, minor, and collector arterial streets, as well as local access streets (Figure 7-2). Most roads in the study area are classified as local access streets.

Principal arterial roadways are the foundation of the city's transportation network, designated as the major thoroughfares for trucks, motor vehicles, and transit vehicles. In the study area, NW Leary Way and 15th Ave NW are defined as principal arterials, meaning that they serve as primary routes for vehicle trips between urban centers and as connections to the regional transportation network.

Minor arterials distribute traffic from the principal arterials to collector arterials and local access streets, and provide connections to community destinations. In the study area, NW 46th St, Shilshole Ave NW, NW Market St, and 24th Ave NW are minor arterials.

Collector arterials collect and distribute traffic from principal and minor arterials to local access streets or directly to local destinations. Collector arterials are typically located within neighborhood boundaries and serve small groups of stores, schools, small apartment complexes, and residential land uses. In the study area, 14th Ave NW and 20th Ave NW are considered collector arterials.

All other streets are local residential or commercial access streets. SDOT does not consider local access streets as part of the arterial network. Local access streets provide direct access from the arterial network to local land uses.

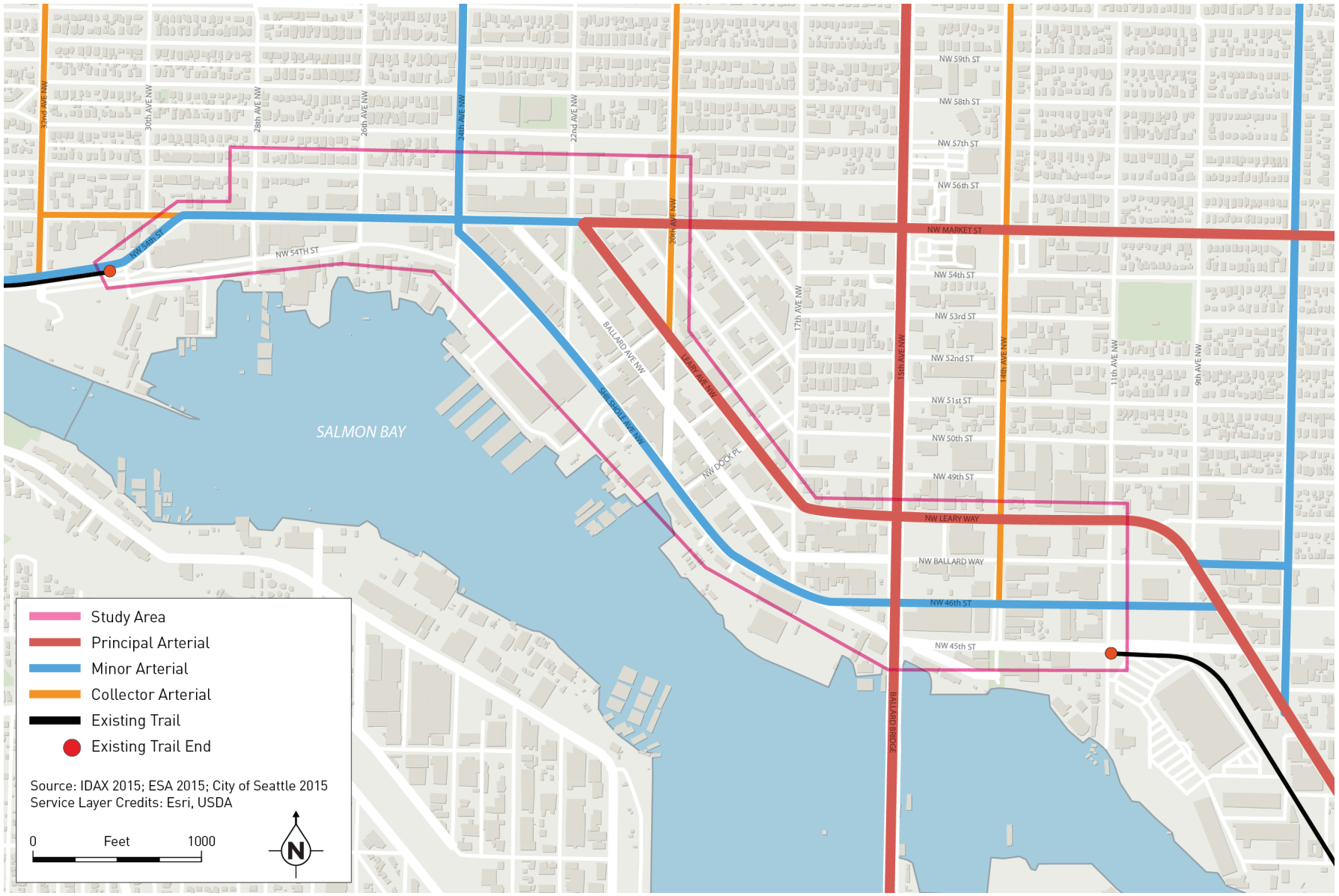

Figure 7-2. Transportation Discipline Study Area Roadway Hierarchy

7.2.3 Intersection Operations and Driveway Delay

Intersection operations were measured using the level of service (LOS) scale ranging from A to F, depending on the delay conditions at the intersection. LOS A represents the best conditions with minimal delay and LOS F represents the worst conditions with severe congestion. LOS ratings are based on the control delay of the intersection or roadway. Table 7-1 lists the intersection LOS delay thresholds for signalized and stop-controlled intersections. There are variations in the ranges of delay associated with the LOS ratings for signalized and unsignalized (stop-controlled) intersections.

Table 7-1. Level of Service Thresholds

Level of Service	*Average Control Delay per Vehicle (seconds)*	
	Signalized Intersections	*Stop-Controlled Intersections*
A	≤ 10	≤ 10
B	> 10 and ≤ 20	> 10 and ≤ 15
C	> 20 and ≤ 35	> 15 and ≤ 25
D	> 35 and ≤ 55	> 25 and ≤ 35
E	> 55 and ≤ 80	> 35 and ≤ 50
F	> 80	> 50

Note: The LOS criteria are based on control delay, which includes initial deceleration delay, queue move-up time, stopped delay, and final deceleration delay.

For this analysis, intersections that operate at LOS E or F are considered unacceptable. As shown in Figure 7-3 and Table 7-2, the following four intersections currently operate at LOS E or F during the PM peak hour:

- Intersection 5b: 15th Ave NW/NW Leary Way northbound off-ramp;
- Intersection 11: Shilshole Ave NW/NW 17th St (southbound approach from NW 17th St);
- Intersection 12: Leary Ave NW/20th Ave NW (southbound approach on 20th Ave NW); and
- Intersection 13: NW 56th St/24th Ave NW (westbound approach on NW 56th St).

All other intersections in the study area currently operate at LOS D or better.

The average delay in seconds at driveways during the PM peak hour is shown in Table 7-3. Existing delay at driveways in the study area ranges between approximately 10 and 25 seconds during the PM peak hour.

Figure 7-3. 2015 PM Peak Hour Study Intersection Level of Service

Table 7-2. 2015 PM Peak Hour Study Intersection Level of Service

*ID**	*Intersection*	*Traffic Control*	*2015 Existing Conditions PM Peak Hour*	
			LOS	*Delay (sec)*
1	NW Market St/28th Ave NW	Signal	A	6
2	NM Market St/24th Ave NW	Signal	D	42
3	NM Market St/Ballard Ave NW	Pedestrian Half Signal	A	8
4	NW Market St/22nd Ave NW/ Leary Ave NW	Signal	D	54
5a	15th Ave NW/NW Leary Way Southbound Off-Ramp	Signal	B	15
5b	15th Ave NW/NW Leary Way Northbound Off-Ramp	Signal	E	61
6	NW Leary Way/14th Ave NW	Signal	A	8
7	NW Leary Way/11th Ave NW	Signal	B	14
8	11th Ave NW/NW 46th St	Signal	B	18
9	11th Ave NW/NW 45th St	Unsignalized	A	10
10	NW 46th St/Shilshole Ave NW	Unsignalized	A	8
11	Shilshole Ave NW/NW 17th St	Unsignalized	E	42
12	Leary Ave NW/20th Ave NW	Unsignalized	F	269
13	NW 56th St/24th Ave NW	Unsignalized	E	39

*ID number matches ID number on Figures 7-1 and 7-3.

Table 7-3. 2015 PM Peak Hour Study Driveway Delay

*ID**	*Driveway*	*2015 Existing Conditions PM Peak Hour Delay (sec)*
14	NW 54th St/Ballard Locks	21
15	Shilshole Ave NW/Stimson Marina	17
16	Shilshole Ave NW/Salmon Bay Center	18
17	Shilshole Ave NW/Salmon Bay Sand and Gravel (north side)	11
18	Shilshole Ave NW/Salmon Bay Sand and Gravel (south side)	22
19	Shilshole Ave NW/Covich-Williams Chevron	15
20	Shilshole Ave NW/Salmon Bay Café	15

*ID**	*Driveway*	*2015 Existing Conditions PM Peak Hour Delay (sec)*
21	Shilshole Ave NW/Ballard Industrial	20
22	Ballard Ave NW/Ballard Industrial	8
23	Shilshole Ave NW/Ballard Mill Marina	20

*ID number matches ID number on Figure 7-1.

7.2.4 **Freight**

As documented in the Freight Master Plan, SDOT has proposed several streets in the study area as Major and Minor Truck Streets. Major Truck Streets are arterial streets that provide connections between and through industrial land uses (Manufacturing Industrial Centers and intermodal terminals), commercial districts, and urban centers (SDOT, 2016). Minor Truck Streets provide connections to and from urban villages and commercial districts, and secondary connections to major truck streets (SDOT, 2016). Major Truck Streets in the study area include:

- Shilshole Ave NW;
- NW Leary Way;
- 15th Ave NW; and
- NW Market St between 24th Ave NW and the eastern boundary of the study area.

Minor Truck Streets in the study area include 24th Ave NW between Shilshole Ave NW and the northern boundary of the study area.

The Industrial Areas Freight Access Project (SDOT and Port of Seattle, 2015) describes all arterial streets in the city as freight routes, although arterials are not subject to the same criteria for street design, traffic management, and pavement design and repair as Major Truck Streets. In addition to Shilshole Ave NW, NW Market St, 24th Ave NW, NW Leary Way, and 15th Ave NW, the following streets are considered arterial streets and are expected to accommodate some freight traffic:

- NW 46th St;
- 14th Ave NW; and
- 20th Ave NW.

Daily truck volumes (medium and heavy trucks) are highest on NW Leary Way/Leary Ave NW, NW Market St, NW 54th St, and Ballard Ave NW based on daily volume counts. During the PM peak hour, freight truck volumes in the study area are also highest on NW Leary Way/Leary Ave NW, Ballard Ave near 22nd Ave NW, and NW Market St.

7.2.5 **Nonmotorized Users**

The existing BGT ends just east and west of the study area. The eastern end of the BGT is at 11th Ave NW and NW 45th St. The western end is located 300 feet east of 32nd Ave NW and NW 54th St.

The BGT is a multi-use trail that provides local and regional access connecting Seattle, Lake Forest Park, and Kenmore. Near the study area, the BGT provides connections to destinations such as Golden Gardens

Park and the Ballard Locks to the west, and Gas Works Park and the University of Washington to the east. Near the study area, the trail has a width of between 12 and 15 feet. Currently, the BGT is used by a variety of nonmotorized users, including walkers, runners, bicyclists, skaters, and commuters.

In addition to the BGT, other bicycle facilities within and near the study area are shown on Figure 7-4. Most streets in the study area have paved sidewalks on both sides of the street with widths varying between 6 and 20 feet (Figure 7-5).

Table 7-4 shows daily nonmotorized counts recorded during 2015 on the BGT at two locations: 9th Ave NW and at Seaview Ave NW. Table 7-5 provides nonmotorized volumes during the PM peak hour on the BGT at 9th Ave NW.

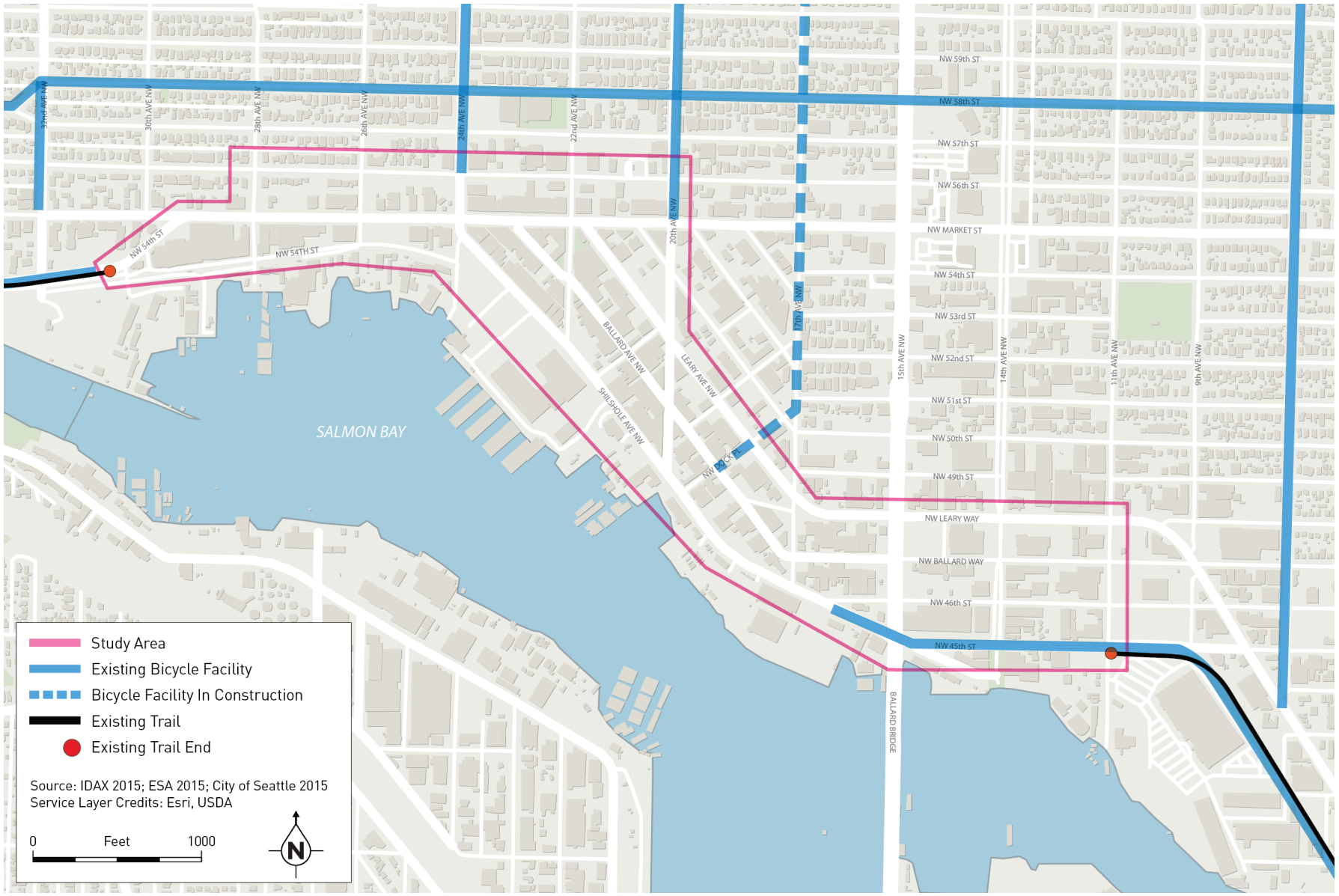

Figure 7-4. 2015 Study Area Bicycle Facilities

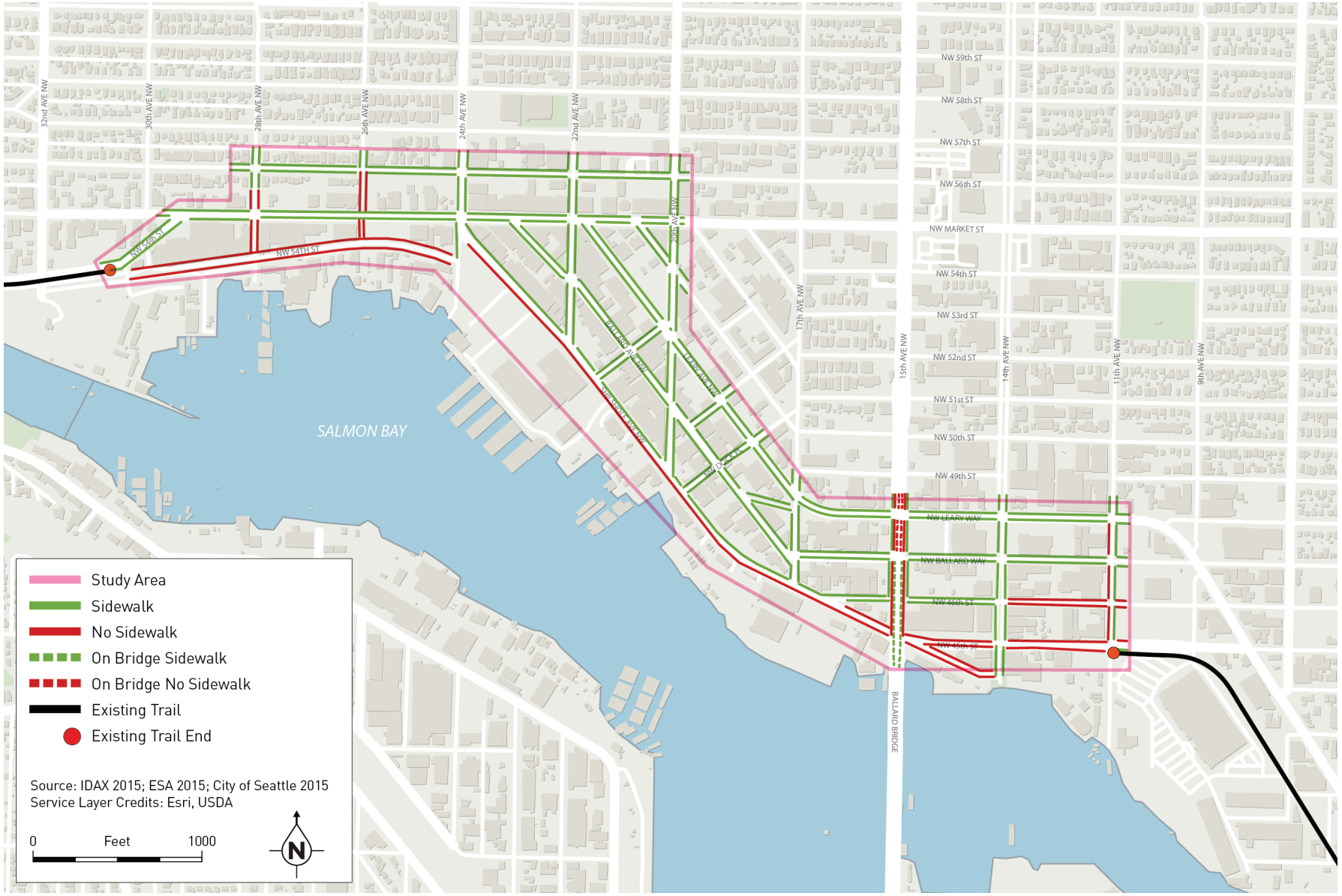

Figure 7-5. 2015 Study Area Sidewalks

Table 7-4. 2015 Daily Bicycle Counts and Estimated Pedestrian Volumes on the BGT

Date	*Total Bicycles*	*Westbound Bicycles*	*Eastbound Bicycles*	*Estimated Total Pedestrians*[1]	*Estimated Westbound Pedestrians*[1]	*Estimated Eastbound Pedestrians*[1]
BGT at 9th Ave NW						
Fri 7/17/15	1,080	670	410	360	230	130
Sat 7/18/15	1,530	760	770	505	260	245
Sun 7/19/15	1,420	715	705	470	245	225
Mon 7/20/15	1,665	845	820	545	285	260
Tues 7/21/15	1,640	815	825	540	275	265
Wed 7/22/15	1,720	850	870	565	290	275
BGT at Seaview Ave NW						
Fri 7/17/15	400	180	220	135	60	75
Sat 7/18/15	635	325	310	210	105	105
Sun 7/19/15	200	80	120	65	25	40
Mon 7/20/15	55	45	10	20	15	5
Tues 7/21/15	75	65	10	25	20	5
Wed 7/22/15	130	75	55	45	25	20
Thurs 7/23/15	95	70	25	30	20	10

[1] Pedestrian volumes estimated based on the bicycle-to-pedestrian ratio developed using counts taken in September 2015.

Note: Counts were rounded to the nearest five users to account for daily fluctuations. For counts that were between one and four users, the number was rounded up to provide a conservative estimate of impacts.

Table 7-5. 2015 PM Peak Hour Nonmotorized Counts on the BGT at 9th Ave NW

PM Peak Hour	*Total Bicycles*	*Westbound Bicycles*	*Eastbound Bicycles*	*Total Pedestrians*	*Westbound Pedestrians*	*Eastbound Pedestrians*
5:00–6:00 PM	190	145	45	50	35	15

Note: Counts were rounded to the nearest five users to account for daily fluctuations. For counts that were between one and four users, the number was rounded up to provide a conservative estimate of impacts.

Bicycle volumes are higher than pedestrian volumes on the BGT. Counts recorded during 2015 indicated that pedestrian volumes are approximately 30% of bicycle volumes on the trail. The counts at 9th Ave NW, the closest location to the study area, also indicate that bicycle volumes are typically higher on weekdays than on weekends (Table 7-4). This is likely because of the high number of commuters who use the BGT compared to recreational users. Nonmotorized volumes on the BGT are substantially higher on the east side of the study area compared to the west side. It is likely that a large number of users are starting and ending their trips in the higher density residential areas north of the study area.

Turning movement counts collected in April 2014 and September 2015 at study area intersections also recorded pedestrian and bicycle movements during the PM peak hour. During the PM peak hour, bicycle volumes were highest at:

- NW 45th St near the eastern end of the BGT;
- Shilshole Ave NW and NW 46th St;
- 22nd Ave NW and NW Market St;
- NW Market St and NW 24th St; and
- NW Market St and NW 28th St.

The bicycle counts indicate that during the PM peak hour, bicyclists are traveling westbound from the eastern end of the BGT along Shilshole Ave NW. Bicyclists likely use various northbound streets, such as 22nd Ave NW and 24th Ave NW, to connect to residential areas. This also likely indicates that some of the bicycle trips begin and end in the residential areas north of the study area.

During the PM peak hour, pedestrian volumes are highest at:

- NW Market St;
- Leary Ave NW near 20th Ave NW; and
- NW 56th St near 24th Ave NW.

Pedestrian volumes in these locations are likely highest due to the adjacent land uses and proximity of transit stops.

7.2.6 Public Transportation

Major transit corridors in the study area include NW Market St, NW Leary Way, 24th Ave NW, and 15th Ave NW. King County Metro operates six transit routes in the study area (Figure 7-6).

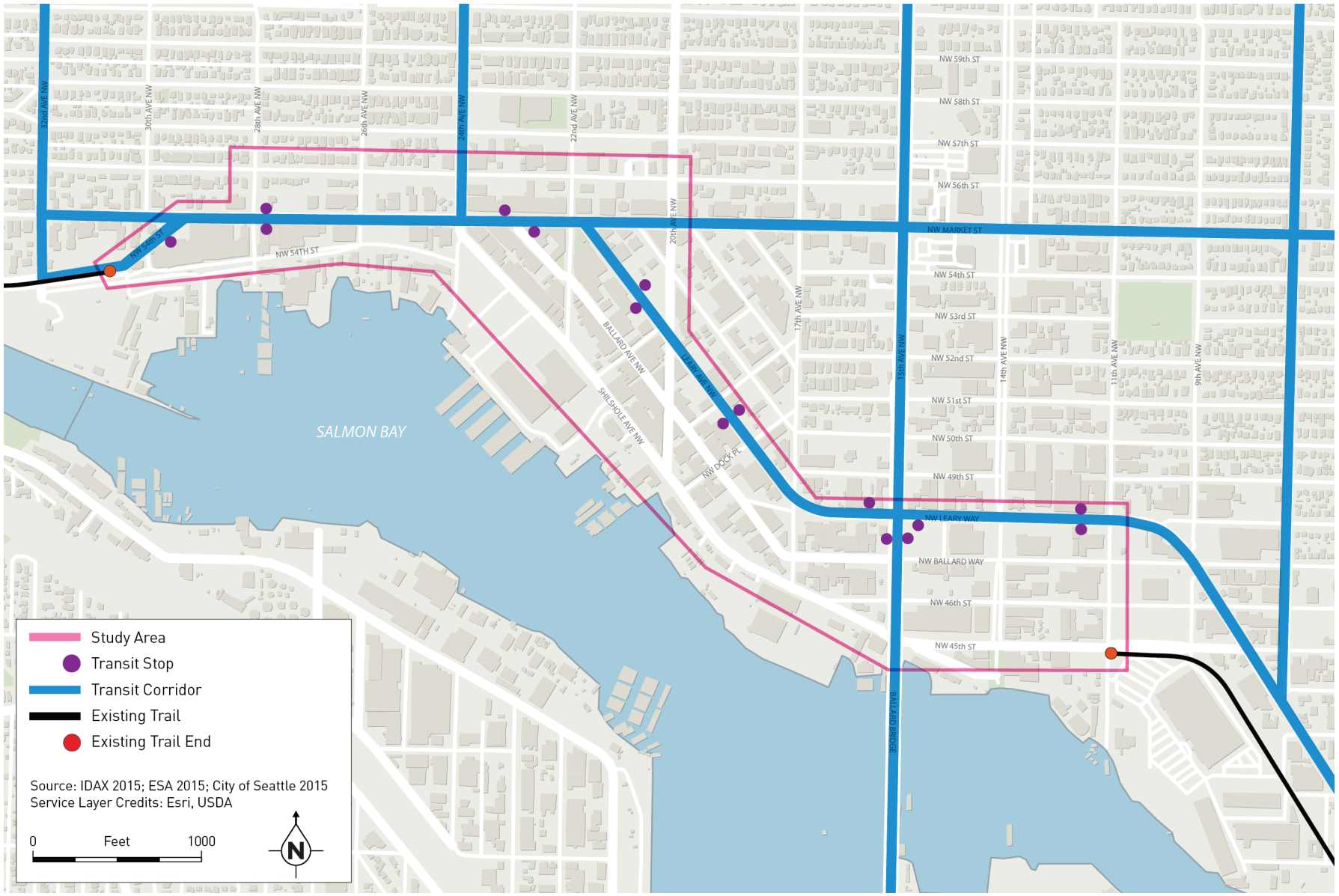

Figure 7-6. 2015 Transit Stops and Corridors

7.2.7 **Freight Rail**

The Ballard Terminal Railroad Co. (BTR) rail line is a shortline railroad that provides freight goods movement in the study area, primarily to the Salmon Bay Sand and Gravel Company. In the study area, the BTR rail line is located on the south side of NW 54th St and Shilshole Ave NW and continues onto the north side of NW 45th St. There is also a rail spur line that travels north from NW 45th St to NW 46th St directly east of 14th Ave NW. There are nine public at-grade crossings in the study area located at:

- 30th Ave NW and NW 54th St;
- 28th Ave NW and NW 54th St;
- 26th Ave NW and NW 54th St;
- 24th Ave NW and NW 54th St;
- Shilshole Ave NW at 15th Ave NW;
- NW 45th St and 11th Ave NW;
- NW 45th St and 14th Ave NW;
- NW 46th St and 14th Ave NW; and
- NW 46th St near 11th Ave NW.

The rail line also crosses several driveways on the south side of Shilshole Ave NW, including the driveways at the Stimson Marina, Salmon Bay Center, Salmon Bay Sand and Gravel, Covich-Williams Chevron, Salmon Bay Café, and Ballard Mill Marina.

Trains do not regularly travel across all of the crossings. Currently, shipments destined for Salmon Bay Sand and Gravel are transferred from BNSF to BTR near the Seaview Boatyard. From this location, trains travel south and east along the BTR rail line to deliver shipments to Salmon Bay Sand and Gravel. The shipment is unloaded from the train cars, and then empty cars are moved back to the transfer location between BTR and BNSF near the Seaview Boatyard. The train engine used by BTR is stored between NW 45th St and NW 46th St just east of 14th Ave NW. Currently, shipments to Salmon Bay Sand and Gravel occur approximately three times per week (Cole, 2016). Although train movements typically occur when traffic and nonmotorized volumes are lower, such as during the night, BTR can operate trains at any time of the day.

Trains typically travel at speeds of 5 to 10 miles per hour (mph) in the study area. Half of the crossings in the study area do not currently have safety enhancements, such as gates, advance warning signs, pavement markings, or crossbucks (signs in a letter "X" formation that indicate grade crossings). At a minimum, federal law requires all public at-grade crossings to have passive warning signs, such as crossbucks (FHWA, 2007). The following five crossings do not provide crossbucks:

- 30th Ave NW and NW 54th St (U.S. Department of Transportation [USDOT] Crossing Number 101212H);
- Shilshole Ave NW at 15th Ave NW (USDOT Crossing Number 101226R);
- NW 46th St and 14th Ave NW (USDOT Crossing Number 101246C);
- NW 46th St near 11th Ave NW (USDOT Crossing Number 101258W); and
- NW 45th St and 11th Ave NW (USDOT Crossing Number 101264A).

7.2.8 **Safety**

Between January 2012 and December 2014, there were 338 vehicular collisions in the study area. The single block segment of Ballard Ave NW between NW Market St and 22nd Ave NW had the highest number of collisions compared to other single block segments in the study area, with 13 collisions over the 3-year period (Figure 7-7). The majority of collisions in the study area were property damage-only collisions with parked vehicles. None of the collisions were fatal.

The intersections with the highest concentrations of collisions—five or more collisions over the 3-year period—included the following (Figure 7-8):

- NW 46th St and 14th Ave NW;
- 15th Ave NW northbound and NW Leary Way;
- NW Market St and Leary Ave NW;
- NW Leary Way and 14th Ave NW; and
- NW Leary Way and 11th Ave NW.

Collisions involving nonmotorized users are shown on Figure 7-9. Collisions involving pedestrians or bicyclists were distributed throughout the study area, with just over half occurring between intersections (on block segments). The majority of the nine collisions with pedestrians occurred when a turning or forward-moving vehicle struck a pedestrian who was crossing the street. The cause of collisions between bicyclists and vehicles in the study area varies, although the majority of collisions occurred when both the vehicle and the bicyclist were moving. For example, many collisions occurred when a vehicle was traveling in an opposite direction to the bicyclist, such as a right-turning vehicle colliding with a forward-moving bicyclist or a turning bicyclist colliding with a forward-moving vehicle. There were no dedicated bicycle facilities in the locations where a collision between a vehicle and a bicyclist occurred, with the exception of one collision that occurred on NW 45th St between 9th Ave NW and 11th Ave NW. The existing BGT runs parallel to this location.

Nonmotorized safety in the study area is also affected by roadway conditions, including the presence of railroad tracks and other obstacles. Incident response data provided by the Seattle Fire Department indicate locations in the study area where roadway conditions could create unsafe passage for bicyclists and pedestrians (Seattle Fire Department, 2015). As shown on Figure 7-10, incident responses have been concentrated along NW 45th St and Shilshole Ave NW, and at the intersections of NW 45th St/14th Ave NW and under the Ballard Bridge. The presence of railroad tracks in these locations could influence safety conditions for nonmotorized users, particularly bicyclists. Incidents near railroad tracks typically occur when bicycle tires become trapped between the railroad tracks and the street. Between January 2012 and December 2014, there were 45 incidents in the study area. However, it is likely that additional incidents caused by roadway conditions occurred but were not recorded.

