April 2015

Federal Way Link Extension

Draft Environmental Impact Statement

ECOSYSTEMS TECHNICAL REPORT

Appendix G2

SoundTransit
Central Puget Sound
Regional Transit Authority

U.S. Department of Transportation
Federal Transit Administration

This page intentionally left blank.

SOUNDTRANSIT

Federal Way Link Extension

Ecosystems Technical Report

Prepared for:
Sound Transit

Prepared by:
HDR Engineering, Inc. and
CH2M HILL

April 2015

This page intentionally left blank.

Contents

Tables

Exhibits

This page intentionally left blank.

Acronyms and Abbreviations

BMP	best management practice
Ecology	Washington State Department of Ecology
EIS	environmental impact statement
EO	Executive Order
ESA	Endangered Species Act
FWLE	Federal Way Link Extension
GIS	geographic information system
GPS	global positioning system
HGM	hydrogeomorphic
I-5	Interstate 5
LWD	large woody debris
NOAA	National Oceanic and Atmospheric Administration
NRCS	U.S. Department of Agriculture Natural Resources Conservation Service
OHWM	ordinary high water mark
SR	State Route
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WDNR	Washington Department of Natural Resources
WRIA	Water Resource Inventory Area
WSDOT	Washington State Department of Transportation

This page intentionally left blank.

1.0 Introduction

An ecosystem is the complex of a community of organisms and its environment functioning as an ecological unit (Merriam Webster Dictionary, 2013). Ecosystems are composed of living organisms, and the environment they inhabit. This Ecosystems Technical Report identifies existing natural resources in the project vicinity and documents the ecosystem components along and near the alternatives for the Federal Way Link Extension (FWLE). The resources evaluated include wetlands, aquatic species and habitat, threatened and endangered species, vegetation, wildlife, and wildlife habit.

1.1 Data Gathered

Sound Transit conducted a literature and data review to identify and characterize potentially affected resources in and near the project vicinity. Existing documentation and information was compiled and reviewed first, so that the field reconnaissance effort could focus on filling information gaps. Existing ecosystem information was gathered from local, state, and federal agencies. This information included published and unpublished reports, maps, web sites, aerial photographs, and communications from agency staff familiar with resources within the project vicinity. The data sources are listed in the following subsections and in Chapter 6, References.

1.1.1 Agency and Public Contacts

Sound Transit contacted the following federal, state, and county agencies, tribes, and local jurisdictions for current information related to ecosystems resources:

- U.S. Army Corps of Engineers (USACE)
- U.S. Environmental Protection Agency (USEPA)
- Confederated Tribes and Bands of the Yakama Nation
- Muckleshoot Indian Tribe
- Puyallup Tribe of Indians
- Snoqualmie Indian Tribe
- Stillaguamish Tribe of Indians of Washington
- Suquamish Tribe of the Port Madison Reservation
- Duwamish Tribe (not federally recognized)
- Snohomish Tribe (not federally recognized)
- Washington Department of Ecology (Ecology)
- Washington Department of Fish and Wildlife (WDFW)
- King County
- City of SeaTac
- City of Des Moines
- City of Kent
- City of Federal Way
- King County

1.1.2 Maps and Existing Documentation

The following maps and other existing documents were reviewed to identify ecosystem features within the project vicinity:

- U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory web site (USFWS, 2013)
- U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) Soil Survey maps (Soil Survey Staff, NRCS, 2013)
- Critical areas maps from local jurisdictions (City of SeaTac, 2013; City of Des Moines, 2010; City of Kent, 2013; City of Federal Way, 2013b; and King County, 2013)
- King County (1991) Wetlands Inventory
- Proposed endangered and threatened species and critical habitat, candidate species, and species of concern in King County list (USFWS, 2013)
- Endangered Species Act Status of West Coast Salmon and Steelhead List (National Oceanic and Atmospheric Administration [NOAA Fisheries], 2013)
- StreamNet (2014) online data for Pacific Northwest salmonid and critical habitat distribution
- WDFW Salmonscape (WDFW, 2014a)
- WDFW (2014b) Priority Habitat and Species database
- Washington Department of Natural Resources (WDNR) Forest Practice Applications Review Stream Typing Online Mapper (2014a)
- WDNR Natural Heritage Information Request Self-Service System (WDNR, 2014b)
- Project aerial photography
- Water Resource Inventory Area (WRIA) 9 Limiting Factors analysis and appendix maps (Kerwin and Nelson, 2000)
- Mapping information from sources such as wetland delineation reports and stream studies conducted for other projects, as available

1.2 Related Laws, Regulations, and Guidelines

Wetlands, aquatic species and habitat, vegetation, wildlife and their habitat, and threatened and endangered species that may be affected by project activities are subject to the following regulations, programs, plans, and policies:

1.2.1 Federal

- National Environmental Policy Act
- Sections 404, 402, and 401 of the Clean Water Act
- Section 7 of the Endangered Species Act (ESA)

- Magnuson-Stevens Fishery Conservation and Management Act
- Bald and Golden Eagle Protection Act
- Migratory Bird Treaty Act
- Protection of Wetlands, Presidential Executive Order (EO) 11990
- Final Rule on Compensatory Mitigation for Losses of Aquatic Species and Habitat (USACE and USEPA, 2008)
- *Corps of Engineers Wetland Delineation Manual* (USACE, 1987)
- *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* Version 2.0 (USACE, 2010)
- Coastal Zone Management Act

1.2.2 State

- Washington State Environmental Policy Act
- Hydraulic code (Washington Administrative Code [WAC] Chapter 220-110)
- Shoreline Management Act
- Washington State Growth Management Act
- Protection of Wetlands, Governor's EO 89-10
- Protection of Wetlands, Governor's EO 90-04
- Water Pollution Control Act, Chapter 90.48 Revised Code of Washington
- *Wetland Mitigation in Washington State* (Ecology et al., 2006)

1.2.3 Local

- Critical Area Ordinance - City of SeaTac (Title 15.30 Environmentally Sensitive Areas)
- Critical Area Ordinance - City of Des Moines (Title 18.86 Environmentally Critical Areas)
- Critical Area Ordinance - City of Federal Way (Title 19 Division 5 Critical Areas)
- Critical Area Ordinance - City of Kent (Title 11.06 Critical Areas)
- Critical Area Ordinance - King County (Title 21A.24 Critical Areas)
- King County In-Lieu-Fee Mitigation Program
- Sound Transit Environmental Policy (2004)
- *Sound Transit Sustainability Plan* (2011)

1.3 Study Areas

1.3.1 Wetlands

The study area for wetlands encompasses the area within 300 feet of the edges of the long-term project footprint, which is defined as the physical footprint of the light rail guideway, station locations, permanent road improvements, and other project facilities that would result in permanent impacts on wetlands. This distance was selected to match the typical largest applicable potential buffer width for

wetlands in the area. Wetlands evaluated in this Draft Environmental Impact Statement (EIS) include wetlands that are wholly or partly within the study area.

1.3.2 Aquatic Species and Habitat

Aquatic habitat includes streams and other non-wetland waters such as ponds and lakes. The study area for aquatic species and habitat was defined as:

- 100 feet upstream and 300 feet downstream of each stream that would cross the long-term footprint and short-term construction footprint, and
- The entire stretch of any stream paralleling the long-term footprint or stream habitat features within 200 feet of the edge of the long-term footprint

For streams that provide habitat for aquatic ESA-listed species, the study area includes at least the segment of stream in which sound could travel in water (i.e., to the first bend in the channel).

1.3.3 Vegetation and Wildlife Resources

The study area for vegetation and wildlife habitat was defined as all areas within the operational and construction footprint of the project alternatives where clearing, grading, and operating construction machinery would disturb existing habitat. An additional 200-foot buffer area on either side of the edge of the long-term footprint was also included in the vegetation and wildlife study area for potential short-term and long-term project effects on vegetation cover and habitat quality for wildlife species that may occur in the area. To allow analysis of wildlife potentially affected by project-related noise and human activity, biologists also reviewed documented occurrences of sensitive wildlife species within 0.25 mile of the alternatives.

2.0 Study Objectives and Methods

This chapter describes the objectives and methods used to study wetlands, aquatic species and habitat, threatened and endangered species, vegetation, terrestrial wildlife, and wildlife habitat, as well as impact assessment methods and assumptions. Sound Transit and the Federal Transit Administration also prepared and circulated the Sound Transit Federal Way Link Extension Technical Methodologies Report in September 2013, and invited cooperating and participating agencies to review and comment. The following discussion summarizes the approach defined in the FWLE Draft EIS Methodologies Report (CH2M HILL, 2014), but also incorporates further detail that became available after field surveys and other reconnaissance were complete.

2.1 Wetlands

2.1.1 Study Objectives

Existing data and previous reconnaissance surveys show that wetlands are located within the project limits for all project alternatives. As a result, specific objectives of this study include the following:

- Identify, map, and describe the existing conditions of the wetlands and wetland buffers located within 300 feet on each side of the FWLE alternatives
- Determine impacts on wetlands associated with each alternative or option
- Describe potential measures to avoid, minimize, or compensate for impacts

2.1.2 Methods

This section summarizes the methods used to identify, evaluate, and assess impacts on wetlands.

2.1.2.1 Review of Existing Maps and Documentation

Biologists reviewed existing maps and documentation to identify known wetlands in the study area and vicinity (see Section 1.1.2), and then evaluated wetlands in the field within the field reconnaissance survey area. Existing geographic information system (GIS) data were gathered from the USFWS National Wetlands Inventory; the cities of SeaTac, Kent, Des Moines, and Federal Way; and King County. These databases were the primary mapping tools used to inform field reconnaissance efforts.

2.1.2.2 Agency Coordination

Sound Transit contacted staff from the cities of SeaTac, Kent, Des Moines, and Federal Way and King County for their critical area maps and information on any wetlands that may have been identified subsequent to finalization of these maps. This search included documentation associated with recent permit applications or code violations.

2.1.2.3 Wetland Determination and Field Reconnaissance

After collecting and reviewing existing information, biologists conducted detailed field reconnaissance surveys within the study area to identify, map, and describe wetlands that could be affected by the FWLE. Wetland field reconnaissance surveys were conducted during March 2013 and January through

March 2014. A more detailed description of the wetland delineation methodology is provided in Appendix A.

Because wetlands in the study area are generally located outside of the public right-of-way, most wetlands were visually surveyed from the public right-of-way; in most cases from the nearest road or sidewalk. Rights-of-entry were obtained for access to the following publicly owned sites where direct impacts on wetlands could occur:

- City of Kent-owned parcels at the Massey Creek Wetland complex south of Kent-Des Moines Road
- City of Des Moines-owned parcel north of S 263rd Street and west of State Route (SR) 99
- City of Federal Way-owned parcels between Redondo Way S and SR 99
- Five segments of Washington State Department of Transportation (WSDOT)-administered right-of-way on the west side of Interstate 5 (I-5) between S 221st and S 224th Streets, south of S 240th Street, south of S 260th Street, north and south of S 288th Street, and north of S 296th Street

Parcels and right-of-way segments that were accessed during the field reconnaissance surveys are shown on maps in Appendix E. At these sites, biologists documented vegetation, soil, and hydrology conditions as necessary at representative wetland and upland sample plots using methods outlined in the *Corps of Engineers Wetland Delineation Manual* (USACE, 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* Version 2.0 (USACE, 2010). Additional information on methods used for wetland identification and delineation is provided in Appendix A. Wetland determination data forms for all wetlands that were directly accessed during field reconnaissance surveys are included in Appendix B. General observations of existing conditions and characteristics were also recorded for each wetland and associated buffer.

Potential wetlands in areas not directly accessible during field reconnaissance surveys were assessed to the extent possible based on visual observations from public areas; current local, state, and federal habitat maps and reports; and the examination of aerial photographs. Areas outside of the WSDOT or other public rights-of-way that appeared to possess wetland indicators for vegetation, soil, and hydrology were included in the analysis to provide a conservative estimate of each alternative's impacts.

All wetlands in the study area were classified according to the USFWS (Cowardin et al., 1979) and hydrogeomorphic (HGM) (Brinson, 1993) classification systems and rated according to the appropriate local jurisdiction critical area ordinances and the *Washington State Wetland Rating System for Western Washington– Revised* (Hruby, 2004).

2.1.2.4 Mapping

Each wetland identified in the study area received a unique identifier that was tracked in a GIS database. As new information was collected on project wetlands, data were recorded in an Excel spreadsheet and linked to the GIS data. Wetland delineation data sample plots described in Section 2.1.2.3 and wetland boundaries that were documented at sites accessed during the field reconnaissance were mapped in the field using a global positioning system (GPS). Wetlands that were not accessible during field reconnaissance surveys were mapped based on documentation and surveys

from other projects or sources. All wetlands within the study area for the Preferred Alternative will be delineated during the Final EIS and/or permitting phase of this project.

2.1.2.5 Rating and Classification of Wetlands

Following the field reconnaissance, all wetlands identified in the study area were rated and the HGM classification was determined using the *Washington State Wetland Rating System for Western Washington – Revised* (Hruby, 2004). The Ecology wetland rating system defines three main wetland functions: water quality treatment, hydrologic support, and habitat. The degree to which several functions are performed by a wetland (e.g., enhancing water quality, reducing floods, and providing fish and wildlife habitat) results in category assignment, with Category I offering the highest function and Category IV offering the lowest.

With the exception of the City of SeaTac and the City of Federal Way, which use their own wetland rating systems, the local jurisdictions in the study area have adopted Ecology's rating system without modification. Wetlands in the City of SeaTac and City of Federal Way, however, were evaluated using the Ecology rating system to provide uniform criteria for evaluating wetland functions in the study area. Wetlands in the City of SeaTac and City of Federal Way were also assigned ratings based on local critical area requirements for the applicable local jurisdiction in order to determine prescriptive buffers. A summary of the rating systems and criteria is provided in Table 2-1.

Biologists assigned preliminary wetland buffers to the identified wetlands in the study area based on the local wetland rating systems. A summary of the buffer width requirements for each of the affected jurisdictions is presented in Table 2-2.

Wetland habitats in the study area were classified using the system outlined by the USFWS in *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al., 1979), typically referred to as the Cowardin system. The Cowardin system classifies wetlands based on the dominant vegetation structure and water regime. Table 2-3 shows the definitions of Cowardin habitat classes present in the study area.

2.2 Aquatic Species and Habitat

2.2.1 Study Objectives

The purpose of this investigation was to describe the aquatic resources and habitat within the project limits for all FWLE alternatives and evaluate the potential impacts of each project alternative and option. Specific objectives of this study include the following:

- Identify important fisheries resources, such as anadromous and resident species reported to inhabit water bodies within the study area
- Identify any federal- or state-listed endangered, threatened, or candidate aquatic species reported to inhabit water bodies within the study area
- Conduct a reconnaissance-level physical habitat survey of water bodies within the study area that could be affected by project alternatives to describe fish habitats and riparian conditions

- Identify any barriers to fish passage within the streams that intersect the project alternatives in the study area as well as downstream.
- Describe potential impacts on aquatic resources that may result from the project alternatives and options
- Describe potential measures to avoid, minimize, or compensate for adverse impacts

2.2.2 Methods

2.2.2.1 Review of Existing Maps and Documentation

Biologists reviewed existing maps and documentation to identify known streams and water bodies in the study area and vicinity (see Section 1.1.2) and then evaluated water bodies in the field within the field reconnaissance survey area. Existing GIS data were gathered from the cities of SeaTac, Kent, Des Moines, and Federal Way and King County. When applicable, aquatic species habitat was analyzed in a subbasin context.

2.2.2.2 Field Reconnaissance

A detailed field reconnaissance survey was conducted to identify, map, and describe streams and other waters and aquatic habitat within the WSDOT or other public rights-of-way in the study area. Other publicly owned property that could be accessed was also surveyed. Aquatic habitat surveys were conducted 300 feet downstream and 100 feet upstream of each stream crossing and on the entire stretch of any stream paralleling the project alternatives within 200 feet from the edge of the alternative, where access allowed. The width of the riparian area alongside the streams that was included in the field reconnaissance was typically restricted to within 50 feet or less and was determined by the edges of roadways and development, as well as by rights-of-way access and property boundaries. These surveys were accomplished on all streams except McSorley Creek, where property access was not obtained. In this case, the stream was observed and characterized from within the SR 99 right-of-way and culvert, and further details of channel dimensions and locations were obtained from previous survey information from a 2001 Biological Assessment (Jones and Stokes, 2001).

Aquatic habitat conditions and functional status were evaluated based on fish life histories, spawning and rearing habitat requirements, seasonal use, and field observations. Habitat was assessed with the assumption that anadromous fish might one day be able to access the area even if they cannot under present conditions. To the extent information is currently available or could be ascertained in the field, downstream fish passage obstructions, including types of impediments to fish passage, were also identified for each stream reach.