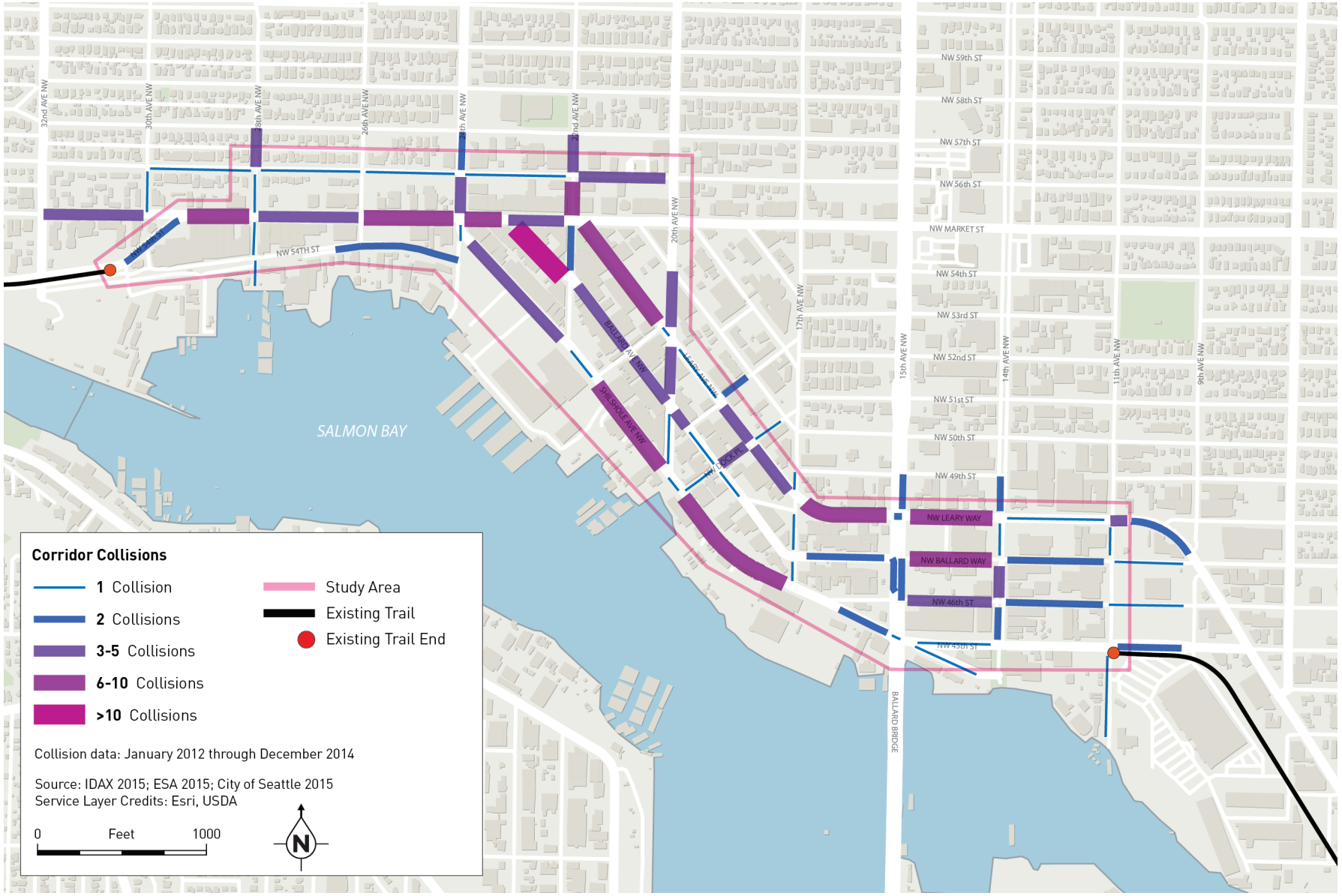

Figure 7-7. Study Area Corridor Collisions

Figure 7-8. Study Area Intersection Collisions

Figure 7-9. Study Area Collisions Involving Nonmotorized Users

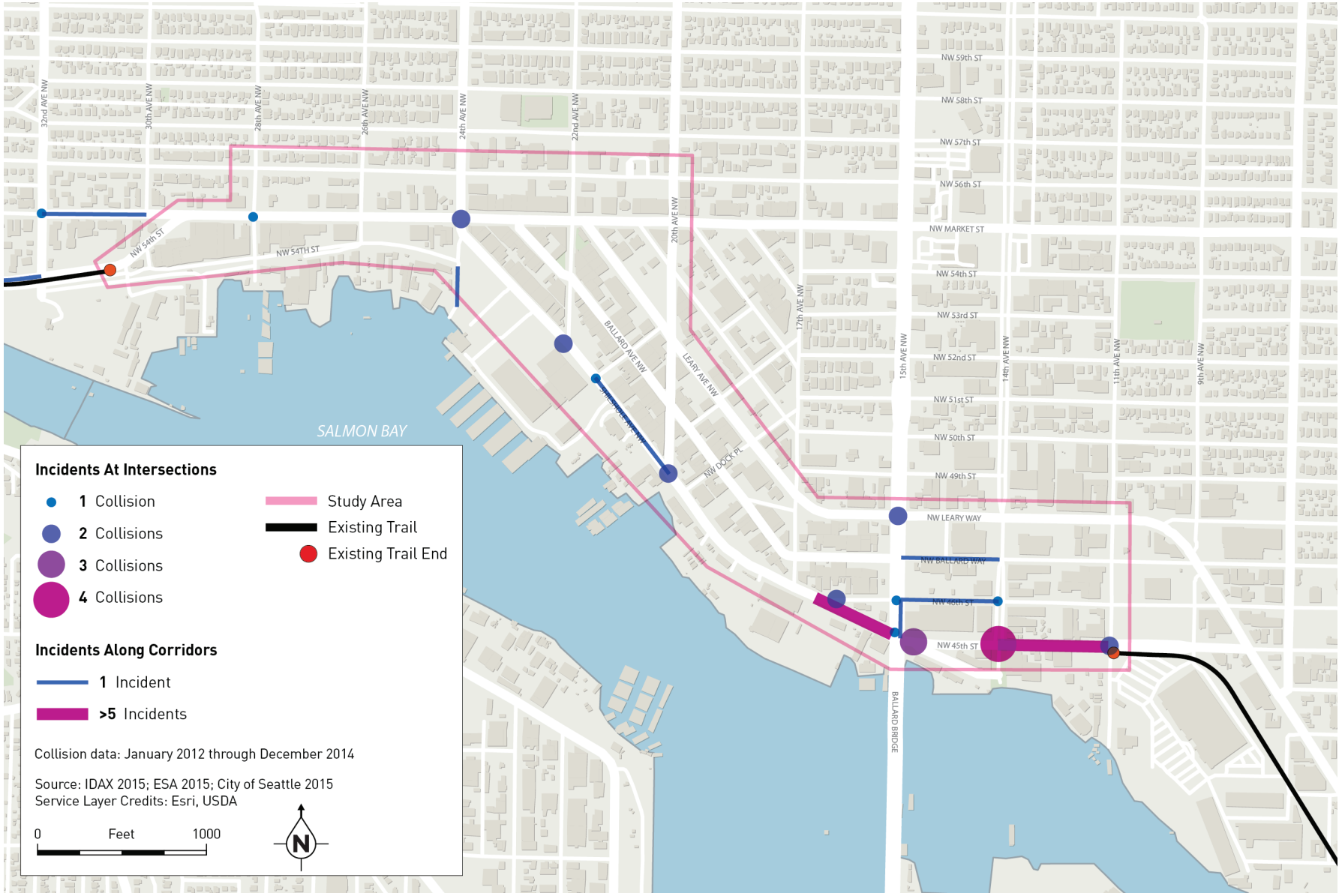

Figure 7-10. Study Area Nonmotorized Incident Responses

7.3 Potential Impacts

7.3.1 No Build Alternative

Construction

No construction activities would occur under the No Build Alternative for the Missing Link project; therefore, there would be no construction impacts associated with the No Build Alternative.

Operation

Roadway Network

The roadway configuration and the 23 study area intersections and driveways for the No Build Alternative would be the same as the 2015 existing conditions.

Traffic Volumes and Operations

The year 2040 was used as the timeline to analyze the impacts of the project. The project team estimated the 2040 passenger vehicle volumes for the study area intersections under No Build conditions (i.e., without the project) by applying an annual background growth rate of 0.6% to existing traffic counts in the study area (IDAX, 2015; SDOT, 2015a, 2015b). The 0.6% growth rate is consistent with the two previous transportation studies completed in 2008 and 2011 for the Missing Link (Parsons Brinckerhoff, 2008, 2011).

The projected growth in traffic volumes would result in more congestion and delay under the No Build Alternative compared to 2015 existing conditions. The following intersections are expected to operate at LOS E or F, or would have increased delay, in 2040 under the No Build Alternative:

- Intersection 4: NW Market St/22nd Ave NW/Leary Ave NW;
- Intersection 5b: 15th Ave NW/NW Leary Way southbound off-ramp;
- Intersection 11: Shilshole Ave NW/NW 17th St (southbound approach);
- Intersection 12: Leary Ave NW/20th Ave NW (southbound approach on 20th Ave NW); and
- Intersection 13: NW 56th St/24th Ave NW (westbound approach).

All other intersections in the study area would operate at LOS D or better (Figure 7-11).

During the PM peak hour, delay at study area driveways could increase by up to 12 seconds compared to existing conditions.

Freight

The primary freight corridors would be the same under the No Build Alternative compared to the 2015 existing conditions. However, increased traffic congestion from background population and employment growth would likely adversely affect freight movement in the study area. Freight vehicles would experience the same delay at study area intersections as general-purpose vehicles. Intersection 11 (Shilshole Ave NW/NW 17th St) would operate at LOS F in 2040 and is located on a primary freight corridor as designated by SDOT.

Figure 7-11. 2040 No Build Alternative PM Peak Hour Study Intersection Level of Service

Nonmotorized Users

Bicycle volumes in the study area are projected to increase by 5% each year between 2015 and 2040 based on recent studies and counts on the BGT, expected land use changes and growth in the Ballard area, and input from SDOT (SDOT, 2015c, 2015d; Fehr & Peers and SvR Design Company, 2011; PSRC, 2015). Pedestrian volumes are projected to increase by 1% each year between 2015 and 2040 (Sound Transit, 2010; Fehr & Peers and SvR Design Company, 2011; PSRC, 2015).

Pedestrian and bicycle facilities in and near the study area under the No Build Alternative would be the same as under the 2015 existing conditions. There would continue to be a gap in the BGT within the study area (between 11th Ave NW and NW 45th St and approximately 300 feet east of 32nd Ave NW and NW 54th St). Similar to existing conditions, bicyclists are anticipated to primarily use Shilshole Ave NW to travel through the study area.

Under the No Build Alternative, increased pedestrian and bicycle volumes in the study area could result in increased conflicts between nonmotorized users and vehicular traffic, particularly for bicyclists. Bicyclists currently travel on study area roadways without designated bicycle facilities, particularly on Shilshole Ave NW. When there are more bicyclists on study area streets in the future, the lack of dedicated facilities could result in more collisions between motor vehicles and bicyclists because of increased volumes.

Public Transportation

Public transportation services under the No Build Alternative would be similar to the 2015 existing conditions. With increased population and employment growth, demand for public transit would likely increase, which could result in the need for service expansion in the study area.

None of the intersections along transit corridors are expected to operate at LOS F under the No Build Alternative. The intersection at NW 56th St and 24th Ave NW would operate at LOS F under the No Build Alternative, but this would not affect transit because the delay would only be experienced by vehicles at the westbound approach. Similarly, the intersection at Leary Ave NW, 20th Ave NW, and NW Vernon Pl would also operate at LOS F under the No Build Alternative, but this would not affect transit because the delay would only be experienced by vehicles at the northeast-bound approach on NW Vernon Pl and the southbound approach on 20th Ave NW.

Freight Rail

Rail operations in the study area under the No Build Alternative are expected to be similar to the 2015 existing conditions. No impacts are anticipated under the No Build Alternative.

Safety

Traffic and nonmotorized volumes in the study area are expected to increase between 2015 and 2040. This could increase collision frequencies for both motor vehicle and nonmotorized users in the study area. Bicycle volumes are expected to grow at a higher rate than vehicles and pedestrians; therefore, the frequency of motor vehicle-bicycle collisions could increase at a greater rate under the No Build Alternative. No new dedicated bicycle facilities would be provided under the No Build Alternative. The majority of collisions between bicyclists and motor vehicles to date have occurred when both the bicyclist and the motor vehicle were moving in areas lacking dedicated bicycle facilities. If this condition persists, there could be an increased likelihood for collisions between motor vehicles and bicyclists because of increased volumes.

Other roadway conditions that influence nonmotorized safety would also remain the same under the No Build Alternative, such as the presence of railroad tracks and other obstacles. If dedicated bicycle facilities are not provided to allow bicyclists to avoid or safely traverse areas with obstacles such as railroad tracks, the number of nonmotorized incidents is expected to increase as nonmotorized volumes increase in the study area.

7.3.2 Impacts Common to All Build Alternatives

Construction

Traffic Volumes and Operations

Construction activities could affect traffic operations in the vicinity of each Build Alternative during the 12- to 18-month construction period. Construction would occur in small segments that could range between three and four street blocks; therefore, isolated portions of the roadway would be affected.

During construction, traffic delay and congestion impacts are anticipated, particularly in areas where the roadway is reduced to one lane. There could also be traffic diversions to other study area streets during construction, which could increase delay and congestion on other roadways. However, traffic delay from diversions is expected to be minimal because it is likely that vehicles would be distributed along multiple adjacent roadways under each alternative.

Additional sources of potential traffic delay during construction could include the following:

- Visual distraction from construction activities; and
- Construction trucks entering and exiting the work zone and staging areas.

In general, delays resulting from these sources are likely to be minor.

Driveway access to properties would likely be maintained during construction. It is possible that driveways could be narrowed during construction, or could be temporarily surfaced with ADA-compliant materials in place of asphalt or concrete. If properties have more than one access point, it is also possible that one driveway could be closed while the other remains open during construction. Impacts are expected to be minor for driveway access and for traffic accessing individual properties.

Freight

Freight traffic could experience temporary, minor delays and congestion. Access to businesses in the study area would be maintained throughout construction. Because freight traffic peaks during the midday, roadway closures during the day could cause additional delay for freight vehicles. However, this impact is not anticipated to be significant because construction closures would only occur for several hours.

Nonmotorized Users

Pedestrian and bicyclist access would be maintained within the construction areas in accordance with City policies for construction. Commercial businesses would remain open, and residential and industrial properties would remain accessible. Sidewalks could be temporarily replaced by ADA-compliant facilities within the construction area and to access other properties. Temporary pedestrian facilities could include asphalt sidewalks, steel plates over unfinished areas, wood sidewalks with railings, or cordoned-off areas of parking lanes. When necessary during construction, nonmotorized users could be rerouted

around active construction zones, which could lengthen nonmotorized trips and travel times. However, the impact would be minor in any one location because construction is expected to occur in segments of three to four street blocks.

Public Transportation

Traffic diversion to other study area streets could increase delay and congestion for transit in the study area. However, this impact would not be significant because diverted vehicles would likely be distributed along multiple adjacent roadways under each of the alternatives.

Specific construction impacts on public transportation that would only occur for the Ballard Avenue Alternative and Leary Alternative are described in Section 7.3.6 and Section 7.3.7, respectively.

Freight Rail

Construction impacts on rail service would only occur on the Shilshole South Alternative (Section 7.3.4). Construction activities for all other Build Alternatives are not expected to affect rail operations in the study area.

Safety

Construction activities for the Build Alternatives could temporarily affect safety in the study area. Temporary changes in roadside characteristics and surfacing could increase accident frequencies in isolated locations in the study area during construction. Changes in roadside characteristics could include the presence of construction equipment and activities or loss of shoulders, among other alterations, which have the potential to create distractions for drivers. Changes in roadway surfacing could affect traffic speeds and braking.

Operation

Roadway Network

All alternatives would provide a dedicated nonmotorized facility for the entire length of the study area. This facility would be 8 to 12 feet wide with varying buffers on the side of the trail between the adjacent roadways and properties.

Traffic Volumes and Operations

The same projected increases in traffic, bicycle, and pedestrian volumes for the year 2040 used in the No Build Alternative analysis were also applied to each Build Alternative described below.

Freight

All alternatives would cross driveways used for freight movement. Freight vehicles would be required to stop before the trail to check for pedestrians and bicyclists before advancing to the roadway. For driveways that were studied, this could result in zero to 25 seconds of additional delay, on average, above the No Build Alternative during the PM peak hour. Similar delays are expected for other driveways in the study area. With the anticipated volume of trail users, and because trail users would be spread out, this delay would occur sporadically during the PM peak hour and all day.

Some businesses that currently use the City right-of-way to access parking or loading docks on their properties might need to relocate their access points to driveways or possibly to the ends of the blocks. The change in access would potentially change how private property owners use the space between their buildings and the City's right-of-way. Some businesses may not be able to access their businesses as they currently do and may have to reorient their business operations to accommodate freight by relocating loading docks or driveways.

Nonmotorized Users

The project would provide a dedicated 8- to 12-foot multi-use trail for nonmotorized users for the entire length of the study area. Additional nonmotorized improvements could include curb treatments, pavement markings and treatments, signage, wayfinding, and lighting. The trail would cross driveways and loading docks. These crossings would be clearly delineated, which would improve comfort and safety for nonmotorized users in the study area compared to the No Build Alternative by organizing and creating predictability of potential conflict points between vehicles and nonmotorized users. Vehicles would be required to stop for trail users at all driveway/trail intersections.

Safety

The Missing Link would improve safety for nonmotorized users and motor vehicles in the study area. A dedicated bicycle facility would improve the predictability of conflict points between motor vehicles and cyclists and reduce the likelihood of collisions because potential conflict points would be clearly identifiable by both motor vehicle drivers and trail users. Potential conflict points would be clearly organized and delineated, which would allow motor vehicle drivers and trail users to be aware of where to travel cautiously. A dedicated facility would also reduce the likelihood of nonmotorized injury incidents by providing a facility that safely traverses or avoids obstacles in the study area such as the railroad tracks. The Missing Link would be designed to clearly delineate trail user space from the roadway, and would include safety features such as buffers, pavement markings, raised crosswalks, curb treatments, signage, and lighting.

7.3.3 Shilshole South Alternative

Construction

Under the Shilshole South Alternative, there could be additional traffic and freight delays on Shilshole Ave NW during construction. If construction activities require the closure of one lane of the roadway, a flagger could be required to direct travel to other routes within the construction zone. This impact could occur for several hours during the midday but only for short segments of roadway (between three and four street blocks).

Under the Shilshole South Alternative, pavement would be added to portions of the BTR rail line to decrease gaps between the tracks and the roadway to improve safety at driveways in the study area. These construction activities would be coordinated with BTR operations and would occur during times when BTR trains are not operating; construction equipment would be cleared from the tracks each day. Because construction activities near the rail line would be coordinated with BTR train movements, construction activities are not expected to affect rail operations. Any construction activities near the BTR rail line would be coordinated with the BTR and would adhere to Federal Railroad Administration requirements for construction near rail facilities.

Operation

Roadway Network

The Shilshole South Alternative would provide a dedicated nonmotorized facility for the entire length of the study area. This facility would be 8 to 12 feet wide with a 1- to 6-foot buffer on each side of the trail between the roadway and adjacent properties.

Under the Shilshole South Alternative, NW 54th St between the Ballard Locks driveway and Shilshole Ave NW would have one lane of travel in each direction. In various locations, driveways would cross the trail to allow access to businesses. The roadway channelization on Shilshole Ave NW would be similar to the No Build Alternative, with one travel lane in each direction for vehicles. There are approximately 41 driveways and loading docks along the alignment. To the extent necessary, driveway access to all businesses would be reconstructed and provided in the same location as the No Build Alternative, but some properties with multiple accesses could have their driveways consolidated into a single access point in coordination with SDOT and property owners. On Shilshole Ave NW at 17th Ave NW, a left-turn pocket in the eastbound direction and new signal would be provided.

One travel lane in each direction would be provided on NW 45th St between Shilshole Ave NW and 11th Ave NW under the Shilshole South Alternative. At the intersection of 14th Ave NW and NW 45th St, a left-turn pocket would be provided in both the eastbound and westbound directions. At the intersection of 11th Ave NW and NW 45th St, a left-turn pocket would be provided in the eastbound direction. A 5- to 17-foot clear zone would be provided between the Ballard Bridge overpass and 11th Ave NW on NW 45th St. The 17-foot-wide clear zone would be centered on the railroad tracks for clearance and safety.

All other roadways in the study area would be the same as the No Build Alternative.

Traffic Volumes and Operations

Depending on the traffic volume at a particular driveway, vehicles exiting could experience up to 11 seconds of increased delay compared to the No Build Alternative.

The Shilshole South Alternative would not cause any intersections to operate at LOS E or F that would otherwise operate at LOS D or better under the No Build Alternative. However, the following five intersections (described below) would operate at a different LOS or have a change in delay when compared to the No Build Alternative (Figure 7-12).

1. Intersection 4: NW Market St/22nd Ave NW/Leary Ave NW

The intersection at NW Market St/22nd Ave NW/Leary Ave NW (Intersection 4) would have approximately 1 second less delay because some nonmotorized users in the study area would likely shift to the trail. This would reduce the amount of conflicting nonmotorized and vehicle movements at the intersection, which would improve overall intersection delay.

2. Intersection 8: 11th Ave NW/NW 46th St

The intersection at 11th Ave NW and NW 46th St (Intersection 8) would operate at LOS B compared to LOS C because traffic would shift from NW 46th St to NW 45th St as NW 45th St is restored to a two-way street. Under the No Build Alternative, NW 45th St remains an eastbound one-way street for vehicles.

Figure 7-12. Shilshole South Alternative PM Peak Hour Study Intersection Level of Service

3. Intersection 10: NW 46th St/Shilshole Ave NW (northbound approach)

The operational changes at Intersection 8 would also result in the intersection at NW 46th St and Shilshole Ave NW (Intersection 10) operating at LOS D under the Shilshole South Alternative compared to LOS A under the No Build Alternative. This intersection is a two-way stop control, and the delay reported above is for the worst-operating approach. Although the LOS decreases under the Shilshole South Alternative, this delay would only be experienced by vehicles at the northbound approach. This volume is much smaller compared to east-west traffic at this intersection. This is not anticipated to have a significant adverse impact on traffic operations because only a small number of vehicles would experience additional delay, and the intersection would still operate at LOS E or better.

4. Intersection 11: Shilshole Ave NW/17th Ave NW (southbound approach)

The intersection at Shilshole Ave NW and 17th Ave NW (Intersection 11) would be signalized under the Shilshole South Alternative. This would improve intersection operations (LOS A compared to LOS F under the No Build Alternative).

5. Intersection 13: NW 56th St/24th Ave NW

The intersection at NW 56th St and 24th Ave NW (Intersection 13) would have approximately 40 seconds less delay when compared to the No Build Alternative because some nonmotorized users in the study area would shift to the trail. This would reduce the amount of conflicting nonmotorized and vehicle movements at the intersection, which would improve overall delay.

Freight

Freight mobility at the intersections of 11th Ave NW and NW 46th St would be improved under the Shilshole South Alternative compared to the No Build Alternative. This is because NW 45th St would be restored to a two-way roadway, which would redistribute traffic in this part of the study area. Freight mobility at the intersection of Shilshole Ave NW and 17th Ave NW would also be improved under the Shilshole South Alternative because a signal would be provided, improving intersection operations from LOS F to LOS A compared to the No Build Alternative.

Approximately 41 driveways and loading docks are located along the alignment of the Shilshole South Alternative. At driveways, freight vehicles could be delayed from zero to 11 seconds (on average) above the No Build Alternative during the PM peak hour. With the anticipated volume of trail users, and because trail users would be spread out, this delay would occur sporadically during the PM peak hour and all day. Although some driveways could experience additional delay compared to the No Build Alternative, this delay would not be considered a significant impact.

Up to 10 freight access points (driveways and loading docks) to private properties could change because the Missing Link would be constructed within the City's right-of-way along the north side of NW 54th St and the south side of Shilshole Ave NW. Some businesses that currently use the City right-of-way to access parking or loading docks on their properties might need to relocate their access points to driveways or possibly to the ends of the blocks. The change in access would potentially change how private property owners use the space between their buildings and the City's right-of-way. Some businesses may not be able to access their businesses as they currently do, and they may have to reorient their business operations to accommodate freight by relocating loading docks or driveways. Businesses that currently use the public right-of-way for loading and unloading activities would no longer be allowed to continue this unpermitted use under the Shilshole South Alternative. Properties with multiple driveways or access points may need to consolidate these where possible to improve safety and operations.

Nonmotorized Users

The project would provide a dedicated 8- to 12-foot multi-use trail for nonmotorized users for the entire length of the study area. Additional nonmotorized improvements under the Shilshole South Alternative could include curb treatments, pavement markings and treatments, signage, wayfinding, and lighting.

The trail would cross approximately 41 driveways and loading docks under the Shilshole South Alternative. Trail crossings with driveways and intersections would be clearly delineated, which would improve comfort and safety for nonmotorized users in the study area compared to the No Build Alternative by organizing and creating predictability of potential conflict points between vehicles and nonmotorized users. Vehicles would be required to stop for trail users at all driveway/trail intersections. However, after stopping before the trail, vehicles would continue forward over the trail and stop at the roadway. It is possible that vehicles blocking the trail would occasionally delay trail users during the day. On average, trail users could have to wait between 15 to 25 seconds for a vehicle to clear the trail.

Signal timing for both vehicles and nonmotorized users would be included at study area intersections. Signal timing would be optimized for all movements, so delay would not be increased to unacceptable levels for nonmotorized users and vehicles.

Pedestrian and Bicycle Volumes

Between 2015 and 2040, bicycle volumes are anticipated to grow by 5% annually, and pedestrian volumes are expected to grow by 1% annually in the study area. These growth rates are based on recent studies and counts on the BGT, expected land use changes and growth in the Ballard area, and input from SDOT (SDOT, 2015c; 2015d; Sound Transit, 2010; Fehr & Peers and SvR Design Company, 2011; PSRC, 2015). Anticipated nonmotorized volumes on the Missing Link in 2040 are summarized in Table 7-6. All nonmotorized counts were rounded to the nearest five users to account for daily fluctuations. For locations where the recorded volumes were between one and four, the count was rounded up to provide a conservative estimate of impacts. In the analysis, it is assumed that bicycle traffic would shift to the trail corridor proposed under each Build Alternative. This assumption provides the most conservative estimate of impacts under each of the Build Alternatives. Pedestrians and bicyclists who have destinations in other parts of the study area may use the trail on Shilshole Ave NW through the study area for only a short distance. This would result in nonmotorized users continuing to use other roadways in the study area as well, but the majority of users would shift to the trail. For additional details on the analysis, see the Transportation Discipline Report (Parametrix, 2016).

Table 7-6. 2040 PM Peak Hour Nonmotorized Volumes on the BGT

PM Peak Hour	*Total Bicycles*	*Westbound Bicycles*	*Eastbound Bicycles*	*Total Pedestrians*	*Westbound Pedestrians*	*Eastbound Pedestrians*
BGT at the eastern end						
5:00–6:00 PM	430	325	105	65	45	20
BGT at the western end						
5:00–6:00 PM	160	90	70	125	85	40

The Missing Link project would be designed to accommodate a high volume of nonmotorized users; therefore, Missing Link users are not expected to be affected by diversion. Signal timing for both vehicles and nonmotorized users would be included in the design at study area intersections; as a result, no impacts on delay would occur from the addition of nonmotorized movements through intersections under the Shilshole South Alternative. Signal timing would be optimized for all movements, so delay would not be increased to unacceptable levels for nonmotorized users and vehicles.

Public Transportation

No impacts on transit under the Shilshole South Alternative are anticipated because transit service is not available on streets along this alignment.

Freight Rail

Under the Shilshole South Alternative, the BTR tracks could be relocated in various isolated locations along NW 54th St, Shilshole Ave NW, and NW 45th St. This could include removing pieces of passing rail that are no longer used or relocating track to allow additional right-of-way space for the trail. All track relocation would be coordinated with BTR so that rail operations would not be adversely affected.

The Shilshole South Alternative would improve separation between nonmotorized users and the rail line, which would improve safety. The Missing Link would cross the rail line near the Ballard Mill Marina. Signage and other design elements would be provided to warn nonmotorized users of train activity.

Safety

The Shilshole South Alternative would improve safety for nonmotorized users and motor vehicles in the study area. Under this alternative, a dedicated bicycle facility would improve predictability of conflict points between motor vehicles and bicyclists and reduce the likelihood of collisions. Potential conflict points would be clearly organized and delineated, which would allow motor vehicle drivers and trail users to be aware of where to travel cautiously. A dedicated facility would also reduce the likelihood of nonmotorized injury incidents by providing a facility that safely traverses or avoids obstacles in the study area such as the railroad tracks. The Missing Link would be designed to clearly delineate trail user space from the roadway and would include safety features such as buffers, pavement markings, raised crosswalks, curb treatments, signage, and lighting.

Under the Shilshole South Alternative, there would be sight distance concerns for exiting vehicles at up to eight driveways on the south side of Shilshole Ave NW between 20th Ave NW and 11th Ave NW where buildings are constructed up to the property lines. Buildings and structures adjacent to the trail could reduce visibility for both vehicles and trail users. However, the final trail design would include safety features to reduce conflicts between trail users and vehicles. The placement of the trail could also be moved to locations farther from the property lines, but this would require additional relocation of the BTR tracks. The final placement of the trail would be decided during final design. Where possible, signage, pavement markings, and advanced warning systems, among other safety enhancements, would notify trail users and vehicle drivers of the trail crossing. Although a buffer would not be provided between the property line and the trail, these driveways would still operate safely under SMC 11.58.230, which states:

> "Except as directed otherwise by official traffic-control devices, the driver of a vehicle emerging from any alley, driveway, private property, or building shall stop such vehicle immediately prior to driving onto a sidewalk or onto the sidewalk area extending across any alley or driveway, or onto a public path, and shall yield the right-of-way to any pedestrian or bicyclist as may be necessary to avoid collision, and upon entering the roadway of a street shall yield the right-of-way to all vehicles approaching on the roadway."

Drivers would be required to stop before crossing the trail, which would allow drivers to look for trail users before continuing to the roadway. There would be no sight distance concerns for vehicles entering driveways because trail crossings would be clearly marked with signage, pavement markings, and other safety enhancements, and buildings would not block views of the trail. Driveways would be wide enough to safely accommodate industrial and commercial traffic.

7.3.4 Shilshole North Alternative

Construction

Under the Shilshole North Alternative, there could be additional traffic and freight delay during construction on Shilshole Ave NW because the roadway is a two-lane street (one lane of traffic in each direction). If construction activities would require the closure of one lane of the roadway, traffic on Shilshole Ave NW would have to be controlled by a flagger to direct travel through the construction zone. Traffic could be affected for several hours during midday.