For streams identified during the field reconnaissance, the ordinary high water mark (OHWM) was estimated and mapped using GPS. Streams that extend beyond the field reconnaissance survey area and other previously mapped streams outside of the WSDOT or other public rights-of-way were also incorporated into the GIS database. The OHWMs of all streams that may be affected by project construction will be delineated during the Final EIS or permitting phase of this project. Final stream classification determinations, in accordance with WAC 222-16-031 and local jurisdictions' critical areas ordinances, will also be made at that time.

TABLE 2-1
Summary of Wetland Rating Systems by Municipality

Regulatory Agency	Wetland Category			
	I	II	III	IV
Washington State Department of Ecology[a] City of Kent[b] City of Des Moines[c] King County[d]	Category I wetlands: • Represent a unique or rare wetland type; or • Are more sensitive to disturbance than most wetlands; or • Are relatively undisturbed and contain ecological attributes that are impossible to replace within a human lifetime; or • Provide a high level of functions. Specific wetlands that meet the Category I criteria include: 1. Relatively undisturbed estuarine wetlands over one acre in size 2. Natural Heritage Wetlands, specifically, wetlands identified by the Washington Natural Heritage Program/Department of Natural Resources as high quality relatively undisturbed wetlands; and wetlands that support state-listed threatened or endangered plants 3. Bogs 4. Mature and old-growth forested wetlands over one acre in size 5. Wetlands in coastal lagoons 6. Wetlands that perform many functions very well, as indicated by a score of 70 or more points out of 100 on the wetland rating form	Category II wetlands are difficult, though not impossible, to replace, and provide high levels of some functions. Specific wetlands that meet the Category II criteria include: 1. Estuarine wetlands less than one acre in size, or disturbed estuarine wetlands larger than one acre 2. Interdunal wetlands greater than one acre 3. Wetlands scoring between 51 and 69 points out of 100 on the wetland rating form	Category III wetlands provide a moderate level of functions. Specific wetlands that meet the Category III criteria include: 1. Interdunal wetlands between 0.1 acre and 1.0 acre in size 2. Wetlands scoring between 30 and 50 points out of 100 on the wetland rating form	Category IV wetlands have the lowest levels of functions and are heavily disturbed. Specific wetlands that meet the Category IV criteria include: 1. Wetlands scoring less than 30 points out of 100 on the wetland rating form
City of SeaTac[e]	Class I Wetland. Only includes wetlands assigned the Unique/Outstanding #1 rating in the 1983 King County Wetlands Inventory (or the most recent City inventory) or which meet any of the following criteria: 1. Are wetlands which have present species listed by the federal or state government as endangered or threatened or outstanding actual habitat for those 2. Are wetlands which have 40% to 60% permanent open water in dispersed patches with two or more classes of vegetation 3. Are wetlands equal to or greater than 10 acres in size and have three or more wetland classes, one of which is open water 4. Are wetlands which have present plant associations of infrequent occurrence	Class II Wetland. Only includes wetlands assigned the Significant #2 rating in the 1983 King County Wetlands Inventory (or the most recent City inventory) or which meet any of the following criteria: 1. Are wetlands greater than 1 acre in size 2. Are wetlands equal to or less than 1 acre in size and have three or more wetland classes 3. Are forested wetlands less than 1 acre in size but are larger than 2,500 square feet 4. Are wetlands which have present heron rookeries or raptor nesting trees	Class III Wetland. Only includes wetlands assigned the Lesser Concern #3 rating in the 1983 King County Wetlands Inventory (or most recent City inventory) or which are wetlands equal to or less than 1 acre in size and have two or fewer wetland classes. This does not include drainage ditches used as part of an approved public storm drainage system that may support wetland vegetation, or retention/detention systems.	Not used

TABLE 2-1
Summary of Wetland Rating Systems by Municipality

Regulatory Agency	Wetland Category			
	I	II	III	IV
	5. Sphagnum or peat wetlands 6. Forested wetlands equal to or greater than 1 acre in size			
City of Federal Way[f]	Category I wetlands meet one of the following criteria: (i) Contain the presence of species or documented habitat recognized by state or federal agencies as endangered, threatened, or potentially extirpated plant, fish, or animal species (ii) Contain the presence of plant associations of infrequent occurrence, irreplaceable ecological functions, or exceptional local significance including but not limited to estuarine systems, peat bogs and fens, mature forested wetlands, groundwater exchange areas, significant habitat, or unique educational sites (iii) Have three or more wetland classes, one of which is open water	Category II wetlands are greater than 2,500 square feet in area, do not exhibit the characteristics of Category I wetlands, and meet one of the following criteria: (i) Are contiguous with water bodies or tributaries to water bodies which under normal circumstances contain or support a fish population, including streams where flow is intermittent (ii) Are greater than 1 acre in size in its entirety (iii) Are less than or equal to 1 acre in size in its entirety and have two or more wetland classes, with neither class dominated by nonnative invasive species	Category III wetlands are greater than 2,500 square feet in area and do not exhibit those characteristics of Category I or II wetlands[g]	Not used

[a] Hruby (2004).
[b] City of Kent City Code 11.06.580.
[c] City of Des Moines Municipal Code 18.04.663.
[d] King County Critical Areas Ordinance, King County Code 21A.24.318.
[e] City of SeaTac Municipal Code 15.10.675.
[f] City of Federal Way Revised Code 19.175.020.
[g] The City of Federal Way does not regulate wetlands smaller than 2,500 square feet, but these wetlands are still subject to applicable state and federal laws.

TABLE 2-2
Summary of Wetland Buffer Widths by Municipality

Wetland Classification	City of SeaTac Buffer Width (feet)[a]	City of Des Moines Buffer Width (feet)[b]	City of Kent Buffer Width (feet)[c]	City of Federal Way Buffer Width (feet)[d]	King County Buffer Width (feet)[e]
I	100	100-300	125-225	200	125-215
II	50	100-300	75-200	100	100-200
III	35	80-150	60-110	>10,000 square feet: 50 2,500-10,000 square feet: 25	75-125
IV	NA	50	40-50	NA	50

[a] City of SeaTac Municipal Code 15.30.290. Additional buffer may apply in steep slope areas. Additional building setbacks apply.
[b] City of Des Moines Municipal Code 18.86.100. Buffer widths vary with wetland function scores for habitat and water quality.
[c] City of Kent City Code 11.06.600. Buffer width varies with habitat score.
[d] City of Federal Way Revised Code 19.175.020.
[e] King County Code 21A.24.325.
NA = not applicable

TABLE 2-3
Summary of the Cowardin Classification System

System	Class	Symbol
Palustrine All non-tidal wetlands dominated by trees, shrubs, 2-7 emergent, mosses, or lichens	Forested Characterized by woody vegetation that is 20 feet or taller.	PFO
	Scrub-Shrub Areas dominated by woody vegetation less than 20 feet tall. Species include true shrubs, young trees (saplings), and trees or shrubs that are small or stunted.	PSS
	Emergent Characterized by erect, rooted, herbaceous hydrophytes present for most of the growing season in most years. Usually dominated by perennial plants.	PEM
	Open Water Unvegetated, open water, typically 6.6 feet or more in depth.	POW

Source: Cowardin et al., 1979.

2.3 Upland Vegetation and Wildlife Resources

2.3.1 Study Objectives

The purpose of this investigation was to provide information on the vegetation and wildlife resources in the project study area and evaluate the potential impacts of each project alternative. Specific objectives of this study include the following:

- Identify, map, and describe the existing conditions of the vegetation communities and wildlife habitat resources located within 200 feet of each side of the project alternatives
- Determine each project alternative's impacts on wildlife, habitat, and vegetation
- Describe potential measures to avoid, minimize, or compensate for adverse impacts

2.3.2 Methods

2.3.2.1 Review of Existing Materials

Biologists reviewed maps, aerial photographs, and documents to determine vegetation communities, wildlife, and wildlife habitat in the study area as well as the greater project vicinity for context (see Section 1.1.2). The potential presence of wildlife species in the study area was determined by the presence of suitable habitat and through existing data sources from literature and online resources such as the WDFW Priority Habitats and Species database (WDFW, 2014b). Priority species in Washington include all state endangered, threatened, sensitive, and candidate species, as well as federal endangered, threatened, and candidate species and species of concern.

2.3.2.2 Field Investigation

Information on plant species and wildlife habitat was obtained concurrently during the wetland and aquatic resources field reconnaissance surveys. No formal wildlife surveys were conducted for this report. Field investigation consisted of reconnaissance-level visual observation of vegetated areas within 200 feet of alternative alignments. Observations were conducted from within the WSDOT or other public rights-of-way within the study area. Reconnaissance also occurred on publicly owned property where Sound Transit received right-of-entry. The general type of vegetation cover, such as mixed coniferous forest, and the prevalent species of trees, shrubs, and other vegetation that occur within the surveyed study areas were recorded in the field, but no formal data plots were sampled.

2.4 Impact Assessment

2.4.1 Impact Assessment Methods

This ecosystems impact assessment describes the projected extent, magnitude, duration, and character of impacts on ecosystems resources for each alternative and option. Impacts were quantified where appropriate and possible (e.g., the area of wetland impacts). Impacts can be either adverse or beneficial.

2.4.1.1 Long-Term Impacts

Long-term impacts on wetlands, wetland buffers, streams, associated buffers, and wildlife habitat and vegetation were first assessed by overlaying project alternatives on base maps of existing ecosystem resources. To provide a conservative estimate of impacts, the analyses for all alternatives and options—both at-grade and elevated profiles—assumed a “worst-case” at-grade project footprint for the long term.

Based on factors such as the width and height of elevated guideways, some of the areas identified as impacted may not experience long-term impacts. During the Final EIS and/or the permitting phase, Sound Transit will reevaluate these assumptions to provide a more detailed assessment of long-term impacts and identify detailed temporary construction limits to distinguish which resources could be restored following construction. Some areas would only be impacted during construction and are discussed below under “Construction Impacts.” The acreage values resulting from this approach provide an indication of the nature and magnitude of potential impacts and reflect differences among alternatives.

Long-term impacts on wetlands were assessed qualitatively by evaluating project footprint impacts on wetland hydrologic, water quality, and wildlife functions. If a contiguous wetland lies partially within and partially outside the project limits, then best professional judgment was used to determine any long-term project impacts on the portion of the wetland not directly impacted by the project. If the remaining wetland functions would be substantially degraded by project construction or operation, then it was assumed that all wetland functions would be lost, and the entire wetland acreage was included in the impact table. Functional impacts that extend beyond the area of long-term wetland impacts were also qualitatively assessed.

A qualitative assessment of long-term impacts on aquatic species considered such factors as the regional significance of the resident and anadromous fish species, fish habitat value (such as its role as a migration corridor or spawning area), degree of connectivity and loss of habitat following project implementation, overall habitat quality, and the potential for enhancing or restoring aquatic habitat or connectivity. Construction and operational impacts on aquatic species from water quality degradation and loss of habitat were also qualitatively assessed.

Long-term impacts on wildlife and wildlife habitat were assessed qualitatively by considering such factors as the regional significance of the resource, wildlife habitat value (such as its role as a wildlife movement corridor), degree of fragmentation and loss of the habitat following project implementation, overall habitat quality, and the potential for enhancing or restoring wildlife habitat or connectivity. Short-term construction and long-term impacts on wildlife, including disturbances from increases in human access, noise, and light, and on migratory birds were also assessed. In addition to the operational footprint of the proposed alignments, a vegetation clear zone would need to be maintained to keep tree branches off of the guideways. This area would extend 15 feet beyond the guideway footprint and would preclude establishing trees within this zone. For this analysis, because forested vegetation cover would not be allowed to regenerate in this zone, this vegetation clear zone footprint is considered a long-term impact on wildlife habitat.

Long-term impacts on vegetation were determined by evaluating the acreage of each major vegetation type that would be eliminated for each alternative. Impacts were also assessed qualitatively by considering such factors as the regional significance of the resource and the potential for enhancing or restoring unique plant communities. Additionally, the potential for the project to increase or decrease the spread of noxious or invasive plant species was analyzed.

Potential long-term impacts on threatened and endangered species (aquatic and terrestrial) include direct mortality, disturbance and displacement effects, and loss or degradation of habitat. Following the identification of a preferred alternative, compliance with the ESA would be assessed and documented through a No Effect memorandum, Biological Assessment, or other ESA documentation. The assessment will also include a review of potential effects on essential fish habitat (EFH), as required by the Magnuson-Stevens Fishery Conservation and Management Act.

Information received from the existing documents, field-reconnaissance-level surveys, and agency consultation identified habitats or areas to be avoided or protected. Impact avoidance is discussed in greater detail in Section 5.0, Potential Mitigation Measures.

2.4.1.2 Short-Term (Construction) Impacts

Construction impacts would be temporary and limited to the period during and immediately following project construction. The conceptual design assumes most construction would occur within the operational footprint for the light rail alignment and stations, but some additional areas that extend beyond the operational footprint could be needed and are identified in a separate construction footprint. For this analysis, the 15-foot vegetation clear zone would primarily be considered a temporary impact on wetlands, streams, and their associated buffers; however, converting forested wetlands to scrub-shrub or emergent wetlands within the vegetation clear zone may be considered a long-term loss of forested wetland habitat by regulatory agencies. Estimated areas of construction impacts on ecosystems resources are summarized in Section 4.0, and are in addition to the quantified long-term impact areas.

2.4.1.3 Indirect Impacts

Indirect impacts can be positive and negative, and include those impacts that are caused by the project later in time or farther removed in distance, but are still reasonably foreseeable. These may include impacts related to station area developments by others, such as changes in the pattern of land use, population density, or water quality. Indirect impacts may also occur through the implementation of mitigation measures for other environmental impacts, or through supporting projects that are not yet defined or considered part of the project alternatives. Indirect impacts on ecosystems resources were analyzed qualitatively and are discussed in Section 4.0.

2.4.2 Assumptions

2.4.2.1 Site Restoration

For purposes of analysis and discussion of temporary construction impacts, Sound Transit assumes that areas supporting native upland or wetland vegetation and riparian corridors located outside of the permanent project limits would be restored after construction is completed. Site restoration features would be installed as soon as feasible following construction. The length of time that would be required for site restoration to effectively replace pre-project wetland functions would vary.

2.4.2.2 Avoiding and Minimizing Impacts on Sensitive Natural Resources

The FWLE will be designed to conform to all federal, state, and local regulations. The project team would use a mitigation sequencing approach based on a hierarchy of avoiding and minimizing adverse impacts through careful design, rectifying temporary impacts, and compensating for unavoidable adverse impacts. Sound Transit also reviewed opportunities for advance mitigation, mitigation banks, and in-lieu fee programs. Potential mitigation measures for the conceptual design were identified that are intended to avoid, minimize, rectify, or compensate for adverse impacts on the ecosystems resources. These measures will be further defined in the Final EIS for the Preferred Alternative.

Mitigation measures would include specific goals and objectives and specify monitoring criteria against which potential mitigation measures can be compared. Mitigation measures would be described in

enough detail in the Final EIS so that reviewing agencies can determine the likelihood of the proposed mitigation succeeding and meeting all stated objectives.

The location of compensatory wetland mitigation may be generally identified in the Final EIS but would only be described in sufficient detail to demonstrate compensation for lost wetland functions and values. A listing of best management practices (BMPs) was developed identifying measures that could be implemented to avoid or reduce adverse impacts on ecosystems resources during construction and operation. The Final EIS will summarize ESA requirements and/or agreements established during consultation with the USFWS and NOAA Fisheries.

This page intentionally left blank.

3.0 Affected Environment

3.1 Wetlands

The FWLE project corridor is located on the broad, relatively flat terrace between Puget Sound and the Green River valley. The plateau includes landforms such as depressions, slope and seep areas, and stream valleys that may support wetlands. Much of this area was developed in the 1960s following construction of I-5 and ongoing development at Seattle-Tacoma International Airport. The current land uses in the project vicinity include a mixture of commercial and office uses (primarily along the major roadways), and single- and multi-family residential. Parks and open-space parcels are distributed across the area. As a result, the wetlands now present in the area may represent fragments of larger historic wetland systems or they may be recently formed wetlands that have developed as a result of changes in land use and surface water drainage patterns.

Sound Transit identified a total of 29 wetlands for the Draft EIS, which have been organized in the discussion below by their occurrence in the SR 99 and I-5 corridors. Of the 29 wetlands identified in the 2 study areas, 10 were accessed during field reconnaissance surveys to collect wetland hydrology, soils, and vegetation data. Detailed wetland determination data forms and wetland rating forms for the 10 wetlands accessed during the field reconnaissance surveys are provided in Appendices B and C, respectively. Photographs of wetlands accessed during the field reconnaissance survey and from public rights-of-way are included in Appendix D. Appendix E presents maps showing locations of individual wetlands and buffers in relation to the FWLE alternatives.