Under the Shilshole North Alternative, construction would occur on NW Market St, a transit corridor, which could have temporary impacts on public transportation. It is possible that delay and congestion could increase as a result of traffic diversion and road closures during construction. However, these impacts would be minimal because construction would occur in segments of three or four street blocks. Construction activities could also require temporary relocations of bus stops in the study area. Any construction activities that could affect public transportation on NW Market St would be coordinated with King County Metro.

Operation

Roadway Network

The Shilshole North Alternative would provide a dedicated nonmotorized facility for the entire length of the study area. This facility would be 12 feet wide with a 3- to 11-foot buffer between the roadway and the trail. A sidewalk between 5 and 12 feet wide would be provided between the trail and adjacent properties. There are approximately 58 driveways and loading docks along the alignment. To the extent necessary, driveway access to all businesses would be reconstructed and provided in the same location as the No Build Alternative. However, some properties with multiple accesses could have their driveways consolidated into a single access point in coordination with SDOT and property owners.

Under the Shilshole North Alternative, NW 54th St between NW Market St and 32nd Ave NW would be a two-lane roadway with one lane in each direction. A left-turn pocket would be provided at 32nd Ave NW in the westbound direction. NW Market St between 30th Ave NW and 24th Ave NW would be a three-lane roadway with one travel lane in each direction and a two-way center-turn lane. At the intersection of NW Market St and 24th Ave NW, right- and left-turn pockets would be provided in the eastbound direction. On Shilshole Ave NW and NW 46th St, one travel lane in each direction would be provided. A signal at 17th Ave NW and Shilshole Ave NW would be provided.

All other roadways in the study area would be the same as the No Build Alternative.

Traffic Volumes and Operations

Depending on the traffic volume at a particular driveway, vehicles exiting could experience up to 25 seconds of additional delay compared to the No Build Alternative.

The Shilshole North Alternative would not cause any intersections to operate at LOS E or F that would otherwise operate at LOS D or better under the No Build Alternative. However, seven intersections (described below) would operate at a different LOS or have changes in delay when compared to the No Build Alternative (Figure 7-13).

1. Intersection 1: NW Market St/28th Ave NW

The intersection at NW Market St and 28th Ave NW (Intersection 1) would operate at LOS C under the Shilshole North Alternative compared to LOS A under the No Build Alternative. Under the Shilshole North Alternative, NW Market St would be reduced from four lanes to three lanes, which would increase delay during the PM peak hour. However, this intersection would still operate at LOS E or better.

2. Intersection 2: NW Market St/24th Ave NW

The intersection at NW Market St and 24th Ave NW (Intersection 2) would have approximately 2 additional seconds of delay because the trail would cross the south leg of the intersection before it continues onto the north side of Shilshole Ave NW. This would create additional minor delay at the intersection but would not reduce overall LOS.

3. Intersection 4: NW Market St/22nd Ave NW/Leary Ave NW

The intersection at NW Market St/22nd Ave NW/Leary Ave NW (Intersection 4) would have approximately 1 second less delay because some nonmotorized users in the study area would likely shift to the trail. This would reduce the amount of conflicting nonmotorized and vehicle movements at the intersection, which would improve overall delay.

4. Intersection 8: 11th Ave NW/NW 46th St

The intersection at 11th Ave NW and NW 46th St (Intersection 8) would operate better under the Shilshole North Alternative (LOS B) compared to the No Build Alternative (LOS C). This is because traffic would shift from NW 46th St to NW 45th St because NW 45th St would be restored to a two-way street. Under the No Build Alternative, NW 45th St would remain an eastbound one-way street for vehicles.

5. Intersection 10: NW 46th St/Shilshole Ave NW (northbound approach)

The operational changes at Intersection 8 would also result in the intersection at NW 46th St and Shilshole Ave NW (Intersection 10) operating at LOS D under the Shilshole North Alternative compared to LOS A under the No Build Alternative. This intersection is a two-way stop control, and the delay is for the worst-operating approach. Although the LOS decreases under the Shilshole North Alternative, this delay would only be experienced by vehicles at the northbound approach. This volume is much smaller compared to east-west traffic at this intersection. This delay is not anticipated to have an adverse impact on traffic operations because only a small number of vehicles would experience additional delay and the intersection would still operate at LOS E or better.

6. Intersection 11: Shilshole Ave NW/17th Ave NW (southbound approach)

The intersection at Shilshole Ave NW and 17th Ave NW (Intersection 11) would be signalized under the Shilshole North Alternative. This would improve intersection operations (LOS B compared to LOS F under the No Build Alternative).

Figure 7-13. Shilshole North Alternative PM Peak Hour Study Intersection Level of Service

7. Intersection 13: NW 56th St/24th Ave NW

The intersection at NW 56th St and 24th Ave NW (Intersection 13) would have approximately 40 seconds less delay when compared to the No Build Alternative because some nonmotorized users in the study area would likely shift to the trail. This would reduce the amount of conflicting nonmotorized and vehicle movements at the intersection, which would improve overall delay.

Freight

Freight mobility at the intersections of 11th Ave NW and NW 46th St would be improved under the Shilshole North Alternative compared to the No Build Alternative. This is because NW 45th St would be restored to a two-way roadway, which would redistribute traffic in this part of the study area. Freight mobility at the intersection of Shilshole Ave NW and 17th Ave NW would also be improved under the Shilshole North Alternative because a signal would be provided, improving intersection operations from LOS F to LOS B compared to the No Build Alternative.

Approximately 58 driveways and loading docks are located along the alignment of the Shilshole North Alternative. At driveways, freight vehicles could be delayed from zero to 25 seconds (on average) above the No Build Alternative during the PM peak hour. With the anticipated volume of trail users, and because trail users would be spread throughout the day, this delay would occur sporadically during the PM peak hour. Although some driveways could experience additional delay compared to the No Build Alternative, this would not be considered an adverse impact.

Up to six freight access points (driveways and loading docks) to private properties could change because the Missing Link would be constructed within the City's right-of-way along the south side of NW 54th St/Market St NW, the north side of Shilshole Ave NW, and the north side of NW 46th St. Some businesses that currently use the City right-of-way to access parking or loading docks on their properties would need to relocate their access points to driveways or possibly to the ends of the blocks. Approximately four loading docks could be affected between 24th Ave NW and 17th Ave NW on Shilshole Ave NW, and two driveways on NW Market St between NW 54th St and 26th Ave NW.

The change in access could potentially change how private property owners use the space between their buildings and the City's right-of-way by preventing some businesses from accessing their properties as they currently do. This may require some property owners to reorient their business operations to accommodate freight by moving driveways or loading docks. Businesses that currently use the public right-of-way for loading and unloading activities would no longer be allowed to continue this unpermitted use under the Shilshole North Alternative. Properties with multiple driveways or access points, such as properties along NW Market St with two access points to a single parking lot, may need to consolidate these to improve safety and operations. This would reduce the number of conflict points with the trail while maintaining adequate access to properties.

Nonmotorized Users

The project would provide a dedicated 12-foot multi-use trail for nonmotorized users for the entire study area. A 3- to 11-foot buffer would be provided between the roadway and the trail. A sidewalk between 5 and 12 feet wide would also be provided between the trail and adjacent properties. Additional nonmotorized improvements under the Shilshole North Alternative could include curb treatments, pavement markings and treatments, signage and wayfinding, and lighting.

The trail would cross approximately 58 driveways and loading docks under the Shilshole North Alternative. Trail crossings with driveways and intersections would be clearly delineated, which would improve comfort and safety for nonmotorized users in the study area by organizing and creating predictability of potential conflict points between vehicles and nonmotorized users. Vehicles would be required to stop for trail users at all driveway/trail intersections. However, after stopping before the trail, vehicles would continue forward over the trail and stop at the roadway. It is possible that vehicles blocking the trail would occasionally delay trail users during the day. On average, trail users could have to wait 15 to 25 seconds for a vehicle to clear the trail.

Pedestrian and bicycle volumes would be similar to those described under the Shilshole South Alternative.

Public Transportation

There would be minimal impacts on transit from the Shilshole North Alternative. At the intersection of NW Market St and 28th Ave NW, which is located along a transit corridor, there could be additional delay compared to the No Build Alternative. This intersection would operate at LOS C under the Shilshole North Alternative compared to LOS A under the No Build Alternative. This could affect transit delay and speeds near this intersection. However, this intersection would operate above LOS E, and mitigation would not be required.

Freight Rail

No impacts on rail from the Shilshole North Alternative are anticipated because rail facilities and operations would not be altered.

Safety

Safety improvements for nonmotorized users and motor vehicles in the study area as a result of the trail would be similar to those resulting from the Shilshole South Alternative (see Section 7.3.4).

Under the Shilshole North Alternative, there would be sight distance concerns for exiting vehicles at approximately eight driveways on NW Market St, approximately 16 driveways on Shilshole Ave NW, and approximately four driveways on NW 46th St where buildings are constructed up to the property lines. Under the Shilshole North Alternative, sidewalks would be provided between the properties and the trail, which would improve safety. Trail users would have a buffer of 5 to 12 feet from the property frontage.

The final trail design would reduce conflicts between trail users and vehicles. Where possible, signage, pavement markings, and advanced warning systems, among other safety enhancements, would notify sidewalk and trail users and vehicle drivers of the trail crossing. Under SMC 11.58.230, driveways along the Shilshole North Alternative alignment would operate safely. Drivers would be required to stop before crossing the trail, which would allow drivers to look for trail users before continuing to the roadway.

There would be no sight distance concerns for vehicles entering driveways because the trail crossings would be clearly marked with signage, pavement markings, and other safety enhancements, and buildings would not block views of the trail. Driveways would be wide enough to safely accommodate industrial and commercial traffic.

7.3.5 Ballard Avenue Alternative

Construction

Under the Ballard Avenue Alternative, there could be additional traffic and freight delay during construction on 28th Ave NW, NW 56th St, 22nd Ave NW, and Ballard Ave NW because these streets are two-lane streets (one lane of traffic in each direction). If construction activities would require the closure of one lane of the roadway, a flagger could be required to direct travel via alternative routes within the construction zone, which could be three to four street blocks in length. It is anticipated that this impact would be minimal because roadway closures would occur temporarily during the midday for several hours.

Operation

Roadway Network

The Ballard Avenue Alternative would alter the roadway network on NW 54th St, 28th Ave NW, NW 56th St, 22nd Ave NW, Ballard Ave NW, 15th Ave NW, NW 46th St, and 11th Ave NW. The Ballard Avenue Alternative would provide a dedicated nonmotorized facility for the entire length of the study area. This facility would be12 feet wide with a 4- to 5-foot buffer between the roadway and the trail. A block-long section of trail between NW Ballard Way and NW 46th St would be 20 feet wide. A sidewalk 6 to 10 feet wide would be provided between the trail and adjacent properties.

Under the Ballard Avenue Alternative, all streets along the trail alignment would have one lane in each direction (two-lane roadway), with the exception of the western right-of-way adjacent to 15th Ave NW, which would be converted to trail-only use. There are approximately 42 driveways and loading docks along the alignment. To the extent necessary, driveway access to all businesses would be reconstructed and provided in the same location as the No Build Alternative, but some properties with multiple accesses could have their driveways consolidated into a single access point in coordination with the City and property owners.

All other roadways in the study area would be the same as the No Build Alternative.

Traffic Volumes and Operations

Depending on the traffic volume at a particular driveway, vehicles exiting could experience up to 3 seconds of additional delay compared to the No Build Alternative.

The Ballard Avenue Alternative would not cause any intersection to operate at LOS E or worse that would otherwise operate at LOS D or better under the No Build Alternative. However, seven intersections (described below) would operate at a different LOS or change in delay when compared to the No Build Alternative (Figure 7-14).

Figure 7-14. Ballard Avenue Alternative PM Peak Hour Study Intersection Level of Service

1. Intersection 1: NW Market St/28th Ave NW

The intersection at NW Market St and 28th Ave NW (Intersection 1) would have approximately 2 additional seconds of delay under the Ballard Avenue Alternative when compared to the No Build Alternative. This is because the trail would cross the east leg of the intersection, which would result in a minor increase in overall intersection delay.

2. Intersection 2: NW Market St/24th Ave NW

There would be approximately 4 additional seconds of delay at the intersection of NW Market St and 24th Ave NW (Intersection 2). This is because a signal would be installed at the nearby intersection of NW 56th St and 24th Ave NW (Intersection 13 – described below), which would alter traffic flow and coordination between the two intersections. Although there could be an additional 4 seconds of delay, Intersection 2 would operate at the same LOS under both the No Build Alternative and Ballard Avenue Alternative.

3. Intersection 4: NW Market St/22nd Ave NW/Leary Ave NW

The intersection at NW Market St/22nd Ave NW/Leary Ave NW (Intersection 4) would have approximately 1 second less delay because some nonmotorized users in the study area would likely shift to the trail. This would reduce the amount of conflicting nonmotorized and vehicle movements at the intersection, which would improve overall delay.

4. Intersection 8: 11th Ave NW/NW 46th St

The intersection at 11th Ave NW and NW 46th St (Intersection 8) would operate at LOS B compared to LOS C under the No Build Alternative. Traffic would shift from NW 46th St to NW 45th St because NW 45th St would be restored to a two-way street. Under the No Build Alternative, NW 45th St would remain an eastbound one-way street for vehicles.

5. Intersection 10: NW 46th St/Shilshole Ave NW (northbound approach)

The operational changes at Intersection 8 would result in the intersection at NW 46th St and Shilshole Ave NW (Intersection 10) operating at LOS D under the Ballard Avenue Alternative compared to LOS A under the No Build Alternative. This intersection is a two-way stop control, and the delay reported above is for the worst-operating approach. Although the LOS would decrease under the Ballard Avenue Alternative, this delay would only be experienced by vehicles at the northbound approach. This volume is much smaller compared to east-west traffic at this intersection. This is not anticipated to have an adverse impact on traffic operations.

6. Intersection 11: Shilshole Ave NW/17th Ave NW (southbound approach)

The intersection at Shilshole Ave NW and 17th Ave NW (Intersection 11) would operate at LOS E under the Ballard Avenue Alternative compared to LOS F under the No Build Alternative. Nonmotorized users would shift to the trail on NW Ballard Way/Ballard Ave NW rather than ride in a lane with traffic on Shilshole Ave NW.

7. Intersection 13: NW 56th St/24th Ave NW

The intersection at NW 56th St and 24th Ave NW (Intersection 13) would operate at LOS B under the Ballard Avenue Alternative compared to LOS F under the No Build Alternative. Under the Ballard

Avenue Alternative, this intersection would be signalized to improve safety for nonmotorized users, which would also improve operations for vehicles compared to the No Build Alternative.

Freight

Freight mobility at the intersection of 11th Ave NW and NW 46th St would be improved under the Ballard Avenue Alternative compared to the No Build Alternative. This is because NW 45th St would be restored to a two-way roadway, which would redistribute traffic in this part of the study area.

Approximately 42 driveways and loading docks are located along the alignment of the Ballard Avenue Alternative. At driveways, freight vehicles could be delayed from zero to 3 seconds (on average) above the No Build Alternative during the PM peak hour. With the anticipated volume of trail users and because trail users would be spread throughout the day, this delay would occur sporadically during the PM peak hour.

Under the Ballard Avenue Alternative, up to eight freight access points (driveways and loading docks) to private properties could change because the Missing Link would be constructed within the City's right-of-way along the north side of NW 54th St, the east side of 28th Ave NW, the south side of NW 56th St, the west side of 22nd Ave NW, the southwest side of Ballard Ave NW/NW Ballard Way, the south side of NW 46th St, and the east side of 11th Ave NW. Some businesses that currently use the City right-of-way to access parking or loading docks on their properties would need to relocate their access points to driveways or possibly to the ends of the blocks. Up to three loading docks could be affected between NW 54th St and NW Market St on 28th Ave NW.

The change in access could potentially alter how private property owners use the space between their buildings and the City's right-of-way. Some businesses may not be able to access their properties as they currently do and may have to reorient their business operations to accommodate freight by moving driveways or loading docks. Businesses that currently use the public right-of-way for loading and unloading activities would no longer be allowed to continue this unpermitted use under the Ballard Avenue Alternative. Properties with multiple driveways or access points, such as properties along NW 56th St with two access points to a single parking lot, may need to consolidate access points to improve safety and operations. This would reduce the number of conflict points with the trail while maintaining adequate access to properties.

Nonmotorized Users

The Ballard Avenue Alternative would provide a dedicated, 12- to 20-foot multi-use trail for nonmotorized users for the entire study area. A 4- to 5-foot buffer would be provided between the roadway and the trail. A sidewalk 6 to 10 feet wide would also be provided between the trail and properties along NW 54th St, NW Market St, Shilshole Ave NW, and NW 46th St. Additional nonmotorized improvements under the Ballard Avenue Alternative could include curb treatments, pavement markings and treatments, signage, wayfinding, and lighting. Curb bulbs would be provided at most intersections along the alignment.

The trail would cross approximately 42 driveways and loading docks under the Ballard Avenue Alternative. Trail crossings with driveways and intersections would be clearly delineated, which would improve comfort and safety for nonmotorized users in the study area by organizing and creating predictability of potential conflict points between vehicles and nonmotorized users. Vehicles would be required to stop for trail users at all driveway/trail intersections. However, after stopping before the trail, vehicles would continue forward over the trail and stop at the roadway. It is possible that vehicles blocking the trail would occasionally delay trail users during the day. On average, trail users could have to wait between 15 to 25 seconds for a vehicle to clear the trail.

Pedestrian and bicycle volumes would be similar to those described under the Shilshole South Alternative.

Public Transportation

No impacts on transit under the Ballard Avenue Alternative are anticipated because there would be no additional delay on transit corridors compared to the No Build Alternative.

Freight Rail

No impacts on rail from the Ballard Avenue Alternative are anticipated because rail operations and facilities would not be altered.

Safety

Safety improvements for nonmotorized users and motor vehicles in the study area as a result of the trail would be similar to those from the Shilshole South Alternative (see Section 7.3.4).

Under the Ballard Avenue Alternative, there could be sight distance concerns for exiting vehicles at up to 16 driveways on the southwest/south side of Ballard Ave NW/NW Ballard Way and up to two driveways on the south side of NW 46th St where buildings are constructed up to the property lines. Under the Ballard Avenue Alternative, sidewalks would be provided between the adjacent properties and the trail, which would improve safety. Trail users would have a buffer of 7 to 10 feet from the property frontage.

The final trail design would include safety features to reduce conflicts between trail users and vehicles. Where possible, signage, pavement markings, and advanced warning systems, among other safety enhancements, would notify sidewalk and trail users and vehicles of the trail crossing. Under SMC 11.58.230, driveways along the Ballard Avenue Alternative would operate safely. Drivers would be required to stop before crossing the trail, which would allow drivers to look for trail users before continuing to the roadway.

There would be no sight distance concerns for vehicles entering driveways because trail crossings would be clearly marked with signage, pavement markings, and other safety enhancements, and buildings would not block views of the trail. Driveways would be wide enough to safely accommodate commercial traffic.

There could be potential safety impacts associated with the Ballard Farmers Market under the Ballard Avenue Alternative. The market occurs every Sunday, year-round, and is located on Ballard Ave NW between Vernon Pl and 22nd Ave NW. When the market is open, Ballard Ave NW between Vernon Pl and 22nd Ave NW is closed to vehicle traffic to accommodate market stalls, which are set up in the right-of-way. The market attracts a large number of pedestrians to the area when open, which could conflict with trail use. The potential for collisions between trail users and visitors to the market could be a safety concern under the Ballard Avenue Alternative. Additional information on the Farmers Market is presented in Chapter 5, Recreation.

7.3.6 **Leary Alternative**

Construction

Under the Leary Alternative, there could be additional traffic and freight delay during construction on 11th Ave NW, a two-lane street (one lane of traffic in each direction). If construction activities require the closure of one lane of the roadway, a flagger could be required to direct travel to alternative routes through the construction zone. This impact would likely be minimal.

Under the Leary Alternative, construction would occur on a transit corridor, which could have temporary impacts on public transportation similar to those described for general-purpose traffic. Increases in delay and congestion from traffic diversion and road closures could be possible during construction. However, these impacts are expected to be minimal because construction would occur in segments of three to four street blocks. Construction activities could also require temporary relocations of bus stops in the study area. Any construction activities that could affect public transportation would be coordinated with King County Metro.

Operation

Roadway Network

The Leary Alternative would provide a dedicated nonmotorized facility for the entire length of the study area. This facility would be 12 feet wide with a 3- to 13-foot buffer between the roadway and the trail. A sidewalk 6 to 10 feet wide would be provided between the trail and adjacent properties.

Under the Leary Alternative, NW Market St and Leary Ave NW/NW Leary Way would no longer be two lanes in each direction (four-lane roadway) along the trail alignment; these streets would have one travel lane in each direction and a center two-way left-turn lane (three-lane roadway). NW 54th St would have one travel lane in each direction (two-lane roadway), similar to existing conditions.

At the intersection of NW Market St and 24th Ave NW, right- and left-turn lanes would be provided in the eastbound and westbound directions. At the NW Leary Way and 15th Ave NW intersection, left-turn lanes would be provided in the eastbound and westbound directions.

There are approximately 33 driveways and loading docks along the alignment. To the extent necessary, driveway access to all businesses would be reconstructed and provided in the same location as the No Build Alternative. However, some properties with multiple access points could have their driveways consolidated into a single access point in coordination with the City and property owners.

All other roadways in the study area would be the same as the No Build Alternative.

Traffic Volumes and Operations

Depending on the traffic volume at a particular driveway, vehicles exiting could experience up to 1 second of additional delay compared to the No Build Alternative.

The Leary Alternative would cause two intersections (Intersections 5a and 7) to operate at LOS E or worse that would otherwise operate at LOS D or better under the No Build Alternative. In addition, this alternative would cause delay to increase by 5 seconds or more at two intersections that operate at LOS E or worse under both alternatives. An additional seven intersections would operate at a different LOS or experience a change in delay when compared to the No Build Alternative. These intersections are described below and shown on Figure 7-15.

1. Intersection 1: NW Market St/28th Ave NW

The intersection at NW Market St and 28th Ave NW (Intersection 1) would operate at LOS C under the Leary Alternative compared to LOS A under the No Build Alternative. Under the Leary Alternative, NW Market St would be reduced from four lanes to three lanes, which would increase delay during the PM peak hour. However, this intersection would still operate at LOS D or better.

2. Intersection 4: NW Market St/22nd Ave NW/Leary Ave NW

The intersection of NW Market St, 22nd Ave NW, and Leary Ave NW (Intersection 4) would have approximately 16 seconds of additional delay under the Leary Alternative compared to the No Build Alternative because the trail would travel through the intersection. This would create additional delay for vehicles because drivers would be required to stop for trail users.

3. Intersection 5a: 15th Ave NW/NW Leary Way (southbound off-ramp); Intersection 5b: 15th Ave NW/NW Leary Way (northbound off-ramp); Intersection 6: NW Leary Way/14th Ave NW; and Intersection 7: NW Leary Way/11th Ave NW

The study intersections on NW Leary Way/Leary Ave NW (Intersections 5a, 5b, 6, and 7) would operate at a worse LOS under the Leary Alternative compared to the No Build Alternative because NW Leary Way/Leary Ave NW would be reduced from four lanes to three lanes to accommodate the trail. Intersection 6 would be reduced to LOS C from LOS A under the Leary Alternative. Intersections 5a and 7 on NW Leary Way/Leary Ave NW would operate at LOS C or better under the No Build Alternative and LOS E or F under the Leary Alternative. The delay at Intersection 5b would increase by an estimated 13 seconds under the Leary Alternative compared to the No Build Alternative even though the intersection would operate at LOS E or F under both alternatives.

4. Intersection 8: 11th Ave NW/NW 46th St

The intersection at 11th Ave NW and NW 46th St (Intersection 8) would operate at LOS B compared to LOS C under the No Build Alternative. Traffic would shift from NW 46th St to NW 45th St because NW 45th St would be restored to a two-way street. Under the No Build Alternative, NW 45th St would remain an eastbound one-way street for vehicles.

5. Intersection 10: NW 46th St/Shilshole Ave NW (northbound approach)

The operational changes at Intersection 8 would also result in the intersection at NW 46th St and Shilshole Ave NW (Intersection 10) operating at LOS D under the Leary Alternative compared to LOS A under the No Build Alternative. This intersection is a two-way stop control, and the delay reported above is for the worst-operating approach. Although the LOS would decrease under the Leary Alternative, this delay would only be experienced by vehicles at the northbound approach. This volume is much smaller compared to east-west traffic at this intersection. This is not anticipated to have an adverse impact on traffic operations.

6. Intersection 11: Shilshole Ave NW/17th Ave NW (southbound approach)

The intersection at Shilshole Ave NW and 17th Ave NW (Intersection 11) would operate at LOS E under the Leary Alternative compared to LOS F under the No Build Alternative because trail users would shift to the trail on NW Leary Way/Leary Ave NW rather than ride in a lane with traffic on Shilshole Ave NW.

7. Intersection 13: NW 56th St/24th Ave NW

The intersection at NW 56th St and 24th Ave NW (Intersection 13) would have approximately 40 seconds less delay when compared to the No Build Alternative because some nonmotorized users in the study area would likely shift to the trail. This would reduce the amount of conflicting nonmotorized and vehicle movements at the intersection, which would improve overall delay.

Figure 7-15. Leary Alternative PM Peak Hour Study Intersection Level of Service

Freight

As described earlier, intersection operations at the following intersections would be similar to or improve under the Leary Alternative when compared to the No Build Alternative:

- Intersection 2: NW Market St/24th Ave NW;
- Intersection 3: NW Market St/Ballard Ave NW;
- Intersection 8: 11th Ave NW/NW 46th St;
- Intersection 9: 11th Ave NW/NW 45th St;
- Intersection 11: Shilshole Ave NW/NW 17th St;
- Intersection 12: Leary Ave NW/20th Ave NW; and
- Intersection 13: NW 56th St/24th Ave NW.

At the intersection of 11th Ave NW and NW 46th St (Intersection 8), freight mobility would be improved because NW 45th St would be restored to a two-way roadway, which would redistribute traffic in this part of the study area. At the intersection of Shilshole Ave NW and NW 17th St, freight mobility would be improved because trail users would shift to the trail on NW Leary Way/Leary Ave NW rather than ride in a lane with traffic on Shilshole Ave NW.

The following four intersections would operate at a lower LOS under the Leary Alternative when compared to the No Build Alternative:

- Intersection 1: NW Market St/28th Ave NW;
- Intersection 6: NW Leary Way/14th Ave NW; and
- Intersection 10: NW 46th St/Shilshole Ave NW.

However, this would not be considered a significant impact because the intersections would still operate at LOS D or better.

Freight would be delayed at the following four intersections under the Leary Alternative when compared to the No Build Alternative:

- Intersection 4: NW Market St/22nd Ave NW/Leary Ave NW;
- Intersection 5a: 15th Ave NW/NW Leary Way southbound off-ramp;
- Intersection 5b: 15th Ave NW/NW Leary Way northbound off-ramp; and
- Intersection 7: NW Leary Way/11th Ave NW.

Freight mobility could be affected on NW Leary Way between 15th Ave NW and the eastern edge of the study area because NW Leary Way would be reduced by one lane in each direction. The decline in LOS experienced on these corridors is described in the previous section.

There are approximately 33 driveways and loading docks along the alignment of the Leary Alternative. At driveways, freight vehicles could be delayed an additional 1 second (on average) above the No Build Alternative during the PM peak hour. With the anticipated volume of trail users and because trail users would be spread throughout the day, this delay would occur sporadically during the PM peak hour.

Up to three freight access points (driveways and loading docks) to private properties could change because the Missing Link would be constructed within the City's right-of-way along the south side of NW 54th St/NW Market St, the southwest side of Leary Ave NW/NW Leary Way, and the east side of 11th Ave NW. Some businesses that currently use the City right-of-way to access parking or loading docks on their properties might need to relocate their access points to driveways or possibly to the ends of the blocks so as not to block the trail. Two driveways on NW Market St and one driveway on NW Leary Way/Leary Ave NW might need to be moved.

The change in access could potentially change how private property owners use the space between their buildings and the City's right-of-way. Some businesses may not be able to access their properties as they currently do, and may have to reorient their business operations to accommodate freight by relocating access. Properties with multiple driveways or access points, such as properties along NW 56th St with two access points to a single parking lot, may need to consolidate access points to improve safety and operations. This would reduce the number of conflict points with the trail while maintaining adequate access to properties.

Nonmotorized Users

The Leary Alternative would provide a dedicated 12-foot multi-use trail for nonmotorized users for the entire study area. A 3- to 13-foot buffer would be provided between the roadway and the trail. A sidewalk 6 to 10 feet wide would also be provided between the trail and adjacent properties. Curb bulbs would be provided at most study area intersections. Additional nonmotorized improvements under the Leary Alternative could include curb treatments, pavement markings and treatments, signage and wayfinding, and lighting.

The trail would cross approximately 33 driveways and loading docks under the Leary Alternative. Trail crossings with driveways and intersections would be clearly delineated, which would improve comfort and safety for nonmotorized users in the study area. Vehicles would be required to stop for trail users at all driveway/trail intersections. However, after stopping before the trail, vehicles would continue forward over the trail and stop at the roadway. It is possible that vehicles blocking the trail would occasionally delay trail users during the day. On average, trail users could have to wait between 15 and 25 seconds for a vehicle to clear the trail.

Public Transportation

Under the Leary Alternative, impacts on public transportation would be similar to those described for general-purpose traffic on NW Leary Way/Leary Ave NW and NW Market St, which are both transit corridors. Additional congestion and delay at intersections on these streets could affect public transportation service on King County Metro Routes 17, 18, 29, 40, 44, and Rapid Ride D.

Freight Rail

No impacts on rail are anticipated from the Leary Alternative because rail operations and facilities would not be altered.

Safety

Safety improvements for nonmotorized users and motor vehicles in the study area as a result of the trail would be similar to those from the Shilshole South Alternative (see Section 7.3.4).

Under the Leary Alternative, there could be sight distance concerns for exiting vehicles at up to nine driveways on the southwest/south side of Leary Ave NW/NW Leary Way and up to eight driveways on the south side of NW Market St, where buildings are constructed up to the property lines. Under the Leary Alternative, sidewalks would be provided between the properties and the trail, which would improve safety. Trail users would have a buffer of 8 to 10 feet from the property frontage. The final design of the trail would include safety features to reduce conflicts between trail users and vehicles. Where possible, signage, pavement markings, and advanced warning systems, among other safety enhancements, would notify sidewalk and trail users and vehicles of the trail crossing. Under SMC 11.58.230, driveways along the Leary Alternative would operate safely. There would be no sight distance concerns for vehicles entering driveways because trail crossings would be clearly marked with signage, pavement markings, and other safety enhancements, and buildings would not block views of the trail. Driveways would be wide enough to safely accommodate industrial and commercial traffic.

The Leary Alternative would reduce the existing sidewalk on NW Market St between 24th Ave NW and 22nd Ave NW by up to 12 feet to accommodate the Missing Link. This location is a heavy-use pedestrian corridor, and the potential for conflicts between pedestrians and trail users could increase if the sidewalk were narrowed to accommodate the trail. Safety improvements, such as pavement variations and signage, could be used to slow trail user traffic through this portion of the Leary Alternative.