3.1.1 Wetland Descriptions

3.1.1.1 SR 99 Corridor

Seventeen wetlands were identified within the 300-foot study area of the SR 99 corridor. Of these, six wetlands were accessed during the field reconnaissance surveys. The remaining 11 were not accessible during the field reconnaissance surveys and were evaluated using existing documentation and observations from public vantage points. Details for each of these wetlands are provided in Table 3-1, and their locations are shown on Exhibits 3-1 through 3-3. Detailed maps of wetlands directly affected by the SR 99 Alternative are provided in Appendix E.

The identified wetlands vary in overall size from less than 0.1 acre to more than 108 acres (McSorley Creek Wetland [Wetland 12-1]). Thirteen wetlands are less than one acre in overall size, and the remaining four wetlands in the study corridor range from 2.6 to 108.6 acres in size. The McSorley Creek Wetland is the largest undisturbed wetland in the FWLE corridor and forms the headwaters of McSorley Creek. Approximately 8 acres of the 108.1 acres of McSorley Creek Wetland fall within the SR 99 study area. Fourteen of the wetlands are located in depressions, and three are associated with slope/seep areas. Wetlands in the study area are primarily deciduous forested wetlands, although the vegetation cover in wetlands immediately adjoining SR 99 is disturbed and dominated by invasive species.

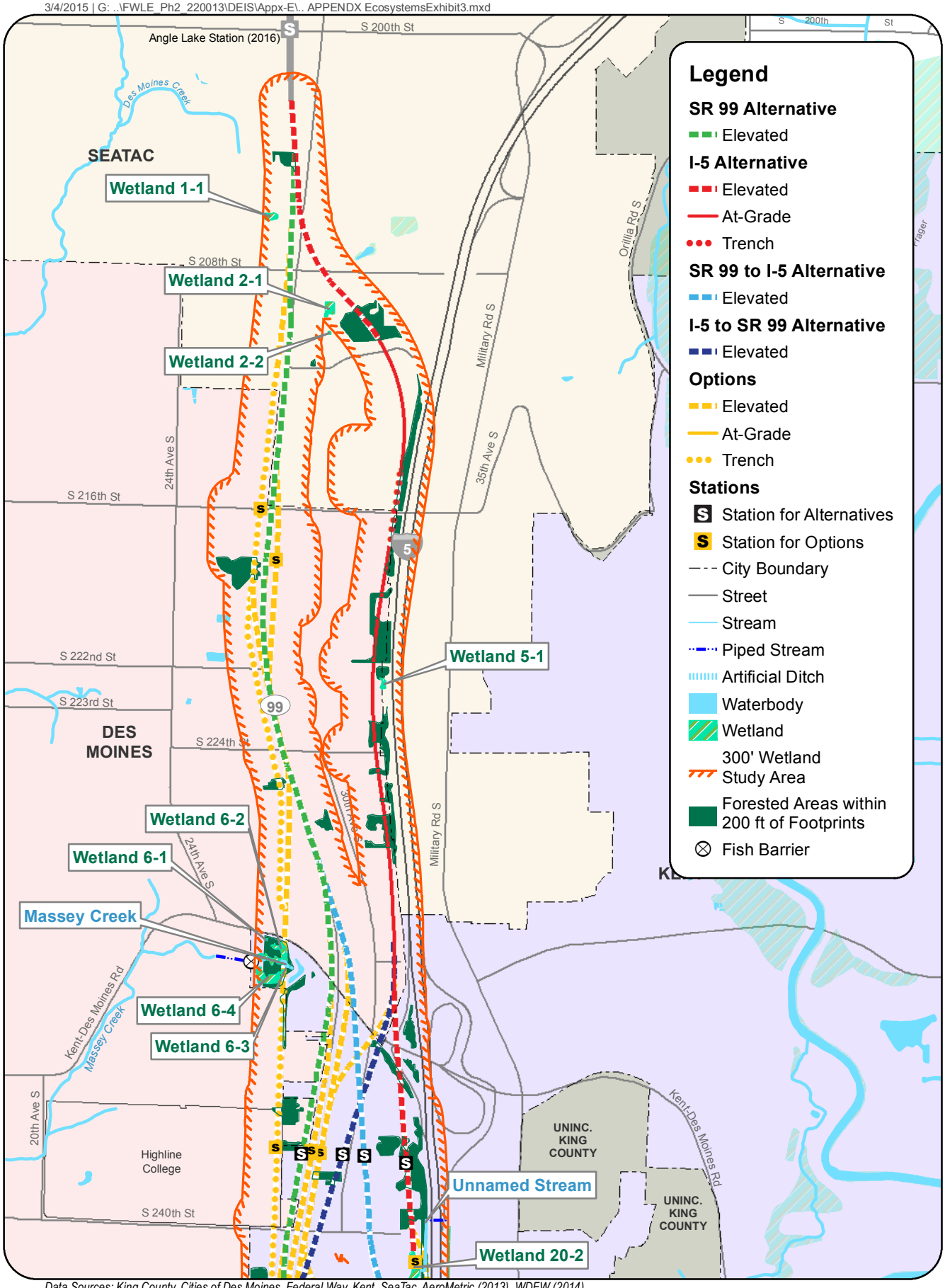
TABLE 3-1
Wetlands in the SR 99 Corridor Study Area

Wetland Name	Hydro-geomorphic Classification	Cowardin Classification[a]	Dominant Species	Approximate Wetland Acreage in Study Area (Total Wetland Acreage)	Wetland Rating (Ecology/ Local)	Jurisdiction	Buffer Width (feet)	Accessed During Field Reconnaissance Surveys
1-1[b]	Slope	PSS	Willows	0.3 (0.3)	IV/III	City of SeaTac	35	No
2-1[b]	Depressional	PEM	Reed canarygrass, cattail	0.4 (0.4)	III/III	City of SeaTac	35	No
2-2[b]	Depressional	PEM	Reed canarygrass	<0.1 (<0.1)	III/III	City of SeaTac	35	No
6-1	Depressional	PSS	Salmonberry	<0.1 (<0.1)	IV	City of Kent	50	Yes
6-2	Slope	PFO	Red alder, black cottonwood, salmonberry	0.7 (0.7)	IV	City of Kent	50	Yes
6-3	Depressional	PSS	Blackberry, creeping buttercup	<0.1 (<0.1)	IV	City of Kent	50	Yes
6-4	Slope	PFO	Red alder, black cottonwood, salmonberry	0.7 (0.7)	IV	City of Kent	50	Yes
11-1	Depressional	PFO/SS	Red alder, western red cedar, willows, dogwood	2.3 (2.6)	III	City of Des Moines	80	No
12-1[b]	Depressional	PFO/SS	Red alder, black cottonwood, Sitka spruce, willows, dogwood	12.5 (108.1)	II	City of Kent	125	Yes
12-2	Depressional	PFO/SS	Red alder, willows, some soft rush	0.5 (0.5)	III	City of Des Moines	80	Yes
12-3	Depressional	PFO	Red alder	0.2 (0.2)	IV	City of Des Moines	50	No
13-1	Depressional	PFO	Willows	0.4 (0.4)	IV	City of Des Moines	50	No
15-1	Depressional	PFO/PSS/PEM/ PAB	Black cottonwood, red alder, cattail	1.7 (7.3)	II/II	City of Des Moines/ City of Federal Way	100	No

TABLE 3-1
Wetlands in the SR 99 Corridor Study Area

Wetland Name	Hydro-geomorphic Classification	Cowardin Classification[a]	Dominant Species	Approximate Wetland Acreage in Study Area (Total Wetland Acreage)	Wetland Rating (Ecology/ Local)	Jurisdiction	Buffer Width (feet)	Accessed During Field Reconnaissance Surveys
16-1	Depressional	PEM	Reed canarygrass	0.1 (0.1)	IV/III	City of Federal Way	25	No
17-1	Depressional	PFO	Red alder	<0.1 (<0.1)	III/NA	City of Federal Way	NA	No
17-2	Depressional	PFO	Willow, salmonberry, some red alder saplings	0.8 (4.8)	III/I	City of Federal Way	100	No
17-3	Depressional	PSS	Red alder saplings	0.1 (0.1)	III/NA	City of Federal Way	NA	No