7.3.7 Connector Segments

Construction

Construction impacts on traffic volumes and operations, freight, nonmotorized users, public transportation, rail, and safety would be similar among all of the connector segments to those described for the Build Alternatives.

Operation

The specific design and impacts of the connector segments would depend on which alignments were being connected. Potential impacts associated with any connector segment could include the following:

- Increased intersection delay for general-purpose vehicles, freight, and public transportation;
- Altered loading dock and driveway access for businesses;
- Pedestrian congestion if sidewalks are reduced; and
- Potential sight distance concerns at driveways.

However, improvements on any of the connector segments would improve safety and comfort for nonmotorized users and vehicles.

7.4 Avoidance, Minimization, and Mitigation Measures

7.4.1 Measures Common to All Alternatives

Construction

To mitigate impacts from construction, SDOT would require the contractor to develop a Traffic Control Plan to reduce impacts on traffic operations and to protect and control motor vehicle, pedestrian, and

bicycle traffic during all phases of construction. The plan would be developed in accordance with City construction specifications and would be updated as appropriate for each construction phase. The plan could outline specific impact-reducing measures, including the following:

- Clearly marked detours for motor vehicles, developed in coordination with other agencies and adjacent construction projects, to provide alternative routes for access through the study area and to avoid active construction areas;
- Accommodations for vehicles that require loading zone access to properties for services such as business deliveries, taxi and bus service, and garbage pickup;
- Use of flaggers, uniformed police officers, barricades, signing, or other traffic control devices;
- Designated construction haul routes to minimize construction traffic impacts on other roadways;
- Accommodations for oversized freight vehicles to travel through construction zones, if necessary, during road closures;
- Clearly marked pedestrian and bicycle access routes as well as proposed locations of detour signage and other wayfinding elements; accessible routes would be within a reasonable distance of temporarily closed trails and other pathways;
- Transit stop closures, alternative transit stop locations, and interim transit routes developed and publicized in coordination with King County Metro;
- Arrangements for emergency access to and travel through construction areas to minimize impacts on emergency response times, developed in coordination with emergency response providers; and
- Maintenance of rail facilities and operations to minimize impacts on freight rail service, developed in coordination with BTR in accordance with Federal Railroad Administration specifications.

The City would maintain access to private property to the maximum extent feasible, and could notify property owners in advance of activities that might temporarily limit access. In addition, SDOT could coordinate with businesses affected by construction to provide wayfinding information for customers and support other outreach activities to minimize the potential adverse impacts of construction.

Operation

Avoidance, minimization, and mitigation measures for potential impacts on operations under each alternative are described below.

7.4.2 Measures Specific to Each Alternative

Shilshole South Alternative

Traffic Operations

No additional intersections are anticipated to operate at LOS E or worse under the Shilshole South Alternative, compared to intersections that operate at LOS D or better under the No Build Alternative. No traffic improvement measures other than those that are part of the project would be required.

Freight

Mitigation measures for freight would not be required because the Shilshole South Alternative would not reduce operations to LOS E or worse at study area intersections that operate at LOS D or better under the No Build Alternative. However, SDOT could implement some improvements, such as signalization at intersections on key freight corridors, to improve LOS.

Up to 10 access points to businesses along NW 54th St, Shilshole Ave NW, and NW 45th St could be reoriented to improve safety and operations along the Missing Link. To mitigate this impact, SDOT could coordinate with affected businesses to reorient their access points to access driveways or possibly to the ends of the blocks. This could result in different access locations, but overall access to properties would be maintained.

Nonmotorized Users

Under the Shilshole South Alternative, nonmotorized facilities and comfort in the study area would be improved compared to the No Build Alternative. Therefore, no mitigation measures would be required. Nonmotorized traffic is also not expected to reduce intersection operations in the study area to LOS E or F when an intersection operates at LOS D or better under the No Build Alternative. However, SDOT could implement some improvements, such as signalization at key intersections, to improve LOS.

Public Transportation

The Shilshole South Alternative is not expected to adversely affect public transportation compared to the No Build Alternative. Therefore, no mitigation measures would be necessary.

Freight Rail

The Shilshole South Alternative could require the relocation of BTR tracks in various isolated locations along NW 54th St, Shilshole Ave NW, and NW 45th St. All track relocations would be coordinated with BTR so that rail operations would not be adversely affected. BTR could complete the removal and reconstruction of any track segments prior to construction of the Missing Link.

Safety

The Shilshole South Alternative would improve safety in the study area compared to the No Build Alternative by providing a dedicated facility for nonmotorized users. The final design would also include safety considerations to ensure that the trail operates safely.

In locations with sight distance concerns, design elements such as pavement markings, signage, or bubble mirrors could be used to further improve safety. Variations in the use of asphalt and concrete, different paint or thermoplastic striping and symbols, and elevations at driveway entrances could be used to clearly identify where the trail intersects driveways. Driveway notification signage could be used to maintain trail usage at safe speeds and to notify trail users and vehicles that a trail intersection exists.

Other improvements, such as intersection signalization or advanced warning systems with vehicle detection that activates elevated flashing beacons, could also be used to improve safety at key intersections or driveways. In coordination with businesses, driveways could also be combined into fewer access points to reduce the number of conflict locations. However, the final design of the trail would include safety features to reduce conflicts between trail users and vehicles.

Shilshole North Alternative

Traffic Operations

No additional intersections are anticipated to operate at a LOS E or worse under the Shilshole North Alternative, compared to intersections that operate at LOS D or better under the No Build Alternative. No traffic improvement measures would be required.

Freight

Mitigation measures for freight would not be required because the Shilshole North Alternative would not reduce operations to LOS E or worse at study area intersections when they operate at LOS D or better under the No Build Alternative. However, SDOT could implement some improvements, such as signalization at intersections on key freight corridors, to improve LOS.

Up to six access points to businesses along NW 54th St/Market St NW, Shilshole Ave NW, and NW 46th St could be reoriented to improve safety and operations along the Missing Link. To mitigate this impact, SDOT could coordinate with affected businesses to reorient their access points to the access driveways or possibly to the ends of the blocks. This could result in different access locations, but overall access to properties would continue to be provided. If access to businesses could not be relocated, SDOT could provide relocation assistance to affected property owners.

Nonmotorized Users

Under the Shilshole North Alternative, nonmotorized facilities and comfort in the study area would be improved compared to the No Build Alternative. Nonmotorized traffic is also not expected to affect intersection LOS or driveway delay in the study area. Therefore, no mitigation measures would be required. However, SDOT could implement some improvements, such as signalization at key intersections, to improve LOS.

Public Transportation

The Shilshole North Alternative is not expected to adversely affect public transportation compared to the No Build Alternative. Therefore, no mitigation measures would be necessary.

Freight Rail

The Shilshole North Alternative is not expected to adversely affect rail compared to the No Build Alternative. Therefore, no mitigation measures would be necessary.

Safety

The Shilshole North Alternative would improve safety in the study area compared to the No Build Alternative by providing a dedicated facility for nonmotorized users. The final design would also include safety considerations to ensure that the trail operates safely. Therefore, no mitigation would be required. Measures described for the Shilshole South Alternative and in Section 1.7.1 could be implemented to address sight distance concerns and improve safety at key intersections or driveways.

Ballard Avenue Alternative

Traffic Operations

No additional intersections are anticipated to operate at LOS E or F under the Ballard Avenue Alternative, compared to intersections that operate at LOS D or better under the No Build Alternative. No traffic improvement measures would be required.

Freight

Mitigation measures for freight would not be required because the Ballard Avenue Alternative would not worsen operations to LOS E or F at study area intersections, compared to intersections that operate at LOS D or better under the No Build Alternative. However, SDOT could implement some improvements, such as signalization at intersections on key freight corridors, to improve LOS.

Up to eight access points to businesses along NW 54th St, 28th Ave NW, NW 56th St, 22nd Ave NW, Ballard Ave NW/NW Ballard Way, NW 46th St, and 11th Ave NW could be reoriented to improve safety and operations along the Missing Link. To mitigate this impact, SDOT could coordinate with affected businesses to reorient their access points to access driveways or possibly to the ends of the blocks. This could result in different access locations, but overall access to properties would continue to be provided.

Nonmotorized Users

Under the Ballard Avenue Alternative, nonmotorized facilities and comfort in the study area would be improved compared to the No Build Alternative. Nonmotorized traffic is also not expected to affect intersection LOS or driveway delay in the study area. Therefore, no mitigation measures would be required. However, SDOT could implement some improvements, such as signalization at key intersections, to improve LOS.

Public Transportation

The Ballard Avenue Alternative is not expected to adversely affect public transportation compared to the No Build Alternative. Therefore, no mitigation measures would be necessary.

Freight Rail

The Ballard Avenue Alternative is not expected to adversely affect rail compared to the No Build Alternative. Therefore, no mitigation measures would be necessary.

Safety

The Ballard Avenue Alternative would improve safety in the study area compared to the No Build Alternative by providing a dedicated facility for nonmotorized users. No mitigation would be required. However, measures described for the Shilshole South Alternative and in Section 1.7.1 could be implemented to address sight distance concerns and improve safety at key intersections or driveways.

Leary Alternative

Traffic Operations

The Leary Alternative would cause two intersections to operate at LOS E or worse that would otherwise operate at LOS D or better under the No Build Alternative (Intersections 5a and 7). The Leary Alternative

would cause delay to increase by 5 seconds or more at two intersections that operate at LOS E or worse under both alternatives (Intersection 4 and 7). These include the following intersections:

- Intersection 4: NW Market St/22nd Ave NW/Leary Ave NW;
- Intersection 5a: 15th Ave NW/NW Leary Way southbound off-ramp;
- Intersection 5b: 15th Ave NW/NW Leary Way northbound off-ramp; and
- Intersection 7: NW Leary Way/11th Ave NW.

The Leary Alternative would increase delay by more than 5 seconds at the intersection of NW Market St/22nd Ave NW/Leary Ave NW (Intersection 4). Under the No Build Alternative, this intersection would operate at LOS E but would have less delay when compared to the Leary Alternative.

Because the right-of-way at on NW Market St and Leary Ave NW/Leary Way NW is constrained, additional right-of-way would be required if SDOT were to mitigate additional delay at Intersections 4, 5a, 5b, and 7. It is likely that this would result in additional impacts on properties and businesses near the intersections. The additional delay that would be experienced at Intersections 4, 5a, 5b, and 7 would likely occur only during the PM peak hour when traffic volumes are highest.

Freight

Mitigation measures for freight would be similar to those mentioned above for general-purpose vehicles. SDOT could implement some improvements, such as signalization at intersections on key freight corridors, to improve LOS.

Up to three access points to businesses along NW 54th St/NW Market St, Leary Ave NW/NW Leary Way, and 11th Ave NW could be reoriented to improve safety and operations along the Missing Link. To mitigate this impact, SDOT could coordinate with affected businesses to reorient their access points to the access driveways or possibly to the ends of the blocks. This could result in different access locations, but overall access to properties would continue to be provided.

Nonmotorized Users

Under the Leary Alternative, the sidewalk width on NW Market St between 24th Ave NW and 22nd Ave NW would be reduced to accommodate the Missing Link. This could create some pedestrian congestion on the sidewalk; however, the multi-use trail would alleviate some pedestrian congestion. Design elements such as landscaping, pavement variations and markings, and signage could be used to mitigate impacts. Elsewhere in the study area, nonmotorized facilities and comfort would be improved compared to the No Build Alternative.

Public Transportation

The Leary Alternative could affect public transportation on Leary Ave NW/NW Leary Way. SDOT could evaluate mitigation measures such as queue jumps to mitigate transit impacts under the Leary Alternative. Queue jumps are additional travel lanes provided for transit vehicles only that give transit priority over general-purpose vehicles at intersections. Queue jumps are often accompanied by a signal with an early green light for transit vehicles only.

Freight Rail

The Leary Alternative would not adversely affect rail compared to the No Build Alternative. Therefore, no mitigation measures would be necessary.

Safety

The Leary Alternative could affect pedestrian safety on NW Market St between 24th Ave NW and 22nd Ave NW where the sidewalk would be reduced by up to 12 feet to accommodate the Missing Link. Design elements such as landscaping, pavement variations and markings, and signage could be used to mitigate impacts. Elsewhere in the study area, the Leary Alternative would improve safety compared to the No Build Alternative by providing a dedicated facility for nonmotorized users. The final design would also include safety considerations to ensure that the trail operates safely. Therefore, no mitigation would be required. However, measures described for the Shilshole South Alternative and in Section 1.7.1 could be implemented to address sight distance concerns and improve safety at key intersections or driveways.

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CHAPTER 8: PARKING

8.1 Introduction

This chapter describes parking in the Missing Link study area. The Parking Discipline Report (Parametrix, 2016) describes in detail the methods used to identify and evaluate parking in the study area. Analysts relied on the following three recent parking studies to determine the on-street and off-street parking conditions in the study area in 2015:

- The 2015 Ballard Parking Study—on-street parking (SDOT, 2015a);
- The 2015 BGT Missing Link Parking Study—on-street and off-street parking (IDAX, 2015); and
- The Ballard Off-street Parking Study, July 2014—off-street parking (SDOT, 2014).

These three studies were used because they were completed recently and cover the entire study area.

8.2 Affected Environment

The study area for the Missing Link parking analysis is the area bounded by the Ship Canal to the south, 9th Ave NW to the east, NW 50th St/Tallman Ave NW/NW 58th St to the north, and 32nd Ave NW to the west (Figure 8-1). For the portions of the study area bounded by a street, the study area includes the entire street. This area, which is roughly two blocks from the most peripheral of the Build Alternatives, is the distance most people would be willing to walk to their destinations after parking, accounting for such factors as the trip purpose, topography, the walking environment, and available time.

The affected environment consists of the parking supply, parking occupancy, and parking utilization in the study area in 2015. These terms are defined as follows:

- **Parking supply** comprises all publicly available on-street and off-street parking spaces in the study area, whether publicly or privately owned and whether available at no cost or for a fee.
- **Parking occupancy** is the number of parking spaces that are occupied at a given time.
- **Parking utilization** is the percentage of the parking supply that is being occupied at a given time.

Parking supply, occupancy, and utilization vary throughout the study area and fluctuate depending on time of day. Data collected during any weekday are assumed to reflect typical weekday parking. Data were collected on weekdays as opposed to weekends, because weekdays capture both occupancy of parking spaces by daytime employers and evening retail businesses. Although weekend counts were not conducted, they are expected to be similar to weekday counts over the larger study area, with fluctuations occurring in some parts of the study area (e.g., weekend utilization higher in the central commercial portion and lower in industrial areas than weekdays).

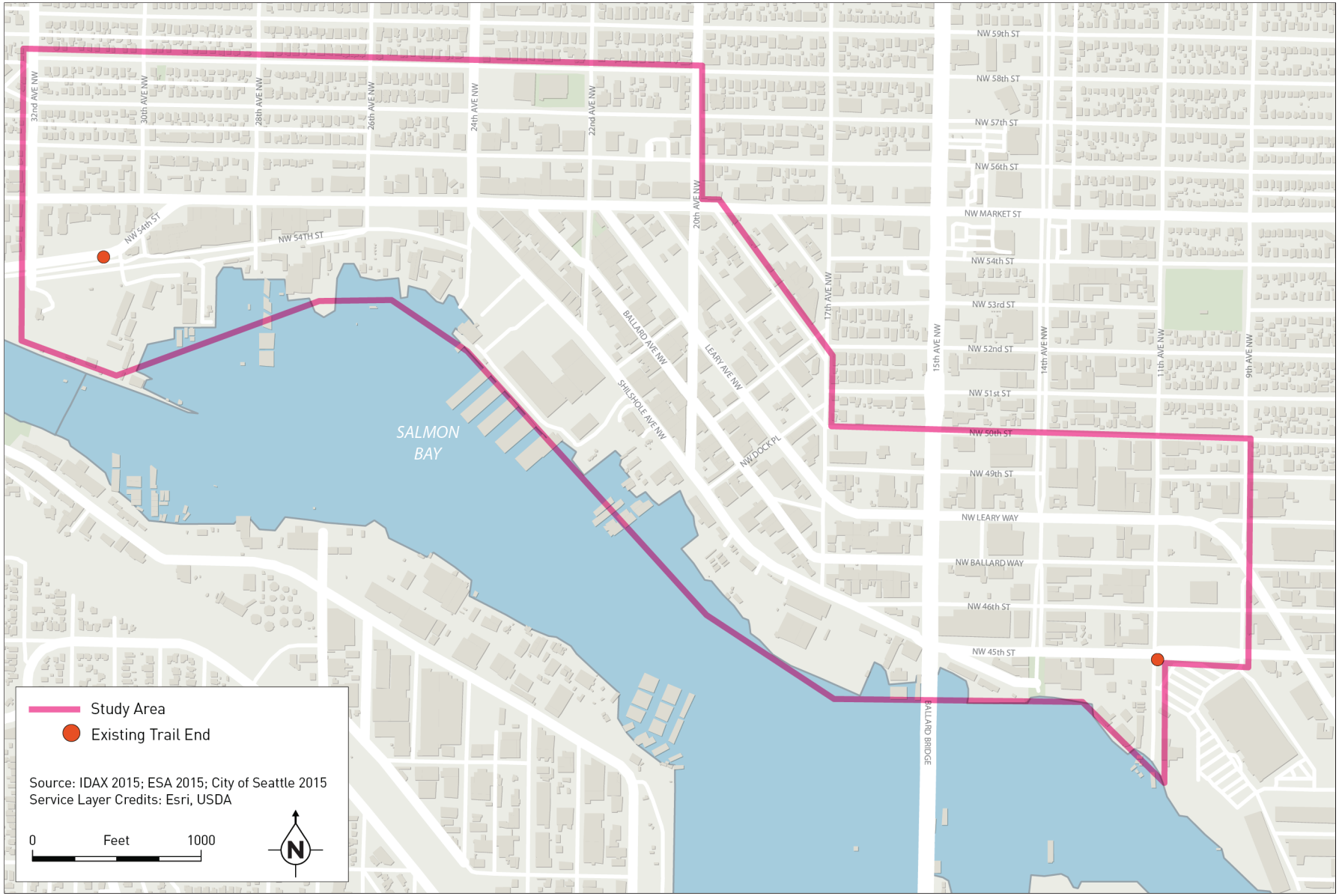


Figure 8-1. Parking Study Area

8.2.1 **Parking Supply**

The study area contains different types of parking supply. This analysis considered the following types of parking:

- On-street parking spaces;
- Off-street parking spaces available for public use; and
- On-street passenger and commercial loading spaces.

On-street and Off-street Parking

In the study area, on-street parking varies from short-term metered parking with 2-hour limits to unmetered spaces with no time limits. All on-street parking spaces in the study area, whether paid or unpaid, were included in the parking analysis.

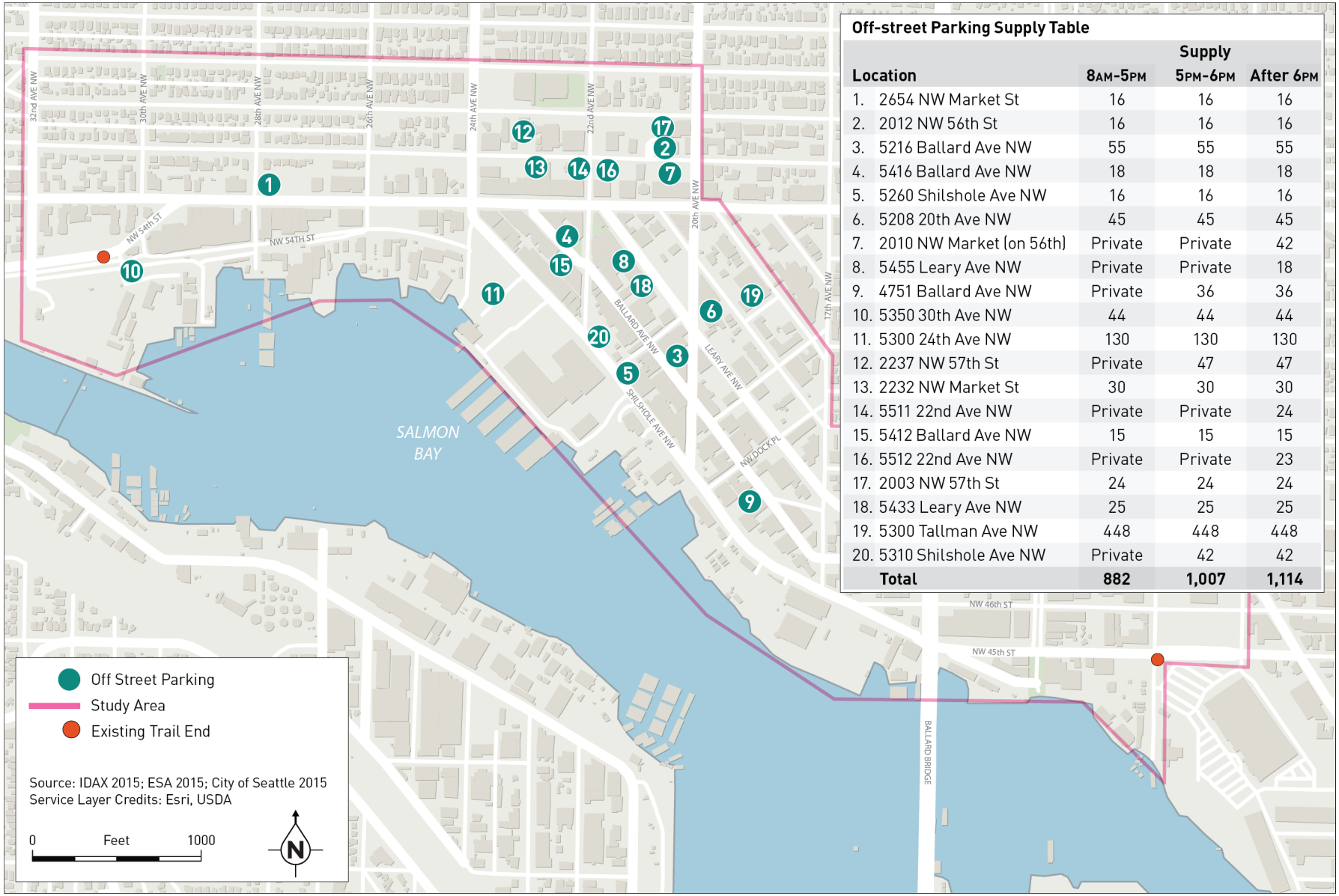
Unstriped areas of City-owned right-of-way along some blocks of Shilshole Ave NW have historically been used by private businesses for parking and loading, although these areas are not formally organized and have not been expressly approved or permitted by the City. The occupancy of parked vehicles depends on the efficiency of the drivers parking on a particular day. In some areas along Shilshole Ave NW, vehicles could be perpendicularly parked on one day and aligned in a parallel manner the next. These unpermitted spaces were counted as they are currently used, whether it is parallel, multiple parallel rows, perpendicular, or angled parking.

NW 54th St between 26th Ave NW and 30th Ave NW is not identified as a legal City street. While people do park on this section of NW 54th St, the parking was not counted as available public parking supply because it is not an officially sanctioned City street or public parking area. A total of 20 off-street parking lots and garages were included in the parking analysis. Users of these off-street lots available for public use are generally required to pay lot-specific rates that vary by parking duration. The number of off-street parking lots and garages in the study area can change quickly, as new lots open and others close due to various factors, including new development displacing lots or including new lots. This analysis provides the most accurate estimation of off-street parking at time of writing.

A total of 3,107 on-street parking spaces and a minimum of 882 off-street parking spaces are available for public use in the study area on weekdays (Table 8-1). The off-street parking supply varies throughout the day, with some off-street lots only open to the public in the evening. The off-street supply from 8 AM to 5 PM is 882 spaces, from 5 PM to 6 PM is 1,007 spaces, and after 6 PM is 1,114 spaces. To be conservative, the minimum off-street parking supply count of 882 is used in Table 8-1. Figure 8-2 shows the on-street parking supply for each block face in the study area, and Figure 8-3 shows the off-street parking supply for each lot and garage in the study area.

The weekend on-street parking supply can be affected by events such as the Ballard Farmers Market, which is held every Sunday on one block of Ballard Ave NW between NW Vernon Pl and 22nd Ave NW. No on-street parking is allowed on this block between 6 AM and 5 PM, but all of the paid parking blocks in central Ballard are free on Sundays. The weekend off-street parking supply is assumed to be similar to the evening weekday supply.

Figure 8-2. On-Street Parking Supply



Off-street Parking Supply Table

Location	Supply 8AM-5PM	Supply 5PM-6PM	Supply After 6PM
1. 2654 NW Market St	16	16	16
2. 2012 NW 56th St	16	16	16
3. 5216 Ballard Ave NW	55	55	55
4. 5416 Ballard Ave NW	18	18	18
5. 5260 Shilshole Ave NW	16	16	16
6. 5208 20th Ave NW	45	45	45
7. 2010 NW Market (on 56th)	Private	Private	42
8. 5455 Leary Ave NW	Private	Private	18
9. 4751 Ballard Ave NW	Private	36	36
10. 5350 30th Ave NW	44	44	44
11. 5300 24th Ave NW	130	130	130
12. 2237 NW 57th St	Private	47	47
13. 2232 NW Market St	30	30	30
14. 5511 22nd Ave NW	Private	Private	24
15. 5412 Ballard Ave NW	15	15	15
16. 5512 22nd Ave NW	Private	Private	23
17. 2003 NW 57th St	24	24	24
18. 5433 Leary Ave NW	25	25	25
19. 5300 Tallman Ave NW	448	448	448
20. 5310 Shilshole Ave NW	Private	42	42
Total	**882**	**1,007**	**1,114**

Figure 8-3. Off-Street Parking Supply

Table 8-1. Parking Supply in Study Area

	Paid On-Street Supply[1]	*Non-Paid On-Street Supply*[2]	*Total On-Street Supply*	*Off-Street Parking Supply*[3]	*Total Parking Supply*
Number of Spaces	484	2,623	3,107	882	3,989
Percent of Total	12%	66%	78%	22%	100%

Sources:
[1] SDOT, 2015a.
[2] IDAX, 2015.
[3] SDOT, 2014; IDAX, 2015.

Loading Zone Spaces

Table 8-2 summarizes the existing loading zone spaces in the study area. In some cases, the City may post one sign for a loading zone that could accommodate multiple vehicles. Each loading zone sign was assumed to indicate one loading zone space. In total, 132 loading zone spaces are available in the study area; these spaces are relatively evenly distributed throughout the study area (Figure 8-4). Loading zone spaces are used for various purposes including commercial loading, passenger drop-off, and taxi loading.

Table 8-2. Loading Zone Spaces in Study Area

Generic Loading Zone Spaces	*Passenger Loading Zone Spaces*	*Truck-Only Loading Zone Spaces*	*Commercial Vehicle Loading Zone Spaces*	*Total Loading Zone Spaces*
82	15	32	3	132

Source: SDOT, 2015b.

8.2.2 Parking Occupancy and Utilization

Occupancy and Utilization by Time of Day

SDOT sets an on-street utilization target range of 70 to 85% for commercial and mixed-use areas. However, SDOT does not have an on-street utilization target for residential and industrial areas, where parking turnover is less important. SDOT's on-street utilization target for commercial and mixed-use areas is consistent with SMC requirements to manage paid parking areas so that one or two parking spaces are available per block face. At higher levels of utilization, it becomes difficult for a driver to find an on-street parking space. If the threshold of 85% for on-street parking utilization is exceeded, it is assumed that the motorists who would otherwise park on the street on a particular block would search farther for an on-street parking space or would use off-street parking.

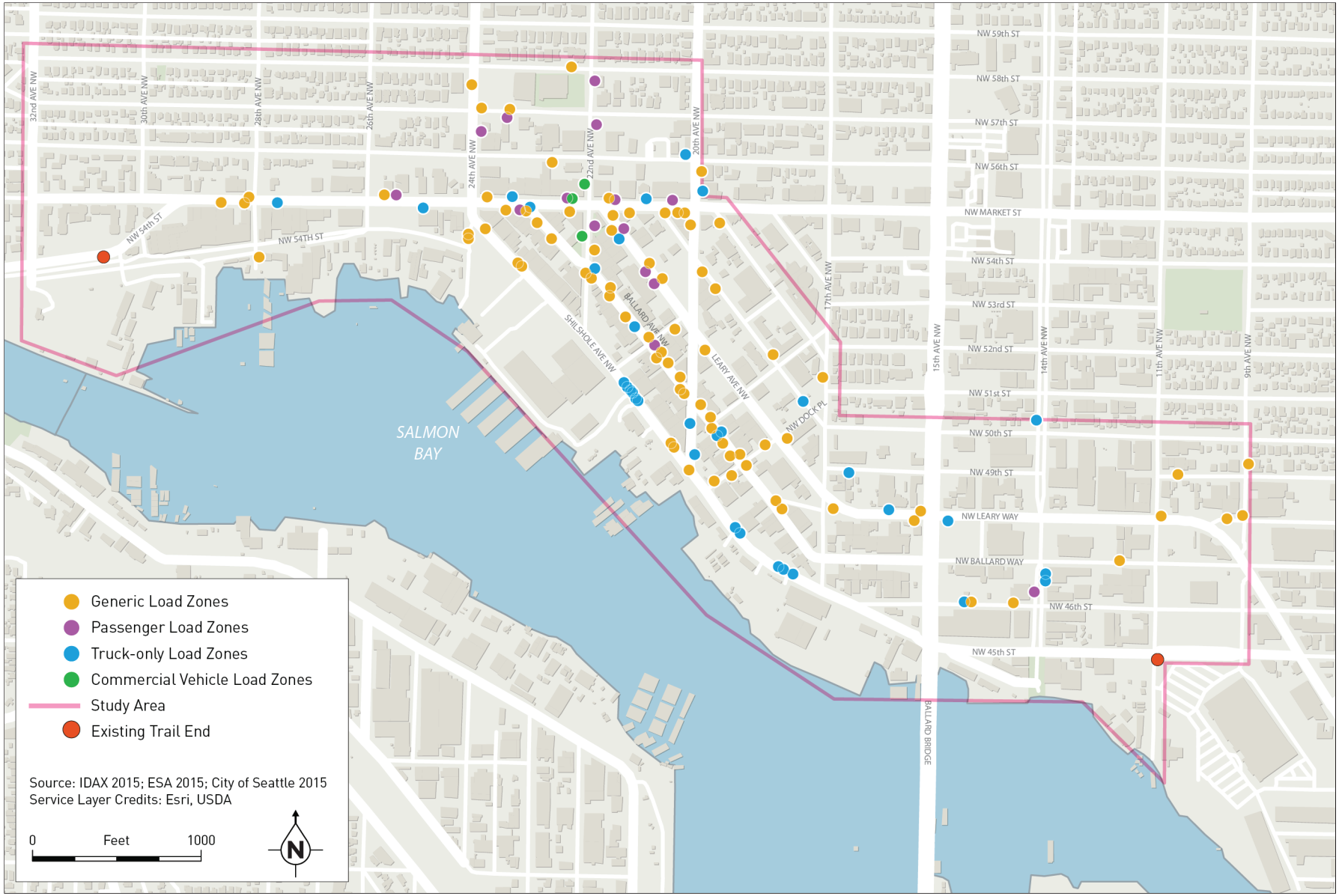


Figure 8-4. Loading Zone Spaces

Utilization data were collected during the AM and PM peak periods to capture the daily fluctuations in utilization from business-related, retail-related, and residential parking. Utilization data were collected at 8 AM, 9 AM, 3 PM, 4 PM, 5 PM, and 6 PM.

Table 8-3 summarizes the weekday on-street and off-street parking utilization observed in the study across the time periods studied for the 2015 existing conditions. On-street and off-street parking utilization are described separately below.

Although weekend counts were not conducted, they are expected to be similar to weekday counts over the larger study area, with fluctuations in some parts of the study area (e.g., weekend utilization is higher in the central commercial portion, and lower in industrial areas than weekdays).

Table 8-3. Overall On-Street Parking Utilization

Parking Type	*Parking Spaces*	*Weekday Occupancy and Utilization (%)*											
		8 AM		*9 AM*		*3 PM*		*4 PM*		*5 PM*		*6 PM*	
		Occupancy	*Utilization*	*Occupancy*	*Utilization*	*Occupancy*	*Utilization*	*Occupancy*	*Utilization*	*Occupancy*	*Utilization*	*Occupancy*	*Utilization*
Paid	484	139	29%	206	43%	323	67%	280	58%	343	71%	440	91%
Non-Paid	2,623	1,717	65%	1,788	68%	1,760	67%	1,693	65%	1,588	61%	1,579	60%
Total	3,107	1,856	60%	1,994	64%	2,083	67%	1,973	64%	1,931	62%	2,019	65%

Sources: SDOT, 2015a; IDAX, 2015.

On-Street Parking Utilization

As shown in Table 8-3, the utilization for weekday on-street parking is similar throughout the day. Major findings are as follows:

- Parking utilization for paid parking varies dramatically throughout the day and is low in the morning and very high later in the evening. Paid parking utilization is highest at 6 PM (91%) and lowest at 8 AM (29%).
- Parking utilization for non-paid parking is consistently moderate throughout the day. Non-paid parking utilization is highest at 9 AM (68%) and lowest at 6 PM (60%).

The following is a summary of on-street parking utilization for each hour evaluated.

On-street parking utilization is highest at **8 AM** in the non-paid, residential blocks of central Ballard and on the northernmost blocks of the study area. The majority of the paid parking in central Ballard has very low utilization at 8 AM. It is assumed that the main destination in the study area is the central business district and the businesses on Shilshole Ave NW. It is also assumed that the non-paid, residential parking areas in the central portion of the study area, roughly south of NW Market St and west of 15th Ave NW, and the northernmost blocks may have high utilization due to residents leaving cars there. The non-paid,

residential area in central Ballard has high utilization throughout all hours studied. West of 28th Ave NW, the residential density is lower; therefore, there is more available parking in the northwestern corner of the study area. Utilization in the southeast portion of the study area is mixed.

At **9 AM**, more of the non-paid parking in central Ballard has filled up, and some of the paid blocks also have high utilization. Some of the blocks in the northernmost portion of the study area have a decline in utilization from 8 AM to 9 AM. This could be due to some residents leaving for work outside of the study area. In the southeast portion of the study area, utilization increases slightly but is still mixed.

At **3 PM**, utilization is very different than during the morning hours studied. Utilization is still very high on the non-paid blocks in central Ballard, but by 3 PM most of the paid blocks have reached a moderate level of utilization, and some have reached over 85% utilization. Utilization on the northernmost blocks slightly increases since the morning, with the paid blocks seeing more usage.

Utilization declines slightly throughout the study area between 3 and **4 PM**. The central non-paid blocks are still highly utilized, but the paid blocks are less utilized. This could be due to some daytime workers leaving the study area and freeing up spaces for those who would have used paid blocks. The northern and southeastern portions of the study area are largely similar between 3 PM and 4 PM, with mixed utilization.

Overall utilization continues to decline slightly between 4 and **5 PM**. This could reflect more daytime workers leaving the study area for the day. At the same time, occupancy on the paid blocks increases by 13%, possibly reflecting more people coming to the central business district for evening activities and evening restaurant/bar workers coming to work. The northern and southeastern portions of the study area are largely similar between 4 PM and 5 PM, with mixed utilization.

Overall utilization for the study area increases slightly at **6 PM**, but the geographic occupancy pattern is unique at 6 PM. Occupancy for paid spaces in the central business district increases dramatically from 71 to 91%, possibly reflecting the high occupancy for evening activities in the study area. Utilization for non-paid spaces continues to decline slightly from its peak at 9 AM, possibly reflecting that many daytime workers have left the study area for the day. Utilization for the northern portion of the study area remains mixed, similar to the other hours during the day, while utilization for the southeastern portion of the study area slightly declines from 5 PM.

Off-Street Parking Utilization

Table 8-4 summarizes weekday off-street parking utilization within the study area. Utilization by time ranges from a high of 67% at 9 AM to a low of 34% at 6 PM. Overall, parking utilization is higher during the AM peak period than the PM peak period. Some lots within the study area are not open to the public at all hours of the day. When lots are not available for public use, they are indicated as “Private” in Table 8-4.

Table 8-4. Off-Street Parking Utilization

Lot/ Garage Number	*Parking Spaces*	*Weekday Occupancy and Utilization* [1]											
		8 AM		*9 AM*		*3 PM*		*4 PM*		*5 PM*		*6 PM*	
		Occupancy	*Utilization*	*Occupancy*	*Utilization*	*Occupancy*	*Utilization*	*Occupancy*	*Utilization*	*Occupancy*	*Utilization*	*Occupancy*	*Utilization*
1	16	4	26%	8	52%	12	75%	7	43%	4	27%	2	13%
2	16	6	39%	7	41%	5	31%	16	100%	16	100%	10	63%
3	55	15	28%	33	60%	24	44%	26	47%	55	100%	32	58%
4	18	7	38%	9	51%	16	89%	8	44%	11	59%	16	89%
5	16	4	27%	6	36%	10	63%	8	50%	11	67%	16	100%
6	45	7	15%	9	20%	16	36%	11	23%	14	31%	21	47%
7	42	Private	Private	Private	Private	Private	Private	Private	Private	Private	Private	13	31%
8	18	Private	Private	Private	Private	Private	Private	Private	Private	Private	Private	13	72%
9	36	Private	Private	Private	Private	Private	Private	Private	Private	11	30%	16	44%
10	44	10	23%	20	45%	29	66%	24	55%	15	34%	7	16%
11	130	28	22%	44	34%	49	38%	40	31%	27	21%	29	22%
12	47	Private	Private	Private	Private	Private	Private	Private	Private	4	9%	1	2%
13	30	6	20%	8	27%	21	70%	16	53%	14	47%	11	37%
14	24	Private	Private	Private	Private	Private	Private	Private	Private	Private	Private	16	67%
15	15	3	20%	4	27%	7	47%	6	40%	8	53%	12	80%
16	23	Private	Private	Private	Private	Private	Private	Private	Private	Private	Private	8	35%
17	24	20	83%	21	88%	16	67%	6	25%	4	17%	1	4%
18	25	7	28%	15	60%	11	44%	4	16%	10	40%	5	20%
19	448	333	74%	408	91%	302	67%	263	59%	152	34%	106	24%
20	42	Private	Private	Private	Private	Private	Private	Private	Private	28	67%	42	100%
Totals	882/ 1,007/ 1,114[2]	451	51%	592	67%	518	59%	434	49%	383	38%	377	34%

Source: IDAX, 2015; SDOT, 2014.
Note: Utilization highlighted in gray indicates that this is an estimated value, based on ratios of similar nearby lots and garages.
[1] "Private" indicates spaces that are not open for public use.
[2] Total parking spaces vary based on public availability of off-street parking lots. Numbers represent 8 AM – 5 PM/5 PM – 6 PM/After 6 PM.

Available Parking Supply

Table 8-5 shows the number of available parking spaces in the study area that are unused for weekdays during each hour of the parking study. A minimum of 1,024 on-street spaces and 290 off-street spaces are available between 8 AM and 6 PM. Overall, 3 PM has the smallest supply of available parking spaces (1,388), because both on- and off-street utilization is moderate at this time (67 and 59%, respectively).

Table 8-5. Available Parking Supply

	8 AM		*9 AM*		*3 PM*		*4 PM*		*5 PM*		*6 PM*	
	On-Street[1]	*Off-Street*[2]	*On-Street*[1]	*Off-Street*[2]	*On-Street*[1]	*Off-Street*[2]	*On-Street*[1]	*Off-Street*[2]	*On-Street*[1]	*Off-Street*[2]	*On-Street*[1]	*Off-Street*[2]
Parking Supply	3,107	882	3,107	882	3,107	882	3,107	882	3,107	1,007	3,107	1,114
Parking Occupancy (Filled Spaces)	1,856	451	1,994	592	2,083	518	1,973	434	1,931	383	2,019	377
Utilization Rate	60%	51%	64%	67%	67%	59%	64%	49%	62%	38%	65%	34%
Available Parking Supply (Unfilled Spaces)	1,251	431	1,113	290	1,024	364	1,134	448	1,176	624	1,088	737

Sources:
[1] SDOT, 2015a; IDAX, 2015.
[2] IDAX, 2015; SDOT, 2014.

Note: Utilization highlighted in gray indicates that this is an estimated value, based on ratios of similar nearby lots and garages.

8.3 Potential Impacts

Construction impacts on parking were evaluated qualitatively because the location and amount of affected parking would change as construction progresses. The potential for temporary loss of parking is described below for each alternative, along with disruption to business access and loading areas.

The operational impacts of the Build Alternatives for parking in 2040, the design year, were evaluated using the following methods:

- A comparison of the total number of on-street and off-street parking spaces in the study area under the No Build Alternative and the Build Alternatives.
- An assessment of the parking supply under the Build Alternatives in relation to the existing parking occupancy.

8.3.1 No Build Alternative

Construction

No construction activities for the Missing Link would occur under the No Build Alternative; therefore, there would be no construction impacts.

Operation

The parking supply and loading zone spaces in the study area under the No Build Alternative are expected to remain the same as under existing (2015) conditions. Table 8-6 summarizes the expected No Build Alternative parking supply.

Table 8-6. No Build Alternative Parking Supply

	Paid On-Street Supply	*Non-Paid On-Street Supply*	*Total On-Street Supply*	*Off-Street Parking Supply*	*Total Parking Supply*
Number of Spaces	484	2,623	3,107	882	3,989
Percent of Total	12%	66%	78%	22%	100%

Occupancy of both on-street and off-street parking within the study area is expected to increase by 2040 in conjunction with population and employment growth in Ballard. Parking prices (adjusted for inflation) would also increase for both on-street and off-street parking based on this increase in occupancy. Parking supply would remain constant under the No Build Alternative. Therefore, an increase in occupancy (number of spaces filled) would increase on-street parking utilization rates across all time periods and all parts of the study area. However, the scale of increased on-street parking occupancy or utilization cannot be predicted using typical traffic forecasting tools.

The No Build Alternative would not change the existing (2015) passenger and commercial loading zone spaces (Table 8-7).

Table 8-7. Loading Zone Spaces in Study Area

Generic Loading Zone Spaces	*Passenger Loading Zone Spaces*	*Truck-Only Loading Zone Spaces*	*Commercial Vehicle Loading Zone Spaces*	*Total Loading Zone Spaces*
82	15	32	3	132

8.3.2 Impacts Common to all Build Alternatives

Construction

Construction activities for the Build Alternatives would temporarily affect on-street parking throughout the entire study area. The amount of parking affected would vary by construction stage and street block, and would be determined once construction and staging plans are finalized. Parking supply outside of the construction area would not be affected. Access routes or loading zones at some businesses could be blocked, but this would only occur intermittently. Off-street parking is not expected to be affected by construction, except for minor temporary changes in access to build the improvements.

Operation

Occupancy of both on-street and off-street parking within the study area would increase by year 2040 in conjunction with population and employment growth. All of the Build Alternatives would remove parking spaces, as described below for each alternative. Therefore, an increase in parking occupancy, coupled with reduced parking supply, would increase on-street and off-street parking utilization across the study area. Because occupancy of on-street spaces in some areas is already high, the removal of on-street parking spaces would likely shift occupancy to off-street parking areas.

The Build Alternatives would improve the nonmotorized facilities in the form of the new multi-use trail, new sidewalks, and improved crossings. The enhanced availability of nonmotorized facilities for bicyclists and pedestrians under the Build Alternatives could provide Ballard visitors with additional choices in how they travel to and through the study area. This could result in changes to the mode split among vehicle and nonmotorized modes of travel. A shift to nonmotorized modes could reduce parking occupancy in the study area, which would minimize the impacts of parking loss associated with the Build Alternatives.

City policy prioritizes other uses of street space over parking and is moving toward limiting parking requirements for new development. The Missing Link would replace some parking with enhanced nonmotorized facilities, supporting overall City planning goals for reducing dependency on single-occupancy vehicles (SOVs) in Ballard.

8.3.3 Shilshole South Alternative

Construction

Construction impacts would be the same for all of the Build Alternatives. There are no construction impacts unique to the Shilshole South Alternative compared to the other alternatives.

Operation

Parking Supply

The Shilshole South Alternative would remove a total of 261 on-street parking spaces (Table 8-8). These parking spaces would be replaced by the new multi-use trail, sidewalks, landscaping, and buffers. The removed parking spaces are generally characterized as employee and business customer parking for industrial businesses, and include the following areas:

- The north side of Shilshole Ave NW and NW 45th St would remain largely unchanged, except at intersections where pedestrian crossing improvements require the removal of a few parking spaces close to the intersections.

- The south side of Shilshole Ave NW and NW 45th St would largely have no parking from where the multi-use trail intersects Shilshole Ave NW between 24th Ave NW and 22nd Ave NW until 11th Ave NW.

Approximately 68 of the 261 removed spaces could remain as unregulated, parallel spaces either between the proposed multi-use trail and existing buildings, or between the proposed multi-use trail and Shilshole Ave NW depending on whether the trail is adjacent to the roadway or buildings. If these 68 unregulated spaces are included in the proposed on-street parking supply, the Shilshole South Alternative would remove approximately 193 on-street parking spaces.

Overall, the loss of 261 on-street parking spaces represents approximately 8% of the on-street parking supply in the study area and approximately 7% of the total parking supply (on-street and off-street combined) in the study area.

Table 8-8. On-Street and Off-Street Parking Supply under the No Build Alternative and Shilshole South Alternative

Parking Type	*No Build Alternative*	*Shilshole South Alternative*	*Net Reduction in Supply*	*Percent Reduction in Supply*
On-street	3,107	2,846	261	8%
Paid	484	484	0	0%
Non-paid	2,623	2,362	261	10%
Off-street	882	882	0	0%
Total	3,989	3,728	261	7%

Loading Zone Spaces

Table 8-9 summarizes the net change in loading zone spaces between the No Action Alternative and the Shilshole South Alternative. The Shilshole South Alternative would not remove any designated loading zone spaces (i.e., those marked by a sign). It could potentially remove or relocate some undesignated loading areas used by businesses that are within the City right-of-way. However, it is not possible to quantify these areas because they are not recognized by the City.

Table 8-9. On-Street Loading Zone Spaces under the No Build Alternative and Shilshole South Alternative

Alternative	*Generic Loading Zone Spaces*	*Passenger Loading Zone Spaces*	*Truck-Only Loading Zone Spaces*	*Commercial Vehicle Loading Zone Spaces*	*Total Loading Zone Spaces*
No Build	82	15	32	3	132
Shilshole South	82	15	32	3	132
Net Change	0	0	0	0	0

8.3.4 **Shilshole North Alternative**

Construction

Construction impacts would be the same for all of the Build Alternatives. There are no construction impacts unique to the Shilshole North Alternative compared to the other alternatives.

Operation

Parking Supply

The Shilshole North Alternative would remove a total of 227 on-street parking spaces (Table 8-10). These parking spaces would be replaced by the new multi-use trail, sidewalks, landscaping, and buffers. The removed parking spaces are generally characterized as employee and business customer parking for industrial businesses, and include the following areas:

- Both sides of NW 54th St would have no parking between 30th Ave NW and NW Market St.
- Much of the parking on the north side of Shilshole Ave NW would be removed under this alternative, but some parallel parking would remain.
- The south side of Shilshole Ave NW would remain largely unchanged, except at intersections where pedestrian crossing improvements require the removal of a few parking spaces close to the intersections.
- Both sides of NW 46th St would largely have no parking from Shilshole Ave NW to 11th Ave NW.

Overall, the loss of 227 on-street parking spaces represents approximately 7% of the on-street parking supply in the study area and approximately 6% of the total parking supply (on-street and off-street) in the study area.

Table 8-10. On-Street and Off-Street Parking Supply under the No Build Alternative and Shilshole North Alternative

Parking Type	*No Build Alternative*	*Shilshole North Alternative*	*Net Reduction in Supply*	*Percent Reduction in Supply*
On-street	3,107	2,880	227	7%
Paid	484	486	-2*	0%
Non-paid	2,623	2,394	229	9%
Off-street	882	882	0	0%
Total	3,989	3,762	227	6%

*Initial design for the Shilshole North Alternative includes an increase of two paid parking spaces where the No Build Alternative includes one loading zone space and one unused bus zone. Generally, the City prioritizes the retention of loading zone spaces and would not assume a conversion to a paid or non-paid parking space. However, the initial design did not delineate loading zone spaces. The City would work with adjacent businesses to prioritize the retention or replacement of loading zones as needed.

Loading Zone Spaces

Table 8-11 summarizes the net change in loading zone spaces between the No Build Alternative and the Shilshole North Alternative. The Shilshole North Alternative could potentially remove or relocate 10 generic loading zone spaces and 14 truck-only loading zone spaces. These spaces could remain by shifting them to other locations along existing block faces, to the other side of a street, or to an adjacent block. Generally, the City prioritizes the retention of loading zone spaces, and the City would work with adjacent businesses to prioritize the retention or replacement of loading zones as needed. However, moving loading zone spaces may not be an option on some blocks; therefore, to be conservative, it was assumed that all 24 loading zone spaces would be removed by the Shilshole North Alternative.

Table 8-11. On-Street Loading Zone Spaces under the No Build Alternative and Shilshole North Alternative

Alternative	*Generic Loading Zone Spaces*	*Passenger Loading Zone Spaces*	*Truck-Only Loading Zone Spaces*	*Commercial Vehicle Loading Zone Spaces*	*Total Loading Zone Spaces*
No Build	82	15	32	3	132
Shilshole North	72	15	18	3	108
Net Reduction	10	0	14	0	24

8.3.5 Ballard Avenue Alternative

Construction

Construction impacts would be the same for all of the Build Alternatives. There are no construction impacts unique to the Ballard Avenue Alternative compared to the other alternatives.

Operation

Parking Supply

The Ballard Avenue Alternative would remove a total of 198 on-street parking spaces (Table 8-12). These parking spaces would be replaced by the new multi-use trail, sidewalks, landscaping, and buffers. The removed parking spaces are generally characterized as residential, employee, and business customer parking for retail businesses. A small number of removed parking spaces in the southeast portion of the study area can be characterized as employee and business customer parking for industrial businesses, and include the following areas:

- The south side of NW 56th St would have no parking between 28th Ave NW and 22nd Ave NW.
- The west side of 22nd Ave NW would have no parking between NW 56th St and Ballard Ave NW.
- The southwest side of Ballard Ave NW would have no parking between 22nd Ave NW and 17th Ave NW.
- The south side of NW Ballard Way would have no parking between 17th Ave NW and 15th Ave NW.
- The south side of NW 46th St would have no parking between 15th Ave NW and 11th Ave NW.
- The west side of 11th Ave NW would have no parking between NW 46th St and NW 45th St.

Overall, the loss of 198 on-street parking spaces represents approximately 6% of the on-street parking supply in the study area and approximately 5% of the total parking supply (on-street and off-street) in the study area. The Ballard Avenue Alternative is the only Build Alternative to have an impact on paid parking, with the removal of 86 paid parking spaces or 18% of paid parking within the study area.

Table 8-12. On-Street and Off-Street Parking Supply under the No Build Alternative and Ballard Avenue Alternative

Parking Type	*No Build Alternative*	*Ballard Avenue Alternative*	*Net Reduction in Supply*	*Percent Reduction in Supply*
On-street	3,107	2,909	198	6%
Paid	484	398	86	18%
Non-paid	2,623	2,511	112	4%
Off-street	882	882	0	0%
Total	3,989	3,791	198	5%

Loading Zone Spaces

Table 8-13 summarizes the net change in loading zone spaces between the No Build Alternative and the Ballard Avenue Alternative. The Ballard Avenue Alternative could potentially remove or relocate 10 generic loading zone spaces, two truck-only loading zone spaces, and two commercial vehicle loading zone spaces. It is possible that these spaces could remain by shifting them to other locations along existing block faces, to the other side of a street, or to an adjacent block. Generally, the City prioritizes the retention of loading zone spaces, and the City would work with adjacent businesses to prioritize the retention or replacement of loading zones as needed. However, moving loading zone spaces may not be an option on some blocks; therefore, to be conservative, it was assumed that all 14 loading zone spaces would be removed by the Ballard Avenue Alternative.

Table 8-13. On-Street Loading Zone Spaces under the No Build Alternative and Ballard Avenue Alternative

Alternative	*Generic Loading Zone Spaces*	*Passenger Loading Zone Spaces*	*Truck-Only Loading Zone Spaces*	*Commercial Vehicle Loading Zone Spaces*	*Total Loading Zone Spaces*
No Build	82	15	32	3	132
Ballard Avenue	72	15	30	1	118
Net Reduction	10	0	2	2	14

8.3.6 Leary Alternative

Construction

Construction impacts would be the same for all of the Build Alternatives. There are no construction impacts unique to the Leary Alternative compared to the other alternatives.

Operation

Parking Supply

The Leary Alternative would remove a total of 103 on-street parking spaces (Table 8-14). These parking spaces would be replaced by the new multi-use trail, sidewalks, landscaping, and buffers. The removed parking spaces are generally characterized as residential, employee, and business customer parking for retail businesses, and includes the following areas:

- Both sides of NW 54th St would have no parking between 30th Ave NW and NW Market St.
- Otherwise, the Leary Alternative would not completely remove parking from individual blocks. While multiple blocks would have some spaces removed, some parking would remain.

Overall, the loss of 103 on-street parking spaces represents approximately 3% of the on-street parking supply in the study area and approximately 3% of the total parking supply (on-street and off-street) in the study area.

Table 8-14. On-Street and Off-Street Parking Supply under the No Build Alternative and Leary Alternative

Parking Type	*No Build Alternative*	*Leary Alternative*	*Net Reduction in Supply*	*Percent Reduction in Supply*
On-street	3,107	3,004	103	3%
Paid	484	490	-6*	-1%*
Non-paid	2,623	2,514	109	4%
Off-street	882	882	0	0%
Total	3,989	3,886	103	3%

*An increase of six paid parking spaces under the Leary Alternative is due to the initial design shifting a bus zone and including additional parking spaces where the No Build Alternative includes three loading zone spaces and one unused bus zone. Generally, the City prioritizes the retention of loading zone spaces and would not assume a conversion to a paid or non-paid parking space. However, the initial design did not delineate loading zone spaces. The City would work with adjacent businesses to prioritize the retention or replacement of loading zones as needed.

Loading Zone Spaces

Table 8-15 summarizes the net change in loading zone spaces between the No Build Alternative and the Leary Alternative. The Leary Alternative could potentially remove or relocate eight generic loading zone spaces, three passenger loading zone spaces, and four truck-only loading zone spaces. It is possible that these spaces could remain by shifting them to other locations along existing block faces, to the other side of a street, or to an adjacent block. Generally, the City prioritizes the retention of loading zone spaces, and the City would work with adjacent businesses to prioritize the retention or replacement of loading zones as needed. However, moving loading zone spaces may not be an option on some blocks; therefore, to be conservative, it was assumed that all 15 loading zone spaces would be removed by the Leary Alternative.

Table 8-15. On-Street Loading Zone Spaces under the No Build Alternative and Leary Alternative

Alternative	*Generic Loading Zone Spaces*	*Passenger Loading Zone Spaces*	*Truck-Only Loading Zone Spaces*	*Commercial Vehicle Loading Zone Spaces*	*Total Loading Zone Spaces*
No Build	82	15	32	3	132
Leary	74	12	28	3	117
Net Reduction	8	3	4	0	15

8.3.7 **Connector Segments**

Construction

Construction impacts would be the same for all of the Build Alternatives. There are no construction impacts unique to the connector segments compared to the other alternatives.

Operation

The designs of the connector segments would depend on what segments were being connected; therefore, it is assumed that on-street parking and loading zone removal could occur on one or both sides of any connector segment that was used in the selected alternative. Table 8-16 lists the number of spaces on each side of each segment. The worst case would be the removal of all spaces on any one segment. However, removal of all spaces on both sides of the street would be unlikely, and would only occur on a street that was very narrow where vehicular traffic lanes also needed to remain, leaving insufficient room for parking.

Table 8-16. On-Street Parking and Loading Zone Spaces Under the Connector Segments

Segment Name	*Street Name/Side of Street*	*Potential Net Reduction in Parking Supply*	*Potential Net Reduction in Loading Zone Spaces*
Ballard Ave NW	Ballard Ave NW between NW Market St and 22nd Ave NW (northeast side)	14	1
	Ballard Ave NW between NW Market St and 22nd Ave NW (southwest side)	39	3
NW Vernon Pl	NW Vernon Pl between Shilshole Ave NW and Ballard Ave NW (northwest side)	6	0
	NW Vernon Pl between Shilshole Ave NW and Ballard Ave NW (southeast side)	8	0
20th Ave NW	20th Ave NW between Shilshole Ave NW and Ballard Ave NW (east side)	9	1
	20th Ave NW between Shilshole Ave NW and Ballard Ave NW (west side)	9	2
	20th Ave NW between Ballard Ave NW and Leary Ave NW (east side)	11	0
	20th Ave NW between Ballard Ave NW and Leary Ave NW (west side)	13	0

Segment Name	*Street Name/Side of Street*	*Potential Net Reduction in Parking Supply*	*Potential Net Reduction in Loading Zone Spaces*
17th Ave NW	17th Ave NW between NW 46th St and NW Ballard Way (east side)	4	0
	17th Ave NW between NW 46th St and NW Ballard Way (west side)	1	0
	17th Ave NW between NW Ballard Way and NW Leary Way (east side)	2	0
	17th Ave NW between NW Ballard Way and NW Leary Way (west side)	9	0
15th Ave NW	15th Ave NW between NW 46th St and NW Ballard Way (west side)	0	0
14th Ave NW	14th Ave NW between NW 45th St and NW 46th St (east side)	3	0
	14th Ave NW between NW 45th St and NW 46th St (mid-block)	18	0
	14th Ave NW between NW 45th St and NW 46th St (west side)	7	0
	14th Ave NW between NW 46th St and NW Ballard Way (east side)	3	2
	14th Ave NW between NW 46th St and NW Ballard Way (mid-block)	18	0
	14th Ave NW between NW 46th St and NW Ballard Way (west side)	4	1
	14th Ave NW between NW Ballard Way and NW Leary Way (east side)	5	0
	14th Ave NW between NW Ballard Way and NW Leary Way (west side)	7	0

8.4 Avoidance, Minimization, and Mitigation Measures

8.4.1 Measures Common to All Build Alternatives

Construction

Construction avoidance, minimization, and mitigation measures would be the same for all of the Build Alternatives.

While the Missing Link would reduce the overall parking supply in the project area during construction, the City would maintain parking availability to the extent feasible during construction. Once construction and staging plans have been developed, the City could develop practices to manage parking during construction to ensure that parking is convenient and accessible to businesses and their patrons to the extent feasible. In addition, the City would continue to enforce short-term parking limits to make the most efficient use of the supply of short-term parking within the project construction area. The City could encourage the contractor's workers to find alternative parking areas away from the work site or to use transit to access the work site, thereby maximizing available nearby parking spaces for the public. Strategies used by the contractor could include, but are not limited to, setting up an off-site parking area and/or setting up a staging area to store tools and materials that would eliminate the need to park work trucks close to the work site.

Operation

Operation avoidance, minimization, and mitigation measures would be the same for all of the Build Alternatives.

The alternatives evaluated for the Missing Link would eliminate between 103 and 261 on-street parking spaces, which represents 3 to 7% of all on- and off-street parking supply in the study area. If connector segments were used, this number could increase or decrease, depending on the combination of segments selected.

Current City plans and policies include strategies to encourage the use of transit and nonmotorized modes of travel, and to discourage the use of SOVs. This emphasis is reflected in the City's prioritization of curb space for transit and loading before on-street parking. Goal TG18 of the Seattle Comprehensive Plan (City of Seattle, 2015) notes that mobility is the primary purpose of the arterial street system, and Policy T42 states that it is the City's general policy to replace short-term parking only when the project results in a concentrated and substantial amount of on-street parking loss. This project would not remove parking spaces in a concentrated or substantial manner. Parking removal would be spread out along each of the alternative alignments. The maximum amount of parking in the study area that could be removed is 7% (under the Shilshole South Alternative).

Potential mitigation measures to offset the impact of parking removal include:

- Modify on-street parking policies and practices, such as varying rates by time of day, to make parking more consistently available for short-term users.
- Adjust short-term parking limits to make the most efficient use of the supply of short-term parking for customers of study area businesses.
- Continue to provide information on off-street parking spaces on the City's website, including the Seattle Parking Map.

- Work with transit agencies to increase the awareness of transit routes and facilities in the area and to encourage visitors to use alternative modes of transportation.
- Work with businesses to increase the awareness of the BGT and other bicycle and pedestrian connections in the area to encourage employees and visitors to use nonmotorized modes of transportation.

A mitigation measure to offset the loss of loading zones could be to shift loading zone spaces to other locations along existing block faces, to the other side of a street, or to an adjacent block. However, shifting loading zone spaces could remove additional parking spaces.

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CHAPTER 9: AIR QUALITY AND GREENHOUSE GAS EMISSIONS

9.1 Introduction

This chapter first describes the existing air quality and greenhouse gas (GHG) baseline conditions in the study area; summarizes the regulatory context; and identifies air pollutants of concern. The chapter then compares each alternative's effect on air quality and GHGs in relation to existing regulations, plans, and policies, including the City of Seattle GHG guidelines for SEPA evaluations.

The chapter distinguishes between air pollutants and GHGs. Both are generated locally, but GHG emissions contribute to cumulative carbon dioxide levels on a global scale. Additionally, air pollutants and GHGs are regulated separately.

The study area selected for the analysis of air quality and GHG emissions is the same study area applied to the transportation analysis (see Chapter 7, Figure 7-1).

9.2 Affected Environment

9.2.1 Regulatory Agencies, Policies, and Requirements

Air quality in the Puget Sound region is regulated and enforced by federal, state, and regional agencies including the EPA, Ecology, and the Puget Sound Clean Air Agency (PSCAA). In addition, the City of Seattle has a plan to address climate change. These agencies' distinct roles are described below.

U.S. Environmental Protection Agency

The 1970 Clean Air Act (last amended in 1990) requires the EPA to set National Ambient Air Quality Standards (NAAQS) for six common air pollutants to protect the public from the negative health effects of air pollution (EPA, 2015c). The six principal pollutants, called "criteria" pollutants, include the following:

- ozone,
- carbon monoxide (CO),
- particle pollution or "particulate matter" (PM),
- nitrogen dioxide (NO2),
- sulfur dioxide (SO2), and
- lead.

The NAAQS specify the concentration of these pollutants to which the public can be exposed without adverse health effects and with an adequate margin of safety.