[a] PEM = palustrine emergent; PFO = palustrine forested; PSS = palustrine scrub-shrub; SS = scrub-shrub (Cowardin et al., 1979)
[b] Wetlands identified in both SR 99 and I-5 corridors.
NA = not applicable

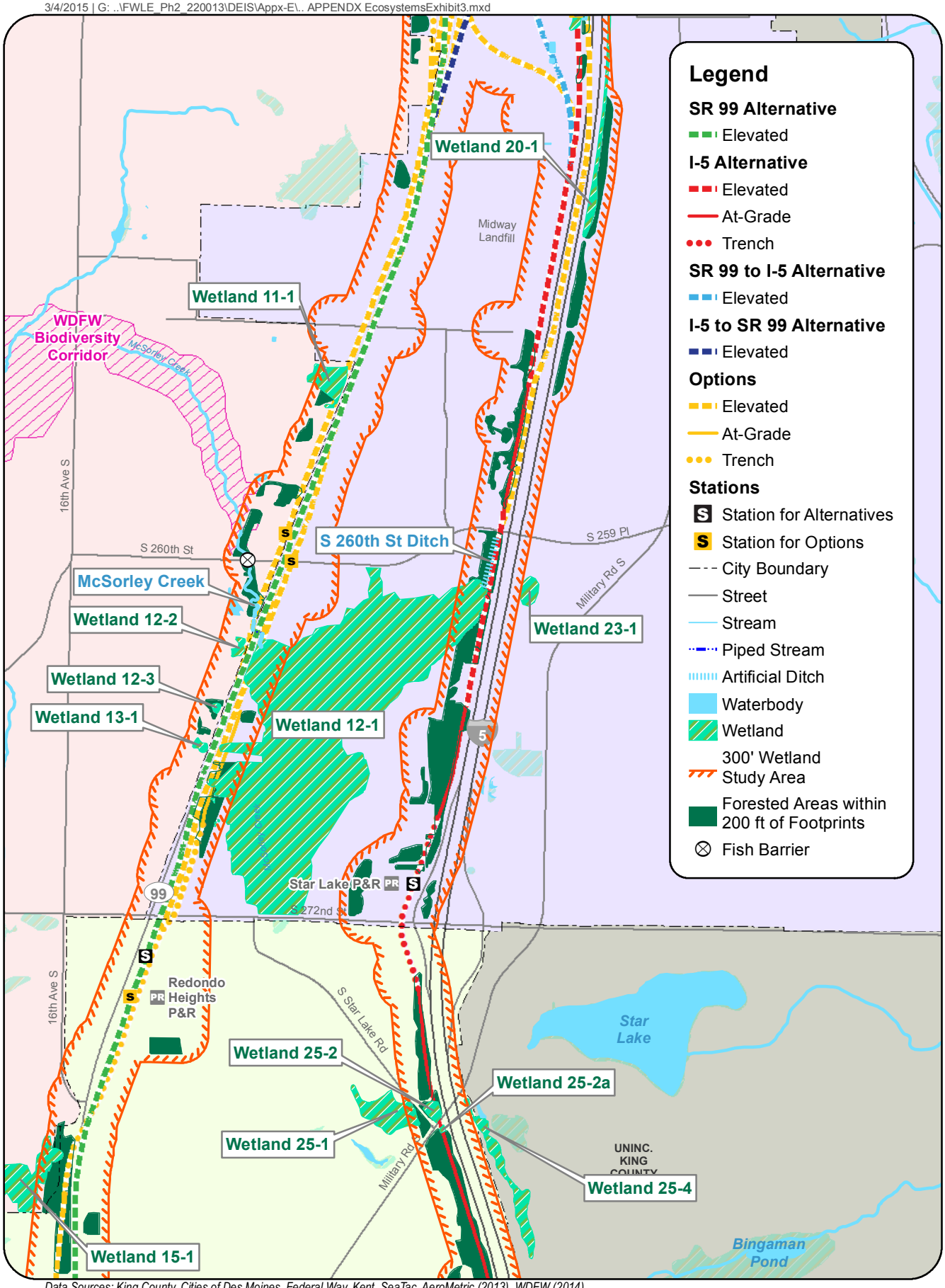


Data Sources: King County, Cities of Des Moines, Federal Way, Kent, SeaTac, AeroMetric (2013). WDFW (2014).

N

0 0.25 0.5 Miles

EXHIBIT 3-1
Ecosystems Resources
Angle Lake Station to Kent/Des Moines Station
Federal Way Link Extension

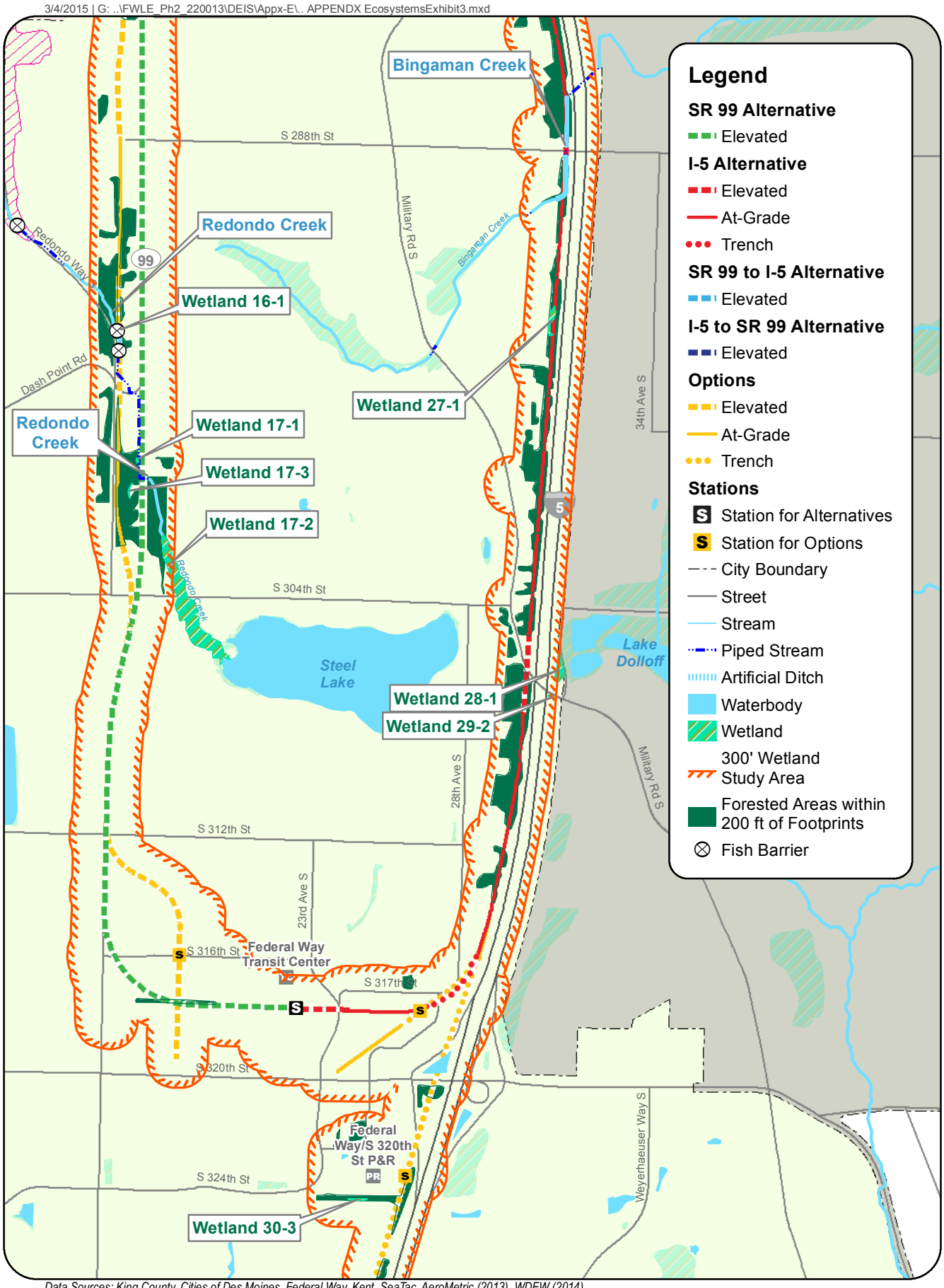


Data Sources: King County, Cities of Des Moines, Federal Way, Kent, SeaTac, AeroMetric (2013). WDFW (2014).