NAAQS are divided into two categories: primary standards and secondary standards. Primary standards protect the general public health, including sensitive populations such as asthmatics, children, and the

elderly. Secondary standards protect the public welfare against hazards such as decreased visibility and damage to animals, crops, vegetation, and buildings (EPA, 2015a).

Two size categories of PM are regulated: "inhalable coarse particles" with diameters between 2.5 and 10 micrometers, and "fine particles" with diameters 2.5 micrometers and smaller (EPA, 2015a). A micrometer is one millionth of a meter. Particles less than 10 micrometers can pass through the nose and throat and enter the lungs.

The units of measure for the specified standards are parts per million (ppm) by volume, parts per billion (ppb) by volume, and micrograms per cubic meter of air ($\mu g/m^3$). Table 9-1 lists the primary and secondary standards set by the EPA for the six criteria pollutants (EPA, 2015a). The standards are periodically reviewed and may be revised by the EPA.

Table 9-1. National Ambient Air Quality Standards (NAAQS)

Pollutant		*Primary/ Secondary*	*Averaging Time*	*Level*	*Form*
Carbon Monoxide		Primary	8-hour	9 ppm	Not to be exceeded more than once per year.
			1-hour	35 ppm	
Lead		Primary and secondary	Rolling 3-month average	0.15 $\mu g/m^3$	Not to be exceeded.
Nitrogen Dioxide		Primary	1-hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years.
		Primary and secondary	Annual	53 ppb	
Ozone		Primary and secondary	8-hour	0.070 ppb	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years.
Particle Pollution	PM2.5	Primary	Annual	12.0 $\mu g/m^3$	Annual mean, averaged over 3 years.
		Secondary	Annual	15.0 $\mu g/m^3$	Annual mean, averaged over 3 years.
		Primary and secondary	24-hour	35 $\mu g/m^3$	98th percentile, averaged over 3 years.
	PM10	Primary and secondary	24-hour	150 $\mu g/m^3$	Not to be exceeded more than once per year on average over 3 years.
Sulfur Dioxide		Primary	1-hour	75 ppb	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years.
		Secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year.

Source: EPA, 2015a.

The agencies have designated areas of the United States according to whether they are meeting the NAAQS, as follows (Ecology, 2015a, 2015b, 2015c):

- **Nonattainment areas**: Areas that exceed the NAAQS for a pollutant by the number of times predesignated by the EPA;
- **Maintenance areas**: Areas that were once designated as nonattainment but are now achieving the NAAQS; and
- **Attainment areas:** Areas that have air pollution levels below the NAAQS.

In nonattainment areas, states must develop plans to reduce emissions and bring the area back into attainment of the NAAQS. The General Conformity Rule, established by the Clean Air Act Amendments of 1990, ensures that the actions taken by federal agencies in nonattainment and maintenance areas do not interfere with a state's plans to meet national standards for air quality (Ecology, 2015a).

In addition, EPA's Mandatory Reporting of Greenhouse Gases Rule requires large sources of GHGs to report their GHG emissions data. Several types of industries are subject to this rule, including suppliers of certain products that would result in GHG emissions if released, combusted, or oxidized; direct emitting source categories; and facilities that inject carbon dioxide underground for sequestration purposes. Facilities that emit 25,000 metric tons or more per year of GHGs are required to submit annual reports to EPA (EPA, 2015b).

The principal source of Washington's GHG emissions is transportation (approximately 47% of total state gross GHG), followed by fossil fuel combustion in the residential, commercial, and industrial sectors (approximately 20%) and electricity consumption from these sectors (approximately 20%) (Ecology, 2007).

Washington State Department of Ecology

Ecology maintains an air quality program with a goal of safeguarding public health and the environment by preventing and reducing air pollution. Through the air quality program, Ecology collects and shares information regarding air quality conditions, effects, and mitigation on a statewide level. Ecology also oversees the development and conformity of the State Implementation Plan (SIP), a complex collection of documents that describes how the state implements, maintains, and enforces NAAQS. While states have the authority to adopt more stringent thresholds than the federal government, Ecology's ambient air quality standards parallel those of the EPA presented in Table 9-1 (Ecology, 2016).

In December 2010, Ecology adopted Chapter 173-441 WAC – Reporting of Emissions of Greenhouse Gases. This rule institutes mandatory GHG reporting for the following:

- Facilities that emit at least 10,000 metric tons of GHGs per year in Washington; or
- Suppliers of liquid motor vehicle fuel, special fuel, or aircraft fuel that supply products equivalent to at least 10,000 metric tons of carbon dioxide per year in Washington.

Puget Sound Clean Air Agency

The PSCAA is responsible for air quality in King County and has local authority for setting regulations and permitting of stationary air pollutant sources and construction emissions. PSCAA also maintains and operates a network of ambient air quality monitoring stations throughout its jurisdiction.

City of Seattle Climate Action Plan 2013

The City's Climate Action Plan (CAP) acknowledges that cities play a powerful role in addressing climate change. Since adoption of the original CAP in 2006, Seattle has taken action on 15 of the 18 strategies established to meet the Kyoto Protocol target for reducing GHG emissions (City of Seattle, 2013). The most recent version of the CAP was adopted in 2013, expanding the CAP vision to include zero net GHG emissions by 2050 and preparing for the likely impacts of climate change. The 2013 CAP provides an action strategy that focuses on reducing GHG emissions while supporting other community goals, including building vibrant neighborhoods, fostering economic prosperity, and enhancing social equity. The plan includes goals of tripling the amount of bicycling from 2007 levels by 2017; reducing passenger vehicle emissions by 82%; reducing passenger vehicle miles traveled by 20% by 2030; trending away from single occupant vehicles; and reducing GHG emissions per mile of Seattle vehicles by 2030 (City of Seattle, 2013).

9.2.2 Air Quality and Pollutants of Concern

Scientific evidence shows that long- and short-term exposure to air pollutants can cause a variety of adverse health effects, including respiratory conditions, cardiovascular conditions, cancer, and premature death (EPA, 2015d).

The Missing Link study area is in the Puget Sound lowland, which generally has sufficient wind most of the year to disperse air pollutants released into the atmosphere. However, CO and PM in the Puget Sound region have exceeded current federal standards in the past. A 1-hour ozone standard was also previously exceeded; however, EPA revoked its 1-hour ozone standard in 2005, and the 8-hour standard is currently being met. Therefore, CO and PM are the main criteria pollutants of concern for the project (see Table 9-2).

Table 9-2. NAAQS Maintenance Areas

NAAQS Criteria Pollutant	*Date of Nonattainment Designation*	*Date of Redesignation to Attainment*	*Affected Area*
CO 8-hour 9 ppm	11/15/1990	10/11/1996	King County
PM10 24-hour 150 µg/m^3	11/15/1990	5/14/2001	King County

Source: Ecology, 2015c.

Carbon Monoxide

CO is an odorless, tasteless, colorless gas emitted from mobile sources (e.g., autos, trucks, and buses); wood-burning stoves; open burning; and industrial combustion sources. CO reduces the blood's capacity to carry oxygen and can cause headaches, dizziness, nausea, listlessness, and, in high doses, may cause death. The federal CO standards have not been exceeded in the Puget Sound area for over 20 years and the area was redesignated to attainment in 1996 (Ecology, 2015c).

Particulate Matter

PM consists of fine particles such as soot, dust, and unburned fuel suspended in the air. It is emitted from a variety of sources, including vehicles, industry, and construction. This pollutant aggravates ailments such as bronchitis and emphysema and is especially harmful for those with chronic heart and lung diseases, as well as the very young, elderly, and pregnant women. The federal annual PM2.5 standard has not been exceeded in the Puget Sound area since monitoring began in 1990. All four counties in the PSCAA monitoring area (Kitsap, Pierce, King, and Snohomish) were below the daily and annual PM10 federal standards since the early 1990s until monitoring stopped in 2006 (PSCAA, 2016). While other areas of Puget Sound are designated maintenance areas, King County is not designated as such (Ecology, 2015c).

9.2.3 Greenhouse Gases

Greenhouse gases warm the earth by absorbing solar energy and slowing the rate at which the energy escapes to space. They act like a blanket and trap heat in the earth's atmosphere, causing climate change. The principal GHGs are carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O).

Road transportation is Seattle's largest source of GHG emissions, comprising approximately 40% of community emissions (City of Seattle, 2013). Fossil fuels burned by cars, trucks, transit, and freight vehicles as they travel throughout Seattle are responsible for the emissions. Because CH4 and N2O emissions constitute less than 0.1% of the total GHGs from these sources, CO2 is the principal GHG of concern for project construction (off-road equipment emissions) and operation (vehicle emissions) (City of Seattle, 2014).

CO2 is naturally present in the atmosphere as part of the Earth's carbon cycle (the natural circulation of carbon among the atmosphere, oceans, soil, plants, and animals). The combustion of fossil fuels such as gasoline and diesel to transport people and goods accounted for about 31% of total CO2 emissions and 26% of total GHG emissions in the United States in 2013 (EPA, 2015e).

9.2.4 Existing Emissions from Idling Vehicles

The focus of this GHG analysis is on air pollutants emitted by idling vehicles. This method is appropriate because none of the alternatives are predicted to change future traffic volumes, but only to change idling times at intersections and as drivers wait for trail users to clear before turning onto or off of roadways. Existing emissions were calculated based on existing vehicle traffic volumes on roadway segments along the alternative routes (Parametrix, 2016b). Traffic volumes are described in Chapter 7, Transportation and in the Transportation Discipline Report (Parametrix, 2016a).

To establish a baseline of existing conditions, the amounts of pollutant and GHG (CO2) emissions were estimated using existing traffic volumes (Parametrix, 2016b) and vehicle delay data at 21 locations, as presented in the Transportation Discipline Report (Parametrix, 2016a). The existing daily vehicle volumes and associated delay times were obtained during peak hours to account for worst-case circumstances. Emissions estimates tabulated in Appendix B and presented in Table 9-3 were derived by converting idling times into CO, PM10, and CO2 emission volumes using idle emission factors published by the EPA (2008). The emission estimates used separate calculations for light-duty gasoline-fueled vehicles and heavy-duty diesel trucks. Table 9-3 contains the combined total emission estimates.

Table 9-3. Existing Annual Vehicle Idling Emissions Based on Vehicle Delay and Traffic Volumes

Main Pollutant of Concern	*Total Idling Emissions*
CO (tons/year)	24.43
PM10 (tons/year)	0.02
CO2 (metric tons/year)	1,421

9.3 Potential Impacts

The organization of this impact analysis is different than in other chapters of this DEIS. This section first describes the methods and criteria used to assess air quality impacts, then presents combined results (construction and operation) for GHGs and main criteria pollutants of concern (CO and PM10). This was done in order to compare the total potential pollutant emissions of each alternative including those from construction activities, lifecycle emissions of construction materials, long-term operational maintenance of the trail, and changes in vehicle traffic and idling emissions.

9.3.1 Analysis Methods

This analysis considers the following types of potential project impacts:

- Short-term CO and PM10 emissions generated by construction equipment, vendor truck trips, and construction worker trips;
- "Lifecycle" emissions of GHG (CO2) generated during manufacturing of the concrete used to pave the new trail; paving of the trail; and maintenance of the trail throughout its expected lifespan of 30 years; and
- Potential improvements to air quality and GHG emissions as a result of removing vehicles from the roads (i.e., people choosing to use the trail instead of vehicles); and
- Potential for the trail connection to negatively impact air quality and GHG emissions by causing delays for vehicles accessing driveways at trail crossings and at intersections.

The City of Seattle SEPA GHG Emissions Worksheet (2016) was used to calculate metric tons of CO2 equivalents created during the manufacture of paving materials, construction of the trail, and maintenance of the trail pavement over its expected lifespan. Air pollutant emissions were calculated using the Road Construction Emissions Model (South Coast Air Quality Management District, 2008).

The volume of nonmotorized trail users who may use the Missing Link once it is completed was estimated using nonmotorized user counts taken near the west and east trail ends. It is assumed that the number of users would be the same across alternatives, and that user volumes would continue to grow, which could result in more delays at driveways and intersections in the study area. See Chapter 7, Transportation, and the Transportation Discipline Report for details (Parametrix, 2016a).

The analysis further evaluated whether completion of the Missing Link could encourage existing drivers to switch to nonmotorized transportation along the trail, thus reducing the number of motorized vehicles and GHG emissions in the study area. However, the air quality analysis was based on the full predicted

growth of motorized vehicle use, which represents a more conservative estimate of emissions. This analysis does not assume motorized trip reduction associated with conversion to trail use.

The presence of trail crossings at driveways could result in delays for vehicles using the driveways, thus increasing the amount of vehicle emissions due to increased idling times (Parametrix, 2016a). Different types of motorized vehicles emit air pollutants and GHGs in varying volumes, so the types of vehicles that could be delayed are also evaluated. Some of the Build Alternatives would result in signalization of intersections, which would substantially reduce existing and projected vehicle delays during the 2040 horizon year and thus reduce pollutant and GHG emissions.

The significance of potential impacts was assessed using the following criteria:

- Significant adverse impacts would occur if:
    - The project would result in construction-related GHG emissions at or above the State of Washington reporting threshold of 10,000 metric tons in a given year, and the project would not implement BMPs to reduce GHG emissions. Construction-related impacts include the generation of GHG emissions by construction equipment hauling construction materials to the site, removing spoils and debris from the site, and resurfacing, as well as other activities. Lifetime construction-related GHG emissions for each alternative were quantified using the City of Seattle GHG guidelines for SEPA evaluations (City of Seattle, 2016).
    - The project construction plus operation would exceed state GHG reporting requirements or federal de minimis thresholds of 100 tons per year applicable within King County pursuant to the 1990 amendments to the federal Clean Air Act for CO and PM10.
- Minor impacts would occur if:
    - Project construction and operation would result in an increase in GHG emissions that falls below state reporting requirements; or
    - Project construction and operation would result in an increase in CO or PM10 that falls below federal NAAQS standards.

9.3.2 **No Build Alternative**

No construction would occur under the No Build Alternative, and therefore no construction-related air pollution or GHG emissions would occur.

Under the No Build Alternative, traffic congestion and delays would continue on their current trajectory as traffic volumes increase through 2040. Table 9-4 presents the estimated increase in vehicle idling emissions in 2040 under the No Build Alternative compared to existing conditions. (See Appendix B, Table B-1 and B-2 for a tabulation of daily emissions at studied roadway segments under existing and No Build conditions.)

Table 9-4. Vehicle Idling Emissions for the No Build Alternative (Existing Conditions and 2040) Based on Vehicle Delay and Traffic Volumes

	Carbon Dioxide (CO2) Metric Tons per Year			*Carbon Monoxide (CO) Tons per Year*			*Particulate Matter (PM10) Tons per Year*		
	Existing	*2040 No Build Total*	*2040 Increase over Existing*	*Existing*	*2040 No Build Total*	*2040 Increase over Existing*	*Existing*	*2040 No Build Total*	*2040 Increase over Existing*
Total Idling Emissions along Analyzed Roadways	1,421	3,239	1,818	24.43	41.49	17.05	0.02	0.07	0.05

9.3.3 Impacts Common to All Build Alternatives

Greenhouse Gases (CO2)

CO2 emissions come from multiple sources, including the extraction, processing, transportation, construction, and disposal of materials and landscape disturbance, and transportation demands created by the development after it is completed (City of Seattle, 2016). Table 9-5 presents the estimated construction, operation, and total CO2 emissions for each Build Alternative in 2040. Quantities shown are approximate.

Table 9-6 presents the estimated change in construction, operation, and total CO2 emissions for each Build Alternative in 2040 compared to the No Build Alternative. The Shilshole North Alternative and the Ballard Avenue Alternative would result in a net decrease in GHG emissions compared to the No Build Alternative, largely as a result of intersection timing upgrades proposed in conjunction with the project that would substantially lower vehicle delays at high-volume intersections. The improvements to traffic flow from these upgrades would more than offset the increased vehicle delays at driveways, as well as construction-related GHG emissions. The Shilshole South and Leary Alternatives would have minor net increases in GHG emissions but would still be well below the reporting threshold of 10,000 metric tons per year. The increases in GHG emissions would be a minor adverse impact.

Criteria Air Pollutants (CO and PM10)

All of the Build Alternatives would have minor adverse impacts with respect to criteria air pollutant emissions of CO and PM10. The Build Alternatives would result in minor increases in total emissions of PM10 and CO relative to the No Build Alternative (Table 9-6). However, total emissions would be well below the 100 ton per year de minimis thresholds applicable within King County pursuant to the 1990 amendments to the federal Clean Air Act (Table 9-6).

All of the Build Alternatives would marginally increase both CO and PM10 emissions compared to the No Build Alternative, primarily because construction-related emissions would more than compensate for operational reductions that would occur as a result of signal installation at the intersections at Shilshole Ave NW and 17th Ave NW under some alternatives.

Table 9-5. Annual 2040 GHG and Air Quality Emissions for Each Alternative

Shilshole South Alternative	CO2 (metric tons)	CO (tons)	PM10 (tons)
Construction	325	5.1	1.6
Operation	3,220	45.23	0.06
Total	3,545	50.33	1.66
Shilshole North Alternative	CO2 (metric tons)	CO (tons)	PM10 (tons)
Construction	333	5.1	1.6
Operation	2,653	37.19	0.05
Total	2,986	42.29	1.66
Ballard Avenue Alternative	CO2 (metric tons)	CO (tons)	PM10 (tons)
Construction	378	5.1	1.6
Operation	2,640	35.69	0.05
Total	3,018	40.79	1.66
Leary Alternative	CO2 (metric tons)	CO (tons)	PM10 (tons)
Construction	340	5.1	1.6
Operation	3,305	46.14	0.06
Total	3,645	51.24	1.66

Table 9-6. Change in Annual 2040 GHG and Air Quality Emissions for Each Alternative Compared to No Build Alternative

Shilshole South Alternative	CO2 (metric tons)	CO (tons)	PM10 (tons)
Change from No Build	+306	+9.14	+1.6
Threshold	10,000	100	100
+/- Threshold Standard	-9,694	-90.86	-98.4
Shilshole North Alternative	CO2	CO	PM10
Change from No Build	-253	+1.10	+1.6
Threshold	10,000	100	100
+/- Threshold Standard	Net Benefit	-97.97	-98.4
Ballard Avenue Alternative	CO2	CO	PM10
Change from No Build	-221	+0.40	+1.6
Threshold	10,000	100	100
+/- Threshold Standard	Net Benefit	-99.60	-98.4
Leary Alternative	CO2	CO	PM10
Change from No Build	+406	+10.05	+1.6
Threshold	10,000	100	100
+/- Threshold Standard	-9,594	-89.95	-98.4

All Build Alternatives would require the manufacture and installation of new pavement, the transportation of construction materials, and other construction-related activities. These activities cause GHG and criteria air pollutant emissions that would be absent under the No Build Alternative.

Traffic in the study area is expected to grow under all Build Alternatives (Parametrix, 2016a), which would generally add to GHG and criteria air pollutant emissions. Alternatives that include transportation system upgrades that could improve traffic flow and decrease idling times could reduce operational emissions compared to the No Build Alternative, since the same improvements are not associated with the No Build Alternative. Where improvements that facilitate traffic flow and reduce delay times offset construction-related emissions, net benefits to air quality could result.

The Shilshole North and Ballard Avenue Alternative would reduce CO2 emissions compared to the No Build Alternative and cause minor net benefits related to CO2, largely due to the previously described transportation infrastructure improvements. The Shilshole South and Leary Alternatives would result in negligible additional CO2 emissions compared to the No Build Alternative. CO and PM would increase under all Build Alternatives compared to the No Build Alternative, but would be well below the significant adverse impact threshold.

9.3.4 Connector Segments

Emissions during construction and operation of any of the connector segments would be minor compared to any of the Build Alternatives, and therefore would not cause a significant adverse environmental impact.

9.4 Avoidance, Minimization, and Mitigation Measures

The following measures could apply to all of the Build Alternatives. Although construction-related emissions would be below EPA thresholds, the City could implement BMPs to minimize PM10, CO, and CO2 emissions in the project vicinity and comply with applicable regulations for air quality. The City should require contractors to comply with the following practices:

- Use measures to control dust, such as watering exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) and covering haul trucks transporting soil, sand, or other loose material.
- Wash mud or dirt from construction equipment to prevent it from being tracked out onto public roads.
- Limit vehicle speeds on unpaved roads.
- Pave all exposed soils in areas planned for paving as soon as possible.
- Minimize vehicle and equipment idle times by shutting off when not in use.
- Maintain all construction equipment and vehicles in accordance with manufacturer specifications.

Additionally, contractors could:

- Encourage carpooling options for employees.
- Use warm-mix asphalt.
- Use reused fly ash concrete.
- Use local building materials to reduce transport distances, when possible.

CHAPTER 10: CULTURAL RESOURCES

10.1 Introduction

This chapter describes cultural resources in the Missing Link study area. Cultural resources include both buried or archaeological resources and aboveground resources such as buildings and other structures.

The Cultural Resources Discipline Report (SWCA, 2016) describes in detail the methods used to identify and evaluate cultural resources in the study area as well as applicable regulations. These methods included review of the following local, state, and federal registers and databases for information about documented cultural resources:

- National Register of Historic Places (NRHP);
- Washington Heritage Register;
- City of Seattle list of Landmarks and Historic Resources Survey Database;
- King County Historic Preservation Program database; and
- Department of Archaeology and Historic Preservation (DAHP) Washington Information System for Architectural and Archaeological Records Data (WISAARD) database.

The EIS team conducted a reconnaissance-level survey of the study area to reexamine previously recorded built environment resources and identify areas or individual resources that are likely eligible for local, state, or federal registers. Information from the King County Department of Assessments and archival sources was used to determine the age of built environment resources.

Historical maps, photographs, and other documents were used to identify locations where past human activity occurred within the study area. Existing geotechnical borehole logs were used to characterize soils and identify areas where potentially significant archaeological resources could be identified during construction.

10.2 Affected Environment

The Missing Link study area for cultural resources includes the four Build Alternatives, a No Build Alternative, and six connector segments that are described from the east project terminus at the intersection of 11th Ave NW and NW 45th St to the west terminus at 30th Ave NW and the Ballard Locks. The study area includes properties directly abutting these alternatives and connector segments (Figure 10-1).

Figure 10-1. Historic Shoreline and Historic District Boundaries

10.2.1 **Setting**

The study area is located along the north shore of Salmon Bay in a glacially exposed and eroded trough. After glaciers left the region at the end of the Pleistocene, Salmon Bay was a dry valley and the shoreline was southwest of its modern position throughout most of the Holocene. Salmon Bay supported a floodplain in which a stream flowed from Lake Union west to the sea as recently as 2,500 years ago (Downing, 1983). Relative sea level in Puget Sound continued to rise throughout the Holocene. The Salmon Bay area transitioned from a floodplain environment into a brackish tidal embayment after 2,500 years ago.

Native American communities whose descendants are now part of the Duwamish, Muckleshoot, Snohomish, Snoqualmie, and Suquamish Tribes once used the project vicinity for settlement and subsistence. Archaeological evidence of Native Americans living around the Puget Sound between about 5,000 and 2,500 years ago is commonly found along modern shorelines. The traditional Native American way of life was altered in the mid-1800s when the first Euroamerican settlers arrived in the Puget Lowland on the coattails of explorers and capitalists (Bass, 1937; Watt, 1931). The historic development of Seattle and its surrounding area was influenced by access to both natural resources and a means to transport them. Land seekers initially chose property along navigable waterways, and communities grew where there were good harbors and nearby resources that could accommodate the growth of trade. Shoreline property was in particular demand, and several early claimants filed for land along a bay that extended inland to the north of the Seattle settlement. This inlet was originally shown as Shilshole Bay on the January 1856 General Land Office survey map (U.S. Surveyor General, 1856) but ultimately became known as Salmon Bay.

Deposition of industrial fill was commonplace along the Salmon Bay shoreline in the 1890s. Canal spoils were later placed along the shoreline during construction of the Ship Canal and Hiram M. Chittenden Locks between 1916 and 1934. As a result, the wetlands along the coast were filled and the Salmon Bay shoreline was extended south of its original position. Figure 10-1 depicts the shoreline of Salmon Bay in 1891 in relation to the study area. The Shilshole North and South Alternatives are at or adjacent to the 1891 shoreline. Mean tide elevation in Salmon Bay rose to the level of Lake Union after completion of the Ship Canal (Chrzastowski, 1983). Lake Washington was subsequently lowered approximately 10 feet to the level of Lake Union (Galster and Laprade, 1991).

Today, soils mapped in the project vicinity consist of Alderwood series soils that formed on uplands and terraces in glacial till (Snyder et al., 1973). The study area, however, does not include intact Alderwood soils because it has been fully developed and most of the area includes a considerable amount of fill. Borings completed during previous geotechnical investigations for other projects found 1 to 17 feet of mixed clayey, gravelly, silty, sandy fill across the surface of the study area. The fill is thickest along the Shilshole North and South Alternatives at the historical shoreline.

10.2.2 **Previously Identified Cultural and Historic Resources**

Archaeological Resources

It is possible that archaeological materials dating to the middle Holocene are present in the project vicinity. If present, they would likely be encountered along the prehistoric shoreline that is closest to the Shilshole North and South Alternatives. Similar to middle Holocene sites, archaeological materials dating to the late Holocene are possibly in the project vicinity. If present, late Holocene sites would likely be encountered just below the historical fill along the prehistoric shoreline that is closest to the Shilshole North and South Alternatives.

The previous geotechnical studies reported potential archaeological deposits within the fill material. Brick, metal, and wood debris were reported throughout the fill, and similar deposits are expected along the connector segments. It appears that two dump sites exist, one near 11th Ave NW and NW 46th St, and the other near 28th Ave NW and NW Market St. Wood and other debris were also found at the base of the fill. The deeply buried wood and debris deposits that are concentrated at the base of the fill are more likely to be culturally significant than the bricks, wood, and metal debris found scattered throughout the upper fill because the lower deposits are located on natural surfaces, are older, and are still in place.

Table 10-1 summarizes the archaeological resources recorded in the vicinity of the BGT, as well as human remains and other cultural materials that have been noted, but not recorded, in the project vicinity.

Table 10-1. Previously Recorded Archaeological Sites and Burke Museum Collections and Materials Noted in the Project Vicinity

Site No.	*Compiler/ Data*	*Age*	*Description*	*Relation to Shilshole North and South Alternatives*	*Relation to Ballard Avenue Alternative*	*Relation to Leary Alternative*
45KI1000	Major 2010	Pre-contact	Salmon Bay midden	0.3 mile west	0.3 mile west	0.3 mile west
Burke Human Remains Site 1162	King County Database	Pre-contact	Human remains	One block north	Adjacent at 1416 NW 46th St	Two blocks south
Burke Archaeological Site 1117	King County Database	Pre-contact	Isolated projectile point	North	North	North
Burke Archaeological Site 1102	King County Database	Pre-contact	Shell midden and human remains	Adjacent to west end	Adjacent to west end	Adjacent to west end

Historic Districts

Three historic districts are located in or near the study area (Table 10-2, Figure 10-1). Two of the districts are listed in the NRHP: (1) the Ballard Avenue Historic District, and (2) the Hiram M. Chittenden Locks and Related Features of the Lake Washington Ship Canal. The third is a local historic district, but not listed in NRHP, the Ballard Avenue Landmark District, which has the same boundaries as the Ballard Avenue NRHP district. Although these two districts have the same boundary, they are distinct districts with different regulatory structures.

The historic streetscape along Ballard Ave NW from NW Market St to NW Dock Pl makes up the NRHP-listed Ballard Avenue Historic District, which includes 74 properties that belong to the period of significance between 1890 and 1930 (Potter, 1976). Forty-one of these properties are adjacent to one or more of the alternatives or connector segments. The Ballard Avenue Alternative extends through the middle of the historic district. The contributing historic properties within this district are described further in the section on “Buildings and Structures” below. The locally designated Ballard Avenue Landmark District was established by the City of Seattle in 1975.

Eight miles of man-made channels and inland bodies of water between Puget Sound and Lake Washington have been recorded as the Hiram M. Chittenden Locks and Related Features of the Lake Washington Ship Canal (Potter, 1977). These features include the fixed dam and double locks at Salmon Bay in Ballard, the Fremont Cut between the locks and Lake Union, and the Montlake Cut between Lake Union and Lake Washington, as well as 20 accessory structures that date to the period of significance between 1906 and 1917. This district is located just west of the Missing Link study area (Figure 10-1).

Table 10-2. Historic Districts in or Adjacent to the Study Area

Description	*Age*	*Relationship to Alternatives*		
		Shilshole North and South	*Ballard Avenue*	*Leary*
Ballard Avenue Historic District / Ballard Avenue Landmark District	1890–1930	½ block north	Within	Adjacent to ½ block south
Hiram M. Chittenden Locks and Related Features of the Lake Washington Ship Canal	1906–1917	Adjacent to west end	Adjacent to west end	Adjacent to west end

Buildings and Structures

In addition to the buildings that were recorded as part of the historic districts, a total of 54 buildings located on properties adjacent to the alternative alignments have been previously recorded. Some of these resources were evaluated for eligibility for listing in the NRHP while others were not. One resource, the 15th Ave Bridge/Ballard Bridge, is individually listed in the NRHP.

The following paragraphs summarize historic resources present along each of the alternative trail alignments and connector segments.

Shilshole South Alternative

This alternative does not pass through any of the historic districts. Although it is adjacent to the north edge of the Hiram M. Chittenden Locks District, it does not border any contributing features in that district. This alternative is adjacent to two eligible or listed resources (Figure 10-2).

The NRHP-listed 15th Ave Bridge/Ballard Bridge crosses a segment of the Shilshole South Alternative at NW 46th St.

A large segment of the Shilshole South Alternative is adjacent to the NRHP-eligible Seattle Lake Shore and Eastern Railroad Grade (SLS&E RR)/Ballard Terminal Railroad (BTR). Proposed plans for the Shilshole South Alternative indicate that this resource is located in very close proximity to the proposed trail and crosses it on Shilshole Ave NW between NW Dock Pl and 17th Ave NW.