N

0 0.25 0.5 Miles

EXHIBIT 3-2
Ecosystems Resources
Kent/Des Moines Station to S 272nd Station
Federal Way Link Extension



Data Sources: King County, Cities of Des Moines, Federal Way, Kent, SeaTac, AeroMetric (2013). WDFW (2014).

EXHIBIT 3-3
Ecosystems Resources
S 288th to Federal Way Transit Center Station
Federal Way Link Extension

The Massey Creek wetlands (Wetlands 6-1, 6-2, 6-3, and 6-4) are located on undeveloped parcels and are relatively undisturbed compared to other smaller wetlands in the study corridor.

According to ratings assigned to the wetlands using the Ecology rating system (Hruby, 2004), wetlands in the SR 99 corridor vary in functional capacity from relatively low functioning to wetlands that provide higher-level functions. Two wetlands (12-1 and 15-1) fall in the higher functioning group (Category II) due to their larger size, diverse vegetation and habitat structure, and greater connectivity to other habitats. Eight wetlands fall into the lower functioning (Category IV) group due to their small size, limited habitat structure, low plant species diversity, and lack of connectivity to other habitats. The remaining seven wetlands provide low to moderate functional scores between Category II and Category IV and were rated Category III. The Ecology rating system also categorizes wetlands based on "their sensitivity to disturbance, their significance, their rarity, our ability to replace them, and the functions they provide" (Hruby, 2004). These wetlands with special characteristics may receive a Category I or II rating independent of the functions the wetlands provide. None of the wetlands in the SR 99 study area received a Category I or II wetlands based on Ecology's criteria for wetlands with special characteristics (Hruby, 2004). Wetlands in the SR 99 corridor are discussed in more detail below.

Wetlands 1-1, 2-1, and 2-2

Wetlands 1-1, 2-1, and 2-2 are located in the north portion of the SR 99 corridor, near the edge of the 300-foot study area. These wetlands are less than 0.5 acre in size and primarily support emergent plant communities dominated by reed canarygrass (*Phalaris arundinacea*), as well as some scrub-shrub vegetation consisting of willows (*Salix* spp.). Wetland 1-1 is a slope wetland with limited potential to provide hydrologic or water quality functions; it also provides low habitat function, and thus received a Category IV rating. Wetlands 2-1 and 2-2 received Category III ratings, as they are closed depressional wetlands that have moderate potential to provide hydrologic and water quality functions, although they also provide low habitat function.

Massey Creek Wetlands (Wetlands 6-1, 6-2, 6-3, and 6-4)

Four wetlands in the headwaters of Massey Creek—Wetlands 6-1 through 6-4—are located south of Kent-Des Moines Road and west of SR 99. . They are primarily slope wetlands that drain directly into Massey Creek. They primarily consist of deciduous forest communities dominated by red alder (*Alnus rubra)* and black cottonwood (*Populus balsamifera*). Salmonberry (*Rubus spectabilis*) and slough sedge (*Carex obnupta*) are common understory plants found in the wetlands. Aggressive invasive species including Himalayan blackberry (*Rubus armeniacus*) and English ivy (*Hedera helix*) are codominant in several of these wetlands, particularly in the east portions adjoining a constructed stormwater pond off site to the east. These wetlands all received Category IV ratings. All four wetlands scored low for hydrology and water quality functions since they are slope wetlands or are small in size (less than 0.1 acre); however, because these wetlands occur in the headwaters of Massey Creek, they provide additional hydrologic support by reducing the effects of peak flood flows that enter Massey Creek. The wetlands scored low for habitat functions due to limited diversity in structure and isolation from other habitats.

Wetland 11-1

Wetland 11-1 is a depressional wetland that adjoins the west side of SR 99 (Exhibit 3-2). It is a forested and scrub-shrub wetland dominated by red alder and western red cedar (*Thuja plicata*) trees with an understory of willows and redtwig dogwood (*Cornus sericea*). Wetland 11-1 provides moderate water quality functions because it could treat surface runoff from SR 99. Wetland 11-1 has moderate potential for hydrologic and habitat functions; however, it lacks opportunity to provide these functions as it is a relatively isolated wetland, and thus received a Category III rating.

McSorley Creek Wetlands (Wetlands 12-1, 12-2, 12-3, and 13-1)

The McSorley Creek wetlands are located primarily in Kent, with a small portion in Des Moines. The complex consists of five depressional wetlands in the SR 99 corridor (12-1, 12-2, 12-3, and 13-1). Wetland 23-1 is located in the I-5 corridor and is discussed in Section 3.1.1.2. The McSorley Creek wetland complex totals approximately 110 acres and is the largest group of wetlands in the SR 99 corridor study area (Exhibit 3-2). The McSorley Creek wetlands drain an area extending east of I-5 and west to just beyond SR 99, and form the headwaters of McSorley Creek. The proximity of the wetlands to each other and the intervening roadways suggests that these wetlands likely represent a single wetland complex that has been divided by construction of I-5 and SR 99, and further encroached upon by the surrounding development. The McSorley Creek Wetland (Wetland 12-1) is the largest wetland in the group (totaling approximately 108.1 acres), and predominantly consists of forest, and shrub communities. Mature red alder, Sitka spruce (*Picea sitchensis*), and black cottonwood trees are common in the interior of the wetland. Willows, dense young red alder stands, and redtwig dogwood (*Cornus sericea*) were all observed on the margins near adjoining development. The wetland's location at the headwaters of McSorley Creek, potential to store floodwaters, and the presence of multiple habitats and native plant species diversity support higher wetland function, resulting in a Category II rating. Communications with City of Kent staff indicated that past development activities have encroached into the wetland, but areas of older, less disturbed forest are present in the interior, which would result in a higher rating.

Four other depressional wetlands (12-2, 12-3, 13-1, and 23-1) are smaller wetlands (no more than 0.5 acre in size) that have been cut off from Wetland 12-1 by development. The proximity of the wetlands to each other and the intervening roadways suggests that these wetlands likely represent a single wetland complex that has been divided by construction of I-5 and SR 99, and further encroached on by the surrounding development. Based on direct field observations of Wetland 12-2, observations from SR 99 right-of-way, and available stormwater utility GIS data, there do not appear to be any culverts under SR 99 that would allow bidirectional flow between Wetlands 12-1, 12-2, 12-3 and 13-1. The presence or absence of hydrologic connectivity between the wetlands would need to be field-verified during the permitting phase of the project if the SR 99 Alternative or I-5 to SR 99 Alternative were identified as the Preferred Alternative. Because of their smaller size and isolation from other habitat, their potential to perform wetland functions and opportunity is generally limited, and thus they are rated as Categories III and IV wetlands.

Wetland 15-1

Wetland 15-1 is a large (7.3-acre) depressional wetland west of SR 99, near the edge of the 300-foot study area. Wetland 15-1 is a headwater wetland in the Redondo Creek drainage basin. It is a structurally diverse wetland comprised of aquatic bed, emergent, scrub-shrub and forested vegetation communities. Dominant vegetation includes black cottonwood, red alder, and cattail (*Typha latifolia*). According to the King County (1991) Wetlands Inventory Notebook, a portion of the wetland was a peat bog dredged by the property owner. Wetland 15-1 receives a Category II rating as it has high potential for all three wetland functions. Wetland 15-1 is surrounded by residential development and thus has opportunity to provide water quality functions. It also adjoins Wooten Park, a relatively undisturbed block of forest, which provides opportunity for habitat functions.

Wetland 16-1

Wetland 16-1 is a small (0.1-acre) excavated depression that discharges to Redondo Creek in a utility corridor located west of SR 99. It appears to receive stormwater from an apartment building complex upslope and to the east. It is a sparsely vegetated emergent wetland dominated by reed canarygrass. Wetland 16-1 received a Category IV rating due to its small size in relation to the contributing watershed and very limited structural potential to provide habitat functions.

Steel Lake/Redondo Creek Wetlands (17-1, 17-2, and 17-3)

The second large group of wetlands in the SR 99 corridor is associated with a tributary of Steel Lake. This group consists of three wetlands (17-1, 17-2, and 17-3) located in Federal Way. The three wetlands total approximately 5.6 acres (Exhibit 3-3). Wetlands 17-1, 17-2, and 17-3 are associated with a Redondo Creek, a small stream that drains from Star Lake. Based on 2013 and 2014 field observations, the reach of Redondo Creek near these wetlands has seasonal flow. These three wetlands likely represent the remnants of a single wetland system divided by the construction of SR 99.