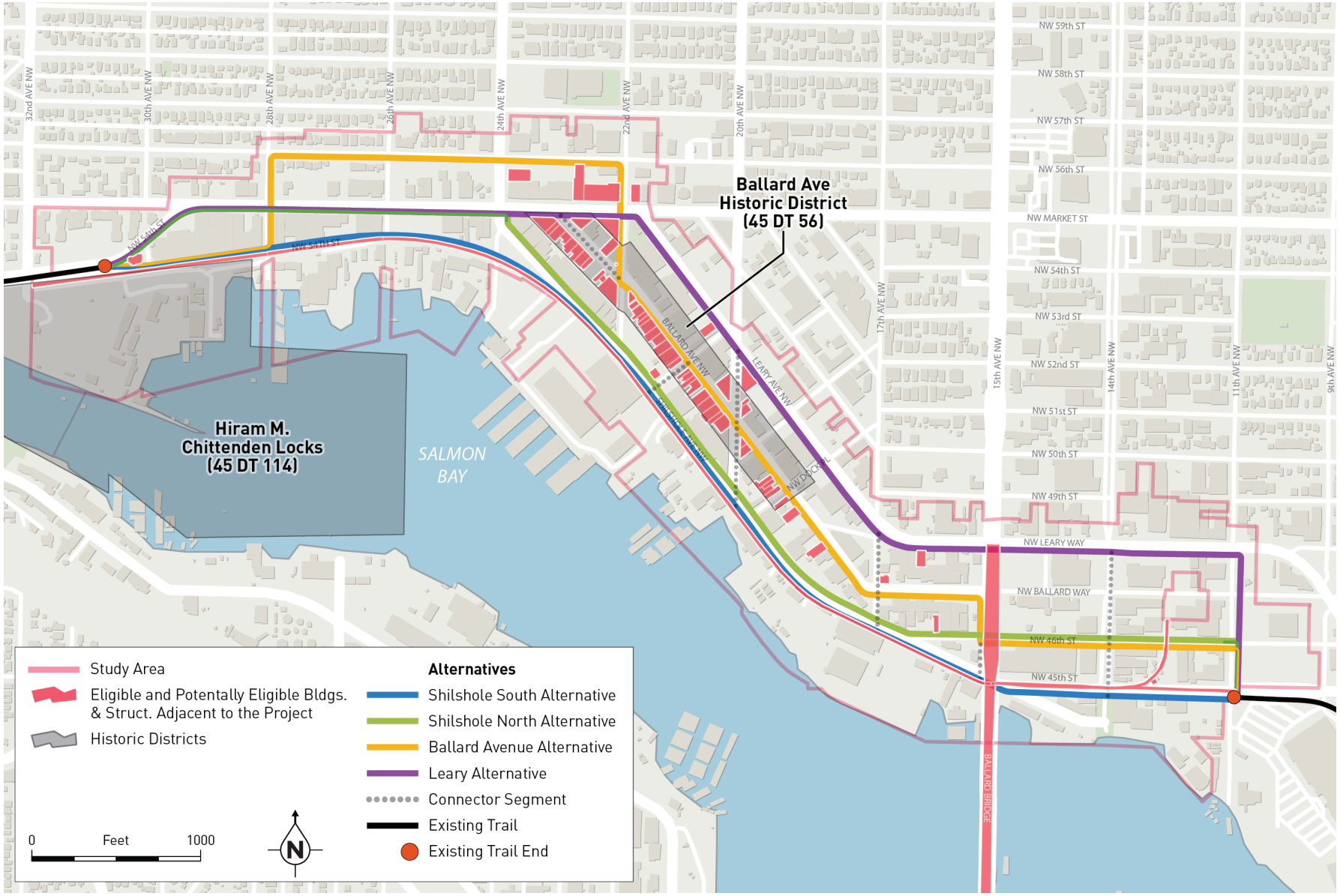

Figure 10-2. Historic Resources

Shilshole North Alternative

This alternative does not pass through any historic districts, but is adjacent to the north edge of the Hiram M. Chittenden Locks District. This alternative does not border any contributing features of that district, but it is adjacent to four eligible or listed resources (Figure 10-2).

The NRHP-listed 15th Ave Bridge/Ballard Bridge crosses a segment of the Shilshole North Alternative at NW 46th St. The Stimson Mill Office, which is NRHP-eligible, is adjacent to this alternative at the corner of NW Vernon Pl and Shilshole Ave NW. In addition, the Jack Johnson Beer Parlor/Lock Spot, which was evaluated and recorded locally, is adjacent to the Shilshole North Alternative on NW 54th St.

Large segments of the Shilshole North Alternative are adjacent to the NRHP-eligible SLS&E RR. Proposed plans for the Shilshole North Alternative indicate that the proposed trail crosses the railroad on NW 46th St, midway between 11th Ave NW and 14th Ave NW. The southeast end of the proposed route also crosses the railroad at the intersection of NW 45th St and 11th Ave NW.

Ballard Avenue Alternative

This alternative extends through the center of two historic districts (the NRHP-listed and local Ballard Avenue historic districts) and is adjacent to the north edge of a third historic district (Hiram M. Chittenden Locks District). A total of 38 eligible or listed resources are adjacent to or crossed by this alternative (Figure 10-2). See the Cultural Resources Discipline Report (SWCA, 2016) for a complete list.

The Ballard Avenue Alternative extends through the center of the Ballard Avenue Historic District from 22nd Ave NW to the southeast district boundary near NW Dock Pl. Twenty-six district resources are adjacent to this alternative alignment.

The 15th Ave Bridge/Ballard Bridge crosses the Ballard Avenue Alternative at NW 46th St, and is located immediately east of the alternative between NW Ballard Way and NW 46th St.

As with the Shilshole North and South Alternatives, plans for this alternative place the trail in close proximity to the SLS&E RR. The west end of the alternative is immediately north of the railroad, and the east end of the alternative crosses the railroad on NW 46th St between 11th Ave NW and 14th Ave NW. The far east end of the alternative also crosses the railroad at the intersection of NW 45th St and 11th Ave NW.

Leary Alternative

The Leary Alternative is adjacent to the north edge of the two Ballard Avenue historic districts and the north edge of the Hiram M. Chittenden Locks District. A total of 11 eligible or listed resources are adjacent to this alternative. These resources include the north end of the 15th Avenue Bridge/Ballard Bridge and the SLS&E RR, which this alternative crosses at the intersection of NW 45th St and 11th Ave NW (Figure 10-2). See the Cultural Resources Discipline Report (SWCA, 2016) for a complete list.

Connector Segments

<u>14th Avenue NW</u>

This connector segment is not in the vicinity of any historic districts, and no historic resources are adjacent to this alternative.

15th Avenue NW

This segment is not adjacent to any historic districts, but is adjacent to the 15th Avenue Bridge/Ballard Bridge between Shilshole Ave NW and NW 46th St.

17th Avenue NW

This segment is adjacent to one eligible building located at the northeast corner of the 17th Ave NW and NW Ballard Way intersection.

20th Avenue NW

The 20th Avenue NW segment extends through the Ballard Avenue Historic District/Ballard Avenue Landmark District and is adjacent to six district resources and the Curtiss Building (Figure 10-2).

NW Vernon Place

The northeast portion of the NW Vernon Pl segment extends into the Ballard Avenue Historic District/Ballard Avenue Landmark District. Three eligible or listed resources are adjacent to this connector segment (Figure 10-2).

Ballard Avenue NW

This segment extends through the Ballard Avenue Historic District/Ballard Avenue Landmark District and is adjacent to 16 eligible or listed resources (Figure 10-2).

10.2.3 Potential for Encountering Additional Archaeological Resources

Based on the natural and cultural setting of the study area, significant cultural resources could be encountered. The potential for encountering significant precontact and ethnographic period archaeological materials is slightly higher than the potential for encountering historical period archaeological materials.

The Salmon Bay shoreline was accessible throughout the Holocene, and local inhabitants almost certainly passed through, camped within, processed resources throughout, and even occupied portions of the study area in the past. These activities left behind variable traces in the archaeological record. While historical filling along the shoreline of Salmon Bay during industrial development and construction of the Ballard Locks buried prehistoric and ethnographic period cultural resources that may be present in the study area, significant early historical archaeological deposits could be present within this fill material. The potential for encountering significant historical cultural materials is highest at the base of the fill along the buried shoreline.

Table 10-3 assigns a sensitivity rating to each alternative based on its potential for encountering prehistoric, ethnographic, or historic period archaeological resources. The Shilshole North and South Alternatives and the Ballard Avenue Alternative appear to be slightly more sensitive than the Leary Alternative, and they carry a higher risk of an archaeological find during construction. This risk is tempered by the fact that there is a significant amount of fill on top of the old shoreline, so any potentially significant cultural materials that may be present are likely deeply buried below the proposed depth of project disturbance.

Table 10-3. Sensitivity for Encountering Cultural Resources within the Missing Link Alternatives

Build Alternative	*Prehistoric Archaeological*	*Ethnographic Archaeological*	*Historic Archaeological*	*Historic Built Environment*
Shilshole North	High	High	High	High
Shilshole South	High	High	High	High
Ballard Avenue	High	High	High	High
Leary	Moderate	Moderate	Moderate	Moderate

10.3 Potential Impacts

10.3.1 No Build Alternative

No construction is proposed for the No Build Alternative; as a result, there are no anticipated impacts to cultural resources.

10.3.2 Impacts Common to all Build Alternatives

Construction

Three major types of construction impacts on historic properties could occur due to construction of the Missing Link. First are direct physical effects, primarily consisting of vibration, noise, dust, or other temporary environmental conditions caused by construction activities. These effects could damage built environment resources or could affect the maintenance or economic viability of these buildings and structures.

Second, indirect effects could result from traffic congestion, the presence of equipment, loss of parking, and limited access during construction. Prolonged periods of traffic disruption and construction could result in the loss of the distinctive character and economic base of historic neighborhoods. However, traffic delays and parking loss from construction would be minimal (see Chapters 7 and 8). Access may be limited but would be maintained during construction.

The third type of construction impact would be potential alterations to the SLS&E RR, which could affect its historic significance. All four Build Alternatives cross the SLS&E RR at various locations. Removal or relocation of rails, or irreversible treatments that cover the rails or other physical features of the railroad such as switches or sleepers would result in an impact to the SLS&E RR.

The four Build Alternatives are located in an area of moderate to high probability for encountering potentially significant archaeological resources within the naturally deposited sediments of the project area. However, because there is a significant amount of fill on top of the old shoreline, the Missing Link construction would not likely affect any potentially significant cultural materials that may be present because project excavations would not extend below the fill.

Operation

No buildings would likely be altered. The streetscape would change slightly with new curb and markings, but in most areas these changes would not alter the overall character of the streetscape, except within the limits of a historic district. There would be no anticipated operational effects on pre-contact, ethnohistoric, or historical archaeological resources.

10.3.3 Shilshole South Alternative

Construction

The Shilshole South Alterative would cross from the north side of the SLS&E RR to the south along Shilshole Ave NW between NW Dock Pl and 17th Ave NW. Removal or relocation of rails, or irreversible treatments that cover the rails or other physical features of the railroad such as switches or sleepers could result in an impact to the railroad.

Operation

There are no operational impacts unique to the Shilshole South Alternative.

10.3.4 Shilshole North Alternative

Construction

The proposed Shilshole North Alternative would cross the SLS&E RR twice. Removal or relocation of rails or other irreversible treatments that cover the rails or other physical features of the railroad such as switches or sleepers could result in an impact to the SLS&E RR at the east end of the alternative at NW 46th St midway between 11th Ave NW and 14th Ave NW, and at the intersection of NW 45th St and 11th Ave NW.

Operation

There are no operational impacts unique to the Shilshole North Alternative.

10.3.5 Ballard Avenue Alternative

Construction

The Ballard Avenue Alternative would cross the SLS&E RR at NW 46th St midway between 11th Ave NW and 14th Ave NW, and at the intersection of NW 45th St and 11th Ave NW. Removal or relocation of rails, or irreversible treatments that cover the rails or other physical features of the railroad such as switches or sleepers could result in an impact to SLS&E RR.

The brick pavers on streets in this alternative are noted in the Ballard Avenue Landmark

Photo 10-1. Ballard Avenue NW

District Guidelines (adopted June 4, 2015) (City of Seattle, 2016) as one of the "qualities" that contributes to the historic character of the district. This description includes historic brick pavers that have been covered with asphalt, as well as streetcar lines that may exist beneath the current street surface. Granite curbs and hitching rings along these roads are also called out in this document as important to the district.

The pavement itself is not listed as a contributing feature within the NRHP nomination for the Ballard Avenue Historic District, but the nomination does note in the Site and Physical Features section that "brick was the earliest pavement to abut the Seattle Electric Railway tracks which ran the length of Ballard Avenue...," and that "granite curb stones, still in evidence here and there, are generally believed to have come to land as ships' ballast" (Potter, 1976).

Removal of granite curbs and brick underlying the asphalt road surface is anticipated throughout the Ballard Avenue Alternative due to changes in existing sidewalk width and construction of the trail and buffer. These changes would constitute an adverse impact to the district. Potential dust and vibrations from construction vehicles and activities could result in the physical deterioration of the buildings and structures as well as the pavers and roadway. An additional impact could be the weight of construction vehicles on the streets with brick pavers.

Operation

There are no operational impacts unique to the Ballard Avenue Alternative.

10.3.6 Leary Alternative

Construction

The Leary Alternative would cross the SLS&E RR at the intersection of NW 45th St and 11th Ave NW. Removal or relocation of rails, or irreversible treatments that cover the rails or other physical features of the railroad such as switches or sleepers as part of this crossing could result in an impact to SLS&E RR.

Operation

There are no operational impacts unique to the Leary Alternative.

10.3.7 Connector Segments

Construction

Removal or relocation of the pavers underlying the asphalt surface and granite curbs on the Ballard Avenue NW connector segment may result in an impact to the Ballard Avenue Historic District.

Operation

There are no operational impacts unique to the connector segments.

10.4 Avoidance, Minimization, and Mitigation Measures

10.4.1 Measures Common to All Build Alternatives

The primary impacts of the Missing Link project on the built environment would be effects to the rail lines and associated features of the SLS&E RR. Construction impacts along the four Build Alternative alignments and connector segments can be minimized if railroad rails are not removed or altered, and effects to other contributing features, such as switches and sleepers, are avoided. The use of surfaces that would not affect the rails or active use of the railroad would also minimize impacts. An example of minimization can be seen along the existing BGT east of the Missing Link project. There, the crossing of the tracks is approached at an angle for safety, and the area between the rails was paved with asphalt. With the implementation of these minimization measures, impacts would not be significant.

Construction mitigation measures for direct and indirect impacts on historic properties would be based on the type of construction activity and the extent of the potential adverse effect on the resources. Traffic delays, loss of parking, and access problems during construction would be minor. Potential impacts could be minimized by implementing measures as outlined in the Transportation Discipline Report (Parametrix, 2016a) and Parking Discipline Report (Parametrix, 2016b). BMPs can be used to control noise, air pollution, dust, and mud and ensure that damage to historic resources is avoided. Efforts to minimize impacts during construction would include limiting the disruptions of utility services and providing continued access to businesses and residences during construction.

The Missing Link would have limited operational impact on built environment resources and no expected impact on archaeological resources.

10.4.2 Measures Specific to Each Alternative

The construction and operation of the Ballard Avenue Alternative and the Ballard Avenue NW connector segment could have impacts on features that contribute to the historic significance of the Ballard Avenue Historic District. The design and appearance of the trail within the district should be compatible with its historic character and period of significance and obtain a Certificate of Approval demonstrating compatibility from the Office of Historic Preservation. Construction impacts to historic streetscapes could be minimized by reuse of the granite curbs for the expanded sidewalk design and by retention and, if necessary, resetting of the existing brick pavement that lies underneath the asphalt surfacing of the street. Any decisions about minimization or mitigation measures should be made in consultation with DAHP and the Ballard Avenue Landmark District Board.

No further measures other than those recommended for all of the alternatives in Section 10.4.1, Measures Common to All Build Alternatives, would be needed.

CHAPTER 11: CUMULATIVE IMPACTS

11.1 Introduction

Cumulative impacts are the effects that may result from the incremental impact of an action when added to other past, present, and reasonably foreseeable actions, regardless of who undertakes them. The purpose of a cumulative impacts analysis is to identify the potential for the project to contribute to the incremental impacts to a degree that, if unmitigated, these impacts could become significant. Potential cumulative impacts are analyzed so that decision-makers can consider how impacts from actions over time "add up" to affect a resource. Analysts identified potential past, present, or reasonably foreseeable future actions that could affect or be affected by the Missing Link project, either directly or indirectly.

The Ballard area has experienced significant development and re-development in the past several years, and this trend is anticipated to continue as long as favorable economic conditions persist. This has resulted in numerous new apartments and condominiums throughout the area, and a relatively high level of construction activity. Listed below are descriptions of several large construction/development projects that are known or are reasonably expected to occur in the near future in the project vicinity.

11.2 Known or Anticipated Projects

11.2.1 West Ship Canal Water Quality Project

SPU is proposing a large project to reduce Combined Sewer Overflows (CSOs) that would occur in the vicinity of the proposed Missing Link project. The project will be under construction over an approximate 6-year period, beginning in approximately 2018. Active construction would occur in phases at different locations, but would be heavy in the Ballard area over much of the construction period.

11.2.2 C.D. Stimson Development

Developer C.D. Stimson Co. plans to build a 500,000-square-foot office complex consisting of five, five-story buildings at 5423 Shilshole Ave NW. The project will start with one 105,000-square-foot building, with the remaining added in the following years. Construction of the first building is anticipated to take 2 years beginning in 2016 or 2017.

11.2.3 Sound Transit 3 Draft Priority Projects List

Sound Transit has developed a draft priority projects list as part of their planning process to expand the regional mass transit system to meet anticipated population growth by 2040. Sound Transit is currently conducting further analysis, and a final list will be included in a ballot measure that could go to voters as early as November 2016. The schedule for these potential projects is not yet known. The projects on the draft project list in the study area are:

C-02 Ballard to University District

This project would build light rail in a tunnel from Ballard's NW Market Street area to the vicinity of the University District light rail station that recently opened.

Light Rail Downtown Seattle to Ballard (Market Street Vicinity)

Several alternative projects would build light rail from downtown Seattle to Ballard's NW Market Street area.

11.2.4 SDOT Move Seattle Transportation Strategy

Three projects in Move Seattle overlap with the study area: the Ballard to Downtown Enhanced Transit Corridor, RapidRide Corridor 6, and Market/45th Transit Improvement Project. All of these projects are proposed to be implemented by 2024.

Ballard to Downtown Enhanced Transit Corridor

In preparation for the potential inclusion of a Ballard light rail line in the future Sound Transit 3 ballot measure, the Ballard to Downtown Enhanced Transit Corridor project improves the corridor's existing transit operations and adds interim safety improvements for people who bike and walk crossing the Lake Washington Ship Canal.

RapidRide Corridor 6

This proposed RapidRide corridor would include dedicated bus lanes on Leary Ave NW/NW Leary Way.

Market/45th Transit Improvement Project

The Market / 45th transit project enhances transit speed and reliability on of one the city's primary east-west corridors and most chronically congested routes.

11.2.5 Seattle Bicycle Master Plan Projects

SDOT's Bicycle Master Plan (SDOT, 2014a) proposes a number of bicycle improvements in and near the Missing Link study area. These projects include constructing neighborhood greenways on NW 50th St, 11th Ave NW, 28th Ave NW, and NW 64th St. Bicycle lanes with minor separation are proposed for NW Market St between 24th Ave NW and 32nd Ave NW, and on 14th Ave NW.

11.2.6 Private Development

The Ballard neighborhood has been experiencing growth in the last few years, and it is anticipated that this growth will continue (City of Seattle, 2014). The types of development expected are commercial buildings, as well as residential medium and high density housing including multi-family complexes with commercial development on the ground floor.

11.3 Potential Cumulative Impacts

11.3.1 Geology Soils and Hazardous Materials

Adverse impacts on geology, soils, and hazardous materials from the Missing Link project are primarily minor impacts related to construction. Other projects in the Ballard neighborhood being constructed before, during, and after construction of the Missing Link project would be required to adhere to similar existing regulatory requirements regarding building code requirements and grading permit requirements. In general, geologic hazards and areas of contamination from legacy contaminants are site specific that can vary in severity over short distances. As a result, these hazards are addressed on a site-specific basis and do not combine to become cumulatively significant. Therefore, there would be no cumulative impacts related to geology, soils, and hazardous materials.

11.3.2 Fish, Wildlife, and Vegetation

There would be no cumulative impacts to fish and wildlife as no impacts would result from the Missing Link, and wildlife species are adapted to the urban environment. Impacts to fish may occur from individual projects if there is in-water work; however, the Missing Link project would not include in-water work.

There would be no cumulative effect on street trees, as no impacts are anticipated to street trees from the Missing Link. The projects considered in the cumulative impacts analysis would likely locate some portion of the development along a street and must comply with SMC 15.43 and the Street Tree Manual (SDOT, 2014b). Some of the projects may result in the removal and replacement of street trees, while others may plant trees where currently none are located.

11.3.3 Land and Shoreline Use

Construction impacts to land use from the Missing Link project would be minor and temporary. Combined with other projects in the study area, the construction impacts could cause potential customers to avoid businesses in the area during construction, which could result in temporarily reduced revenues for affected businesses. If the timing of construction for SPU's West Ship Canal Water Quality project overlaps with the Missing Link project, there could be considerable congestion and construction-related traffic delays, dust and noise, and other effects. Each project would be required to implement mitigation measures during construction to minimize impacts to businesses. SDOT and SPU would coordinate construction activities and staging to reduce potential short-term impacts on transportation from their respective projects. Overall, no significant construction-related cumulative impacts on land uses are expected.

Operation of the projects could result in higher land utilization to accommodate projected employment and population growth, which would be consistent with adopted land use plans and policies. The transportation projects are required to mitigate for impacts in compliance with adopted codes and plans. Light rail stations could cause demand for office, multi-family residential, restaurants, and other non-industrial uses within the vicinity of the stations. Increased residential, employment, recreational, and retail opportunities, and a general concentration of uses, is consistent with land use plans and policies. The addition of a multi-use trail, and the resulting increased bicycle and pedestrian traffic, could have a cumulative negative impact on the uses that currently rely on relatively predictable vehicular access and traffic flow, on-street parking, and loading zones. The location of the trail would increase delays for businesses that would need to wait for trail users to pass before using their driveways or loading/unloading trucks. These delays would be minor on an individual basis, but could incrementally

add increased costs for labor and fuel. For businesses operating with a low profit margin or facing other challenges from operating in the rapidly densifying area, the delays could add economic pressure.

Zoning regulations prevent major changes in land use, but allow for a range of uses within each designation. Uses consistent with plans, policies, and land use codes that have less need for freight and commercial access could be permitted in industrial and manufacturing areas, and changes in use could occur over time. Industrial uses could face increased pressure to relocate because of the increased delays, costs, and potential inconveniences associated with development trends in the area.

Anticipated improvements to the transit infrastructure, combined with measures described in Chapters 7 and 8 and discipline reports associated with this project (Parametrix, 2016a, 2016b), would minimize and mitigate impacts to existing uses. The long-term viability of any land use preferred under Seattle adopted plans and policies is not anticipated to be significantly compromised.

11.3.4 **Recreation**

Impacts on recreation from the Missing Link project are primarily minor impacts from construction. Other projects in the Ballard neighborhood being constructed before, during, and after construction of the Missing Link project could lead to cumulative impacts on street- and sidewalk-based recreation, such as walking, jogging, and bicycling. Construction impacts include street closures, temporary loss of access, noise, traffic, and dust. Given the high degree of recently completed and ongoing projects, construction of the Missing Link could contribute to "construction fatigue" for people living in and visiting the Ballard neighborhood.

11.3.5 **Utilities**

If construction of SPU's Ship Canal Water Quality project occurs simultaneously with construction of the Missing Link, impacts on utilities could be increased, as construction of the SPU project could require utility outages or relocations. SDOT and SPU would coordinate construction staging to minimize any potential short-term impacts on utilities.

11.3.6 **Transportation**

If construction of SPU's Ship Canal Water Quality project, the C.D. Stimson development, and/or other development projects occur simultaneously with the Missing Link project, impacts on traffic and other transportation resources could be increased. Construction activities related to these projects could interfere with roadway, rail, or trail operations, and construction of the Missing Link could add to overall transportation impacts in the Ballard area. SDOT and SPU would coordinate construction activities and staging to reduce potential short-term impacts on transportation from their respective projects.

Sound Transit's proposed priority projects, SDOT's Move Seattle projects, and the Seattle Bicycle Master Plan projects would likely decrease personal vehicle use in the study area, which could reduce congestion and delay for motor vehicles in this area. The RapidRide Corridor 6 project could conflict with the Leary Alternative for the Missing Link, because there may not be enough roadway width to accommodate both projects.

11.3.7 **Parking**

If construction of the West Ship Canal Water Quality project occurs simultaneously with construction of the Missing Link, impacts on parking could be increased. SDOT and SPU could coordinate construction activities to minimize the potential short-term impacts on parking.

Construction of the C.D. Stimson development could affect parking in the study area for a limited time, if construction occurs concurrently. SDOT and C.D. Stimson Co. would coordinate regarding construction activities to mitigate any potential construction impacts. In combination with the reduction of on-street parking by the Missing Link, this could result in higher utilization of available parking in the western portion of the study area. This impact would be offset to some degree following construction, because the development is proposed to include off-street parking. Construction of Sound Transit's projects, as well as SDOT's proposed Transit Improvement Project, would increase impacts on parking if they occurred concurrently with the Missing Link project. SDOT and Sound Transit would coordinate construction activities to minimize the short-term impacts on parking that could occur, but the cumulative effect would be an overall loss of parking in the Ballard area.

Construction of ongoing private development could affect parking in the study area for the foreseeable future. Private developments could have an impact on on-street parking in the study area by increasing parking occupancy. In combination with the reduction of on-street parking by the Missing Link, this could result in higher use of available parking throughout the study area. This occupancy could be offset to some degree over the long term if development projects contain some parking for tenants.

11.3.8 **Air Quality and Greenhouse Gas**

There would be no significant adverse construction or operational impacts of the Missing Link project on air quality or GHG. In combination with other planned or reasonably foreseeable projects, an increase in emissions of CO and PM10 from the Missing Link could contribute to cumulative impact on air quality resulting from construction activities, including paving, material transport, and worker trips; increased emissions from traffic delays caused by road closures; emissions from construction equipment; and higher traffic volumes associated with increased development density. The resulting cumulative impact would be minor to negligible.

11.3.9 **Cultural Resources**

The four Build Alternatives would not contribute to a cumulative impact on archaeological resources. However, a few of the projects listed in Section 11.2, Known or Anticipated Projects, are likely to impact the BTR at crossings due to the removal or covering of character-defining features. The West Ship Canal Water Quality project proposes to upgrade the existing railroad tracks for use in moving construction materials and spoils, and the proposed C.D. Stimson Development would require access points that cross the tracks. If these projects propose the removal or covering of character-defining features of the BTR, they could, along with the Missing Link, contribute to a cumulative impact for cultural resources.

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CHAPTER 12: REFERENCES

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Consultant Team		
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Peter Carr, Technical Editor ESA	B.S.J. Journalism	23
Air Quality and Greenhouse Gas		
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Name and Employer	*Degree and Relevant License*	*Years of Relevant Experience*
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Geology, Soils, and Hazardous Materials		
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Name and Employer	*Degree and Relevant License*	*Years of Relevant Experience*
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Land Use		
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Mark Johnson, Reviewer ESA	B.L.A. Landscape Architecture Professional Landscape Architect, WA #510	25
Parking		
Brian Macik, Author Parametrix	B.A. Env. Studies/Political Science M.U.P. Master of Urban Planning	9
Ryan LeProwse, Reviewer Parametrix	B.S. Civil Engineering P.E. Washington and Oregon	15
Recreation		
Spencer Easton, Author ESA	B.A. Liberal Arts	8
Transportation		
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Ryan LeProwse, Reviewer Parametrix	B.S. Civil Engineering P.E. Washington and Oregon	15
Utilities		
Spencer Easton, Author ESA	B.A. Liberal Arts	8

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CHAPTER 14: DISTRIBUTION LIST

The following parties have received the DEIS by compact disc or printed copy:

Tribal Governments

Duwamish Tribe

Muckleshoot Indian Tribe

Snoqualmie Tribe

Suquamish Tribe

Tulalip Tribes

Regional

Port of Seattle

Puget Sound Regional Council

Sound Transit

Washington State

Department of Archaeology and Historic Preservation

Department of Ecology SEPA Register

Washington State Representative Frame

Washington State Representative Tarleton

Washington State Senator Carlyle

U.S. Representative McDermott

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U.S. Senator Murray

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Wallingford Branch

Local

Ballard Neighborhood Customer Service Center

King County Councilmember Kohl-Wells

King County Executive Constantine

Seattle Bicycle Advisory Board

Seattle City Councilmembers

Seattle Department of Construction & Inspections

Seattle Department of Neighborhoods, Historic Preservation Program

Seattle Department of Parks and Recreation

Seattle Department of Transportation

Seattle Design Commission

Seattle Freight Advisory Board

Seattle Landmarks Preservation Board

Seattle Legislative Department

Seattle Office of Economic Development

Seattle Office of the Mayor

Seattle Pedestrian Advisory Board

Seattle Public Utilities

Seattle Transit Advisory Board

Queen Anne Chamber of Commerce

Seattle Parks Foundation

Sustainable Ballard

Washington State Bicycle Association

Other

14th Avenue Visioning Project

Ballard Chamber of Commerce

Ballard Civic Center Steering Committee

Ballard Community Center

Ballard District Council

Ballard Farmers Market

Ballard-Interbay Northend Manufacturing and Industrial Center Action Committee

Ballard Merchants Association

Ballard Rotary

Ballard Terminal Railroad

Cascade Bicycle Club

Feet First

Fremont Chamber of Commerce

Friends of the Burke-Gilman Trail

Greater Seattle Chamber of Commerce

Groundswell Northwest

Lake Union District Council

Magnolia/Queen Anne District Council

North Seattle Industrial Association

APPENDIX A
HAZARDOUS MATERIALS DATABASES REVIEWED

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Table A-1. Database and Records Searched

St	Acronym	Full Name	Government Agency	Gov Date	Arvl. Date	Active Date
WA	AIRS (EMI)	Washington Emissions Data System	Department of Ecology	12/31/2013	02/24/2015	03/13/2015
WA	ALLSITES	Facility/Site Identification System Listing	Department of Ecology	05/04/2015	05/06/2015	05/29/2015
WA	AST	Aboveground Storage Tank Locations	Department of Ecology	04/01/2014	05/06/2014	06/04/2014
WA	BROWNFIELDS	Brownfields Sites Listing	Department of Ecology	07/21/2015	07/22/2015	08/20/2015
WA	CDL	Clandestine Drug Lab Contaminated Site List	Department of Health	04/03/2015	05/14/2015	06/18/2015
WA	COAL ASH	Coal Ash Disposal Site Listing	Department of Ecology	09/10/2014	09/11/2014	10/15/2014
WA	CSCSL	Confirmed and Suspected Contaminated Sites List	Department of Ecology	07/21/2015	07/22/2015	08/20/2015
WA	CSCSL NFA	Confirmed and Contaminated Sites - No Further Action	Department of Ecology	07/21/2015	07/22/2015	08/20/2015
WA	DRYCLEANERS	Drycleaner List	Department of Ecology	12/31/2014	05/01/2015	05/22/2015
WA	Financial Assurance 1	Financial Assurance Information Listing	Department of Ecology	02/24/2012	02/24/2012	03/27/2012
WA	Financial Assurance 2	Financial Assurance Information Listing	Department of Ecology	05/18/2015	05/19/2015	06/18/2015
WA	Financial Assurance 3	Financial Assurance Information Listing	Department of Ecology	02/01/2001	03/06/2007	04/19/2007
WA	HIST CDL	List of Sites Contaminated by Clandestine Drug Labs	Department of Health	02/08/2007	06/26/2007	07/19/2007
WA	HSL	Hazardous Sites List	Department of Ecology	02/19/2015	03/13/2015	03/20/2015
WA	ICR	Independent Cleanup Reports	Department of Ecology	12/01/2002	01/03/2003	01/22/2003
WA	INACTIVE DRYCLEANERS	Inactive Drycleaners	Department of Ecology	12/31/2014	05/01/2015	05/29/2015
WA	INST CONTROL	Institutional Control Site List	Department of Ecology	07/21/2015	07/22/2015	08/20/2015
WA	LUST	Leaking Underground Storage Tanks Site List	Department of Ecology	05/19/2015	05/22/2015	06/18/2015
WA	NPDES	Water Quality Permit System Data	Department of Ecology	07/21/2015	07/22/2015	08/20/2015
WA	RGA HWS	Recovered Government Archive State Hazardous Waste Facilities	Department of Ecology		07/01/2013	12/24/2013
WA	RGA LF	Recovered Government Archive Solid Waste Facilities List	Department of Ecology		07/01/2013	01/10/2014
WA	RGA LUST	Recovered Government Archive Leaking Underground Storage Tan	Department of Ecology		07/01/2013	12/24/2013
WA	SPILLS	Reported Spills	Department of Ecology	06/08/2015	06/09/2015	07/13/2015
WA	SPILLS 90	SPILLS90 data from FirstSearch	FirstSearch	05/23/2006	01/03/2013	03/06/2013
WA	SWF/LF	Solid Waste Facility Database	Department of Ecology	03/12/2015	03/13/2015	03/20/2015
WA	SWRCY	Recycling Facility List	Department of Ecology	07/27/2015	07/28/2015	08/20/2015
WA	SWTIRE	Solid Waste Tire Facilities	Department of Ecology	11/01/2005	03/16/2006	04/13/2006
WA	UIC	Underground Injection Wells Listing	Department of Ecology	05/19/2015	05/22/2015	06/30/2015
WA	UST	Underground Storage Tank Database	Department of Ecology	05/27/2015	05/29/2015	06/19/2015
WA	VCP	Voluntary Cleanup Program Sites	Department of Ecology	07/21/2015	07/22/2015	08/20/2015
WA	WA MANIFEST	Hazardous Waste Manifest Data	Department of Ecology	12/31/2014	05/01/2015	05/29/2015

St	Acronym	Full Name	Government Agency	Gov Date	Arvl. Date	Active Date
US	2020 COR ACTION	2020 Corrective Action Program List	Environmental Protection Agency	04/22/2013	03/03/2015	03/09/2015
US	BRS	Biennial Reporting System	EPA/NTIS	12/31/2011	02/26/2013	04/19/2013
US	CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System	EPA	10/25/2013	11/11/2013	02/13/2014
US	CERCLIS-NFRAP	CERCLIS No Further Remedial Action Planned	EPA	10/25/2013	11/11/2013	02/13/2014
US	COAL ASH DOE	Steam-Electric Plant Operation Data	Department of Energy	12/31/2005	08/07/2009	10/22/2009
US	COAL ASH EPA	Coal Combustion Residues Surface Impoundments List	Environmental Protection Agency	07/01/2014	09/10/2014	10/20/2014
US	CONSENT	Superfund (CERCLA) Consent Decrees	Department of Justice, Consent Decree Library	12/31/2014	04/17/2015	06/02/2015
US	CORRACTS	Corrective Action Report	EPA	03/10/2015	03/31/2015	06/11/2015
US	DEBRIS REGION 9	Torres Martinez Reservation Illegal Dump Site Locations	EPA, Region 9	01/12/2009	05/07/2009	09/21/2009
US	DOD	Department of Defense Sites	USGS	12/31/2005	11/10/2006	01/11/2007
US	DOT OPS	Incident and Accident Data	Department of Transportation, Office of Pipeline	07/31/2012	08/07/2012	09/18/2012
US	Delisted NPL	National Priority List Deletions	EPA	03/26/2015	04/08/2015	06/22/2015
US	EDR MGP	EDR Proprietary Manufactured Gas Plants	EDR, Inc.			
US	EDR US Hist Auto Stat	EDR Exclusive Historic Gas Stations	EDR, Inc.			
US	EDR US Hist Cleaners	EDR Exclusive Historic Dry Cleaners	EDR, Inc.			
US	EPA WATCH LIST	EPA WATCH LIST	Environmental Protection Agency	08/30/2013	03/21/2014	06/17/2014
US	ERNS	Emergency Response Notification System	National Response Center, United States Coast	03/30/2015	03/31/2015	06/02/2015
US	FEDERAL FACILITY	Federal Facility Site Information listing	Environmental Protection Agency	03/26/2015	04/08/2015	06/11/2015
US	FEDLAND	Federal and Indian Lands	U.S. Geological Survey	12/31/2005	02/06/2006	01/11/2007
US	FEMA UST	Underground Storage Tank Listing	FEMA	01/01/2010	02/16/2010	04/12/2010
US	FINDS	Facility Index System/Facility Registry System	EPA	01/18/2015	02/27/2015	03/25/2015
US	FTTS	FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fu	EPA/Office of Prevention, Pesticides and Toxins	04/09/2009	04/16/2009	05/11/2009
US	FTTS INSP	FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fu	EPA	04/09/2009	04/16/2009	05/11/2009
US	FUDS	Formerly Used Defense Sites	U.S. Army Corps of Engineers	06/06/2014	09/10/2014	09/18/2014
US	HIST FTTS	FIFRA/TSCA Tracking System Administrative Case Listing	Environmental Protection Agency	10/19/2006	03/01/2007	04/10/2007
US	HIST FTTS INSP	FIFRA/TSCA Tracking System Inspection & Enforcement Case Lis	Environmental Protection Agency	10/19/2006	03/01/2007	04/10/2007
US	HMIRS	Hazardous Materials Information Reporting System	U.S. Department of Transportation	03/30/2015	03/31/2015	06/11/2015
US	ICIS	Integrated Compliance Information System	Environmental Protection Agency	01/23/2015	02/06/2015	03/09/2015
US	INDIAN LUST R1	Leaking Underground Storage Tanks on Indian Land	EPA Region 1	02/03/2015	04/30/2015	06/22/2015
US	INDIAN LUST R10	Leaking Underground Storage Tanks on Indian Land	EPA Region 10	02/03/2015	02/12/2015	03/13/2015

St	Acronym	Full Name	Government Agency	Gov Date	Arvl. Date	Active Date
US	INDIAN LUST R4	Leaking Underground Storage Tanks on Indian Land	EPA Region 4	09/30/2014	03/03/2015	03/13/2015
US	INDIAN LUST R5	Leaking Underground Storage Tanks on Indian Land	EPA, Region 5	04/30/2015	05/29/2015	06/22/2015
US	INDIAN LUST R6	Leaking Underground Storage Tanks on Indian Land	EPA Region 6	03/17/2015	05/01/2015	06/22/2015
US	INDIAN LUST R7	Leaking Underground Storage Tanks on Indian Land	EPA Region 7	03/30/2015	04/28/2015	06/22/2015
US	INDIAN LUST R8	Leaking Underground Storage Tanks on Indian Land	EPA Region 8	04/30/2015	05/05/2015	06/22/2015
US	INDIAN LUST R9	Leaking Underground Storage Tanks on Indian Land	Environmental Protection Agency	01/08/2015	01/08/2015	02/09/2015
US	INDIAN ODI	Report on the Status of Open Dumps on Indian Lands	Environmental Protection Agency	12/31/1998	12/03/2007	01/24/2008
US	INDIAN RESERV	Indian Reservations	USGS	12/31/2005	12/08/2006	01/11/2007
US	INDIAN UST R1	Underground Storage Tanks on Indian Land	EPA, Region 1	02/03/2015	04/30/2015	06/22/2015
US	INDIAN UST R10	Underground Storage Tanks on Indian Land	EPA Region 10	05/06/2015	05/19/2015	06/22/2015
US	INDIAN UST R4	Underground Storage Tanks on Indian Land	EPA Region 4	09/30/2014	03/03/2015	03/13/2015
US	INDIAN UST R5	Underground Storage Tanks on Indian Land	EPA Region 5	04/30/2015	05/26/2015	06/22/2015
US	INDIAN UST R6	Underground Storage Tanks on Indian Land	EPA Region 6	03/17/2015	05/01/2015	06/22/2015
US	INDIAN UST R7	Underground Storage Tanks on Indian Land	EPA Region 7	09/23/2014	11/25/2014	01/29/2015
US	INDIAN UST R8	Underground Storage Tanks on Indian Land	EPA Region 8	04/30/2015	05/05/2015	06/22/2015
US	INDIAN UST R9	Underground Storage Tanks on Indian Land	EPA Region 9	12/14/2014	02/13/2015	03/13/2015
US	INDIAN VCP R1	Voluntary Cleanup Priority Listing	EPA, Region 1	09/29/2014	10/01/2014	11/06/2014
US	INDIAN VCP R7	Voluntary Cleanup Priority Listing	EPA, Region 7	03/20/2008	04/22/2008	05/19/2008
US	LEAD SMELTER 1	Lead Smelter Sites	Environmental Protection Agency	11/25/2014	11/26/2014	01/29/2015
US	LEAD SMELTER 2	Lead Smelter Sites	American Journal of Public Health	04/05/2001	10/27/2010	12/02/2010
US	LIENS 2	CERCLA Lien Information	Environmental Protection Agency	02/18/2014	03/18/2014	04/24/2014
US	LUCIS	Land Use Control Information System	Department of the Navy	05/28/2015	05/29/2015	06/11/2015
US	MLTS	Material Licensing Tracking System	Nuclear Regulatory Commission	03/31/2015	04/09/2015	06/11/2015
US	NPL	National Priority List	EPA	03/26/2015	04/08/2015	06/22/2015
US	NPL LIENS	Federal Superfund Liens	EPA	10/15/1991	02/02/1994	03/30/1994
US	ODI	Open Dump Inventory	Environmental Protection Agency	06/30/1985	08/09/2004	09/17/2004
US	PADS	PCB Activity Database System	EPA	07/01/2014	10/15/2014	11/17/2014
US	PCB TRANSFORMER	PCB Transformer Registration Database	Environmental Protection Agency	02/01/2011	10/19/2011	01/10/2012
US	PRP	Potentially Responsible Parties	EPA	10/25/2013	10/17/2014	10/20/2014
US	Proposed NPL	Proposed National Priority List Sites	EPA	03/26/2015	04/08/2015	06/22/2015
US	RAATS	RCRA Administrative Action Tracking System	EPA	04/17/1995	07/03/1995	08/07/1995
US	RADINFO	Radiation Information Database	Environmental Protection Agency	04/07/2015	04/09/2015	06/11/2015
US	RCRA NonGen / NLR	RCRA - Non Generators / No Longer Regulated	Environmental Protection Agency	03/10/2015	03/31/2015	06/11/2015

St	Acronym	Full Name	Government Agency	Gov Date	Arvl. Date	Active Date
US	RCRA-CESQG	RCRA - Conditionally Exempt Small Quantity Generators	Environmental Protection Agency	03/10/2015	03/31/2015	06/11/2015
US	RCRA-LQG	RCRA - Large Quantity Generators	Environmental Protection Agency	03/10/2015	03/31/2015	06/11/2015
US	RCRA-SQG	RCRA - Small Quantity Generators	Environmental Protection Agency	03/10/2015	03/31/2015	06/11/2015
US	RCRA-TSDF	RCRA - Treatment, Storage and Disposal	Environmental Protection Agency	03/10/2015	03/31/2015	06/11/2015
US	RMP	Risk Management Plans	Environmental Protection Agency	02/01/2015	02/13/2015	03/25/2015
US	ROD	Records Of Decision	EPA	11/25/2013	12/12/2013	02/24/2014
US	SCRD DRYCLEANERS	State Coalition for Remediation of Drycleaners Listing	Environmental Protection Agency	03/07/2011	03/09/2011	05/02/2011
US	SSTS	Section 7 Tracking Systems	EPA	12/31/2009	12/10/2010	02/25/2011
US	TRIS	Toxic Chemical Release Inventory System	EPA	12/31/2013	02/12/2015	06/02/2015
US	TSCA	Toxic Substances Control Act	EPA	12/31/2012	01/15/2015	01/29/2015
US	UMTRA	Uranium Mill Tailings Sites	Department of Energy	09/14/2010	10/07/2011	03/01/2012
US	US AIRS (AFS)	Aerometric Information Retrieval System Facility Subsystem (	EPA	10/16/2014	10/31/2014	11/17/2014
US	US AIRS MINOR	Air Facility System Data	EPA	10/16/2014	10/31/2014	11/17/2014
US	US BROWNFIELDS	A Listing of Brownfields Sites	Environmental Protection Agency	03/23/2015	03/24/2015	06/02/2015
US	US CDL	Clandestine Drug Labs	Drug Enforcement Administration	02/25/2015	03/10/2015	03/25/2015
US	US ENG CONTROLS	Engineering Controls Sites List	Environmental Protection Agency	03/16/2015	03/17/2015	06/02/2015
US	US FIN ASSUR	Financial Assurance Information	Environmental Protection Agency	03/09/2015	03/10/2015	03/25/2015
US	US HIST CDL	National Clandestine Laboratory Register	Drug Enforcement Administration	02/25/2015	03/10/2015	03/25/2015
US	US INST CONTROL	Sites with Institutional Controls	Environmental Protection Agency	03/16/2015	03/17/2015	06/02/2015
US	US MINES	Mines Master Index File	Department of Labor, Mine Safety and Health	12/30/2014	12/31/2014	01/29/2015
US	US MINES 2	Ferrous and Nonferrous Metal Mines Database Listing	USGS	12/05/2005	02/29/2008	04/18/2008
US	US MINES 3	Active Mines & Mineral Plants Database Listing	USGS	04/14/2011	06/08/2011	09/13/2011
CT	CT MANIFEST	Hazardous Waste Manifest Data	Department of Energy & Environmental Protection	07/30/2013	08/19/2013	10/03/2013
NY	NY MANIFEST	Facility and Manifest Data	Department of Environmental Conservation	08/01/2015	08/06/2015	08/24/2015
PA	PA MANIFEST	Manifest Information	Department of Environmental Protection	12/31/2014	07/24/2015	08/18/2015
WI	WI MANIFEST	Manifest Information	Department of Natural Resources	12/31/2014	03/19/2015	04/07/2015

Oil/Gas Pipelines

Source:
PennWell
Corporation
Telephone:
281-546-1505

Petroleum Bundle (Crude Oil, Refined Products, Petrochemicals, Gas Liquids (LPG/NGL), and Specialty Gases (Miscellaneous)) N = Natural Gas Bundle (Natural Gas, Gas Liquids (LPG/NGL), and Specialty Gases (Miscellaneous)). This map includes information copyrighted by PennWell Corporation. This information

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Electric Power Transmission Line Data

Source:
PennWell
Corporation
Telephone:
800-823-6277

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US	AHA Hospitals	Sensitive Receptor: AHA Hospitals	American Hospital Association, Inc.
US	Medical Centers	Sensitive Receptor: Medical Centers	Centers for Medicare & Medicaid Services
US	Nursing Homes	Sensitive Receptor: Nursing Homes	National Institutes of Health
US	Public Schools	Sensitive Receptor: Public Schools	National Center for Education Statistics
US	Private Schools	Sensitive Receptor: Private Schools	National Center for Education Statistics
WA	Daycare Centers	Sensitive Receptor: Daycare Center Listing	Department of Social & Health Services

STREET AND ADDRESS INFORMATION

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APPENDIX B
EMISSIONS ESTIMATES TABULATIONS

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Table B-1. Existing Vehicle Idling Emissions based on Vehicle Delay and Traffic Volumes along Analyzed Roadways

Roadway Segment	Daily CO Emissions (tons/year)	PM10 Emissions (tons/year)	CO2 Emissions (metric tons per year)
NW 54th St west of NW Market St	1.241186	0.001443	82.25383
28th Ave NW north of MW Market St	0.057174	8.1E-05	4.171538
NW Market St west of 24th Ave NW	4.003318	0.003298	229.557
NW 56th St west of 24th Ave NW	0.22148	0.000105	10.66514
NW 56th St east of 24th Ave NW	0.918896	0.00044	44.33982
NW Market St west of 24th Ave NW	4.003318	0.003298	229.557
Shilshole Ave NW southeast of 24th Ave NW	1.048685	0.000711	56.1085
22nd Ave NW south of NW 56th St	1.658834	0.000961	84.41996
22nd Ave NW south of NW Market St	0.897842	0.000609	48.05352
Leary Ave NW south of NW Market St	4.496598	0.003604	255.2028
Ballard Ave NW southeast of 22nd Ave NW	0.167048	0.000482	18.65624
NW Vernon Pl northwest of Shilshole Ave NW	0.166163	0.000148	9.820184
17th Ave NW north of Shilshole Ave NW	1.095268	0.002118	94.8524
Shilshole Ave NW west of NW 46th St	0.592295	0.000421	32.20061
NW Ballard Way east of 17th Ave NW	0.285207	0.000532	24.18516
NW 46th St west of 15th Ave NW	0.545424	0.000425	30.63442
NW Leary Way west of 15th Ave NW	0.944013	0	33.62891
NW 45th St west of 14th Ave NW	0.212339	0.000144	11.34869
14th Ave NW south of NW Ballard Way	0.297543	0.000339	19.52691
NW Leary Way east of 14th Ave NW	1.015333	0.001258	69.34339
11th Ave NW north of NW 46th Ave NW	0.563632	0.000466	32.3634
Total Idling Emissions along Analyzed Roadways	**24.4316**	**0.020881**	**1,420.89**

Table B-2. Tabulation of Annual Vehicle Idling Emissions for the No Build Alternative based on Forecasted Vehicle Delay and Traffic Volumes in 2040

Roadway Segment	CO Emissions (tons/year)	CO Increase over Existing	PM10 Emissions (tons/year)	PM10 Increase over Existing	CO_2 Emissions (metric tons/year)	CO_2 Increase over Existing
NW 54th St west of NW Market St	2.08	0.84	0.0040	0.0026	180.67	98.42
28th Ave NW north of MW Market St	0.08	0.02	0.0002	0.0001	7.68	3.51
NW Market St west of 24th Ave NW	5.00	1.00	0.0069	0.0036	360.92	131.36
NW 56th St west of 24th Ave NW	0.96	0.74	0.0008	0.0007	54.62	43.96
NW 56th St east of 24th Ave NW	3.98	3.06	0.0032	0.0028	226.87	182.53
NW Market St west of 24th Ave NW	4.15	0.14	0.0069	0.0036	330.59	101.04
Shilshole Ave NW southeast of 24th Ave NW	1.59	0.54	0.0015	0.0008	95.56	39.45
22nd Ave NW south of NW 56th St	2.57	0.91	0.0025	0.0016	157.74	73.32
22nd Ave NW south of NW Market St	1.44	0.54	0.0016	0.0010	93.44	45.39
Leary Ave NW south of NW Market St	6.99	2.49	0.0094	0.0058	497.49	242.29
Ballard Ave NW southeast of 22nd Ave NW	0.20	0.03	0.0009	0.0005	32.10	13.45
NW Vernon Pl northwest of Shilshole Ave NW	0.25	0.08	0.0004	0.0002	18.61	8.79
17th Ave NW north of Shilshole Ave NW	6.42	5.33	0.0206	0.0185	771.54	676.69
Shilshole Ave NW west of NW 46th St	0.78	0.18	0.0009	0.0005	52.13	19.93
NW Ballard Way east of 17th Ave NW	0.34	0.05	0.0010	0.0005	39.57	15.38
NW 46th St west of 15th Ave NW	0.71	0.17	0.0009	0.0005	50.20	19.56
NW Leary Way west of 15th Ave NW	1.22	0.28	0.0000	0.0000	43.51	9.88
NW 45th St west of 14th Ave NW	0.27	0.06	0.0003	0.0002	17.84	6.50
14th Ave NW south of NW Ballard Way	0.39	0.09	0.0007	0.0004	33.68	14.15
NW Leary Way east of 14th Ave NW	1.34	0.33	0.0028	0.0015	120.99	51.65
11th Ave NW north of NW 46th Ave NW	0.73	0.17	0.0010	0.0006	52.79	20.43
Total Idling Emissions along Analyzed Roadways	**41.49**	**17.05**	**0.0668**	**0.0459**	**3,238.56**	**1,817.67**

Table B-3. Tabulation of Annual Vehicle Idling Emissions for the Shilshole South Alternative based on Forecasted Vehicle Delay and Traffic Volumes in 2040

Roadway Segment	CO Emissions (tons/year)	CO Increase over Existing	PM10 Emissions (tons/year)	PM10 Increase over Existing	CO_2 Emissions (metric tons/year)	CO_2 Increase over Existing
NW 54th St west of NW Market St	2.42	0.35	0.0047	0.0007	210.79	30.11
28th Ave NW north of MW Market St	0.08	0.00	0.0002	0.0000	7.68	0.00
NW Market St west of 24th Ave NW	12.33	7.33	0.0171	0.0102	890.27	529.35
NW 56th St west of 24th Ave NW	0.73	-0.23	0.0006	-0.0002	41.53	-13.09
NW 56th St east of 24th Ave NW	3.02	-0.95	0.0025	-0.0008	172.49	-54.39
NW Market St west of 24th Ave NW	4.15	0.00	0.0069	0.0000	330.59	0.00
Shilshole Ave NW southeast of 24th Ave NW	2.10	0.51	0.0019	0.0005	125.97	30.41
22nd Ave NW south of NW 56th St	2.53	-0.04	0.0025	0.0000	155.55	-2.19
22nd Ave NW south of NW Market St	1.42	-0.02	0.0016	0.0000	92.14	-1.30
Leary Ave NW south of NW Market St	6.89	-0.10	0.0093	-0.0001	490.58	-6.91
Ballard Ave NW southeast of 22nd Ave NW	0.20	0.00	0.0009	0.0000	32.10	0.00
NW Vernon Pl northwest of Shilshole Ave NW	0.32	0.08	0.0005	0.0001	24.27	5.66
17th Ave NW north of Shilshole Ave NW	0.25	-6.18	0.0008	-0.0198	29.67	-741.87
Shilshole Ave NW west of NW 46th St	2.41	1.64	0.0029	0.0020	162.17	110.04
NW Ballard Way east of 17th Ave NW	0.34	0.00	0.0010	0.0000	39.57	0.00
NW 46th St west of 15th Ave NW	2.22	1.51	0.0029	0.0020	156.17	105.97
NW Leary Way west of 15th Ave NW	1.22	0.00	0.0000	0.0000	43.51	0.00
NW 45th St west of 14th Ave NW	0.27	0.00	0.0003	0.0000	17.84	0.00
14th Ave NW south of NW Ballard Way	0.39	0.00	0.0007	0.0000	33.68	0.00
NW Leary Way east of 14th Ave NW	1.34	0.00	0.0028	0.0000	120.99	0.00
11th Ave NW north of NW 46th Ave NW	0.58	-0.15	0.0008	-0.0002	42.23	-10.56
Total Idling Emissions along Analyzed Roadways	**45.23**	**3.75**	**0.0610**	**-0.0058**	**3,219.80**	**-18.76**

Table B-4. Tabulation of Annual Vehicle Idling Emissions for the Shilshole North Alternative based on Forecasted Vehicle Delay and Traffic Volumes in 2040

Roadway Segment	CO Emissions (tons/year)	CO Increase over Existing	PM10 Emissions (tons/year)	PM10 Increase over Existing	CO_2 Emissions (metric tons/year)	CO_2 Increase over Existing
NW 54th St west of NW Market St	2.22	0.14	0.0043	0.0003	192.72	12.04
28th Ave NW north of MW Market St	0.24	0.16	0.0006	0.0004	23.05	15.36
NW Market St west of 24th Ave NW	5.11	0.11	0.0071	0.0002	368.94	8.02
NW 56th St west of 24th Ave NW	0.73	-0.23	0.0006	-0.0002	41.53	-13.09
NW 56th St east of 24th Ave NW	3.02	-0.95	0.0025	-0.0008	172.49	-54.39
NW Market St west of 24th Ave NW	4.24	0.09	0.0071	0.0002	337.94	7.35
Shilshole Ave NW southeast of 24th Ave NW	1.30	-0.29	0.0012	-0.0003	78.19	-17.38
22nd Ave NW south of NW 56th St	2.53	-0.04	0.0025	0.0000	155.55	-2.19
22nd Ave NW south of NW Market St	1.42	-0.02	0.0016	0.0000	92.14	-1.30
Leary Ave NW south of NW Market St	6.89	-0.10	0.0093	-0.0001	490.58	-6.91
Ballard Ave NW southeast of 22nd Ave NW	0.20	0.00	0.0009	0.0000	32.10	0.00
NW Vernon Pl northwest of Shilshole Ave NW	0.19	-0.05	0.0003	-0.0001	14.56	-4.05
17th Ave NW north of Shilshole Ave NW	0.31	-6.12	0.0010	-0.0196	37.09	-734.45
Shilshole Ave NW west of NW 46th St	2.41	1.64	0.0029	0.0020	162.17	110.04
NW Ballard Way east of 17th Ave NW	0.34	0.00	0.0010	0.0000	39.57	0.00
NW 46th St west of 15th Ave NW	2.22	1.51	0.0029	0.0020	156.17	105.97
NW Leary Way west of 15th Ave NW	1.22	0.00	0.0000	0.0000	43.51	0.00
NW 45th St west of 14th Ave NW	0.27	0.00	0.0003	0.0000	17.84	0.00
14th Ave NW south of NW Ballard Way	0.39	0.00	0.0007	0.0000	33.68	0.00
NW Leary Way east of 14th Ave NW	1.34	0.00	0.0028	0.0000	120.99	0.00
11th Ave NW north of NW 46th Ave NW	0.58	-0.15	0.0008	-0.0002	42.23	-10.56
Totals	**37.19**	**-4.30**	**0.0504**	**-0.0164**	**2,653.05**	**-585.52**

Table B-5. Tabulation of Annual Vehicle Idling Emissions for the Ballard Avenue Alternative based on Forecasted Vehicle Delay and Traffic Volumes in 2040

Roadway Segment	CO Emissions (tons/year)	CO Increase over Existing	PM10 Emissions (tons/year)	PM10 Increase over Existing	CO_2 Emissions (metric tons/year)	CO_2 Increase over Existing
NW 54th St west of NW Market St	2.42	0.35	0.0047	0.0007	210.79	30.11
28th Ave NW north of MW Market St	0.10	0.02	0.0002	0.0001	9.88	2.19
NW Market St west of 24th Ave NW	5.44	0.44	0.0076	0.0006	393.00	32.08
NW 56th St west of 24th Ave NW	0.09	-0.88	0.0001	-0.0007	4.86	-49.76
NW 56th St east of 24th Ave NW	0.35	-3.62	0.0003	-0.0029	20.20	-206.67
NW Market St west of 24th Ave NW	4.52	0.37	0.0076	0.0006	359.98	29.39
Shilshole Ave NW southeast of 24th Ave NW	1.30	-0.29	0.0012	-0.0003	78.19	-17.38
22nd Ave NW south of NW 56th St	2.53	-0.04	0.0025	0.0000	155.55	-2.19
22nd Ave NW south of NW Market St	1.42	-0.02	0.0016	0.0000	92.14	-1.30
Leary Ave NW south of NW Market St	6.89	-0.10	0.0093	-0.0001	490.58	-6.91
Ballard Ave NW southeast of 22nd Ave NW	0.20	0.00	0.0009	0.0000	32.10	0.00
NW Vernon Pl northwest of Shilshole Ave NW	0.19	-0.05	0.0003	-0.0001	14.56	-4.05
17th Ave NW north of Shilshole Ave NW	1.24	-5.19	0.0040	-0.0166	148.37	-623.17
Shilshole Ave NW west of NW 46th St	2.50	1.72	0.0030	0.0021	167.96	115.84
NW Ballard Way east of 17th Ave NW	0.34	0.00	0.0010	0.0000	39.57	0.00
NW 46th St west of 15th Ave NW	2.30	1.59	0.0030	0.0021	161.75	111.55
NW Leary Way west of 15th Ave NW	1.22	0.00	0.0000	0.0000	43.51	0.00
NW 45th St west of 14th Ave NW	0.27	0.00	0.0003	0.0000	17.84	0.00
14th Ave NW south of NW Ballard Way	0.39	0.00	0.0007	0.0000	33.68	0.00
NW Leary Way east of 14th Ave NW	1.34	0.00	0.0028	0.0000	120.99	0.00
11th Ave NW north of NW 46th Ave NW	0.62	-0.11	0.0009	-0.0002	44.87	-7.92
Total Idling Emissions along Analyzed Roadways	**35.69**	**-5.80**	**0.0519**	**-0.0149**	**2,640.39**	**-598.18**

Table B-6. Tabulation of Daily Vehicle Idling Emissions for the Leary Alternative based on Forecasted Vehicle Delay and Traffic Volumes in 2040

Roadway Segment	CO Emissions (tons/year)	CO Increase over Existing	PM10 Emissions (tons/year)	PM10 Increase over Existing	CO_2 Emissions (metric tons/year)	CO_2 Increase over Existing
NW 54th St west of NW Market St	2.22	0.14	0.0043	0.0003	192.72	12.04
28th Ave NW north of MW Market St	0.24	0.16	0.0006	0.0004	23.05	15.36
NW Market St west of 24th Ave NW	5.11	0.11	0.0071	0.0002	368.94	8.02
NW 56th St west of 24th Ave NW	0.73	-0.23	0.0006	-0.0002	41.53	-13.09
NW 56th St east of 24th Ave NW	3.02	-0.95	0.0025	-0.0008	172.49	-54.39
NW Market St west of 24th Ave NW	4.24	0.09	0.0071	0.0002	337.94	7.35
Shilshole Ave NW southeast of 24th Ave NW	1.30	-0.29	0.0012	-0.0003	78.19	-17.38
22nd Ave NW south of NW 56th St	3.10	0.53	0.0030	0.0005	190.61	32.86
22nd Ave NW south of NW Market St	1.74	0.30	0.0019	0.0003	112.91	19.47
Leary Ave NW south of NW Market St	8.44	1.46	0.0114	0.0020	601.13	103.64
Ballard Ave NW southeast of 22nd Ave NW	0.20	0.00	0.0009	0.0000	32.10	0.00
NW Vernon Pl northwest of Shilshole Ave NW	0.19	-0.05	0.0003	-0.0001	14.56	-4.05
17th Ave NW north of Shilshole Ave NW	1.24	-5.19	0.0040	-0.0166	148.37	-623.17
Shilshole Ave NW west of NW 46th St	2.41	1.64	0.0029	0.0020	162.17	110.04
NW Ballard Way east of 17th Ave NW	0.34	0.00	0.0010	0.0000	39.57	0.00
NW 46th St west of 15th Ave NW	2.22	1.51	0.0029	0.0020	156.17	105.97
NW Leary Way west of 15th Ave NW	3.53	2.31	0.0000	0.0000	125.69	82.18
NW 45th St west of 14th Ave NW	0.27	0.00	0.0003	0.0000	17.84	0.00
14th Ave NW south of NW Ballard Way	1.13	0.74	0.0022	0.0014	97.30	63.62
NW Leary Way east of 14th Ave NW	3.87	2.53	0.0080	0.0052	349.53	228.54
11th Ave NW north of NW 46th Ave NW	0.58	-0.15	0.0008	-0.0002	42.23	-10.56
Total Idling Emissions along Analyzed Roadways	**46.14**	**4.65**	**0.0630**	**-0.0038**	**3,305.03**	**66.47**

Table B-7. GHG and Air Quality Assumptions for Each Alternative

Alternative	Estimated Pavement Width (feet)	Trail Length (linear feet)	Pavement (square feet)	Project Life (years)
Shilshole South Alternative	30	6,500	195,000	30
Shilshole North Alternative	30	6,650	199,500	30
Ballard Avenue Alternative	30	7,550	226,500	30
Leary Alternative	30	6,800	204,000	30