The largest wetland (17-2) is 4.8 acres and is located in the shallow valley of Redondo Creek east of SR 99, extending south to the edge of Steel Lake outside of the SR 99 study area. Vegetation in this wetland is dominated by shrub habitat (predominantly willow, salmonberry, and red alder saplings). Because Wetland 17-2 is a relatively large wetland in its watershed, supports water quality and hydrologic function in Redondo Creek, and has relatively intact buffers to the east, resulting in a Category III rating. Wetlands 17-1 and 17-3 are smaller wetlands (0.1 acre or less in size) located immediately to the west of SR 99, where the road prism has formed shallow depressions in the slope. These fragmented wetlands do have natural buffers to the south, but provide somewhat lower function due to their small size, limited potential to store floodwater and improve water quality, and limited structural diversity and habitat features. As a result, they were rated Category III.

3.1.1.2 I-5 Corridor

Sixteen wetlands were identified within the I-5 corridor. Wetlands 1-1, 2-1, 2-2, and 12-1 occur in both the SR 99 and I-5 corridors. Of these, four wetlands were accessed during the field reconnaissance surveys. The remaining 13 wetlands were not accessible during the field reconnaissance surveys and were evaluated using existing documentation and public vantage points. Details for each of these wetlands are provided in Table 3-2, and the locations are shown on Exhibits 3-1 through 3-3. Wetland determination data for wetlands identified during the field reconnaissance survey are in Appendix B.

TABLE 3-2
Wetlands in the I-5 Corridor Study Area

Wetland Name	Hydrogeomorphic Classification	Cowardin Classification[a]	Dominant Species	Approximate Wetland Acreage in Study Area (Total Wetland Acreage)	Wetland Rating (Ecology/ Local)	Jurisdiction	Buffer Width (feet)	Identified in Field Reconnaissance Surveys
1-1[b]	Slope	PSS	Willows	0.3 (0.3)	IV/III	City of SeaTac	35	No
2-1[b]	Depressional	PEM	Reed canarygrass, cattail	0.4 (0.4)	III/III	City of SeaTac	35	No
2-2[b]	Depressional	PEM	Reed canarygrass	<0.1 (<0.1)	III/III	City of SeaTac	35	No
5-1	Depressional	PSS	Willow, salmonberry	0.1 (0.1)	III/III	City of Des Moines/ City of SeaTac	50/35	Yes
12-1[b]	Depressional	PFO/SS	Red alder, black cottonwood, Sitka spruce, willows, dogwood	12.5 (108.1)	II	City of Kent	125	Yes
20-1	Depressional	PEM/PSS	Alder, willows, reed canarygrass	2.2 (2.5)	IV	City of Kent	50	No
20-2	Depressional	PSS/PEM	Willows, cattail, reed canarygrass	0.6 (0.6)	III	City of Kent	75	Yes[c]
23-1	Depressional	PFO/PSS	Red alder	<0.1 (1.2)	III	City of Kent	75	No
25-1	Depressional	PFO	Red alder, salmonberry, sedges	0.6 (4.4)	III/II	City of Federal Way	100	No
25-2	Depressional	PFO	Red alder, salmonberry, sedges	0.7 (0.7)	III/III	City of Federal Way	50	No
25-2[a]	Depressional	PSS	Red alder	0.1 (0.1)	IV/NA	City of Federal Way	NA	No
25-4	Depressional	PFO	Red alder, salmonberry, soft rush	<0.1 (4.0)	II/III	City of Federal Way/ Unincorporated King County	100/80	No

TABLE 3-2
Wetlands in the I-5 Corridor Study Area

Wetland Name	Hydrogeomorphic Classification	Cowardin Classification[a]	Dominant Species	Approximate Wetland Acreage in Study Area (Total Wetland Acreage)	Wetland Rating (Ecology/ Local)	Jurisdiction	Buffer Width (feet)	Identified in Field Reconnaissance Surveys
27-1	Depressional	PFO	Red alder, black cottonwood, willows, spirea	0.3 (0.3)	III/III	City of Federal Way	50	Yes
28-1	Lake fringe	PFO/PSS/PEM / OW	Red alder, willows, dogwood, spirea, reed canarygrass, cat-tail	0.2 (11.6)	II/I	Unincorporated King County/ City of Federal Way	100/ 200	No
29-2	Riverine	PEM	Reed canarygrass	<0.1 (<0.1)	III/III	City of Federal Way	50	No
30-3	Depressional	PFO	Red alder	0.1 (0.1)	III/III	Federal Way	50	No

[a] PEM = palustrine emergent; PFO = palustrine forested; PSS = palustrine scrub-shrub; SS = scrub-shrub (Cowardin et al., 1979)
[b] Wetlands identified in both SR 99 and I-5 corridors.
[c] Field-verified that Wetland 20-2 does not extend east into WSDOT I-5 right-of-way.
NA = not applicable

Ecology rating forms for all wetlands in the I-5 study area are in Appendix C. Sound Transit rated wetlands in the study area using Ecology's 2004 wetland rating system. Ecology has published a revised rating system that becomes effective January 1, 2015. As part of the Final EIS, Sound Transit will update the ratings for wetlands along the Preferred Alternative using the revised rating system. Photos of wetlands identified in the field reconnaissance survey are and from public rights-of-way are in Appendix D. Detailed maps of wetlands directly affected by the I-5 Alternative are shown in Appendix E.

The identified wetlands vary in size from less than 0.1 acre to more than 108 acres. As with the SR 99 corridor, Wetland 12-1 (McSorley Creek Wetland) is the major wetland in the I-5 study area. Approximately 4.5 acres of the 108.1 acres of McSorley Creek Wetland fall within the I-5 study area. Other wetlands in the I-5 study area are generally small, isolated features adjoining I-5. Vegetation present in these wetlands varies, but most of the wetlands consist of one vegetation community type. According to ratings assigned to the wetlands using the Ecology rating system, Wetlands 12-1, 25-4, and 28-1 are Category II wetlands due to their larger size, mature vegetation, habitat structure, and greater connectivity and support to other habitats. Two wetlands fall into the lower functioning (Category IV) group, and the remaining 12 wetlands provide low to moderate functional scores in between Category II and Category IV, and were rated Category III. None of the wetlands met Ecology's criteria for wetlands with special characteristics.

Wetlands 1-1, 2-1, 2-2, and 12-1 are located in both the SR 99 and I-5 corridors and are discussed in Section 3.1.1.1, SR 99 Corridor. Wetlands in the I-5 study area are discussed in more detail later in this section.

Wetland 5-1

Wetland 5-1 is a depressional wetland located on the west side of I-5 between S 221st Street and S 224th Street. It is approximately 0.8 acre in size, and vegetation in the wetland is dominated by willow, salmonberry, and Himalayan blackberry, with a smaller emergent component. Mowed lawn and an electrical substation are along the western buffer, and the eastern buffer is within the I-5 right-of-way. A dense fringe of Himalayan blackberry is present on the east side of the wetland. Wetland 5-1 scored high for water quality functions; however, it provides limited hydrologic and habitat function due to the small size, lack of habitat features, and absence of connection to other habitats, resulting in a wetland rating of Category III.

Wetland 20-1

Wetland 20-1 is depressional wetland located on the east side of I-5 across from the Midway Landfill near the edge of the 300-foot study area. Wetland 20-1 is a linear wetland feature of approximately 2.5 acres that drains water from I-5 and discharges to the north into a ravine located in the Green River drainage basin. This emergent and scrub-shrub wetland is dominated by alders, willow, and reed canarygrass. Because of its moderately large size and proximity to I-5, Wetland 20-1 provides moderate water quality function. However, it provides low hydrologic and habitat functions, and thus was rated Category IV.

Wetland 20-2

Wetland 20-2 is located west of the west side of the I-5 right-of-way and south of S 240th Street. Wetland 20-2 is a depressional wetland approximately 0.6 acre in size, and supports scrub-shrub and emergent vegetation communities. The north portion of the wetland appears to only be seasonally saturated and is mowed reed canarygrass, whereas the south portion of the wetland appears to be a permanently inundated, excavated area dominated by cattails with a fringe of willows around the perimeter of the inundated area. Wetland 20-2 discharges to an unnamed stream in the I-5 right-of-way (south of Kent-Des Moines Road), which flows north under I-5 (refer to section 3.2.2 for a discussion of this stream). Wetland 20-2 provides moderate water quality function, and low hydrologic and habitat function, and thus was rated Category III.

Wetland 23-1

Wetland 23-1 is part of the larger McSorley Creek wetland complex previously discussed in Section 3.1.1.1; it is located on the east side of I-5 near the edge of the 300-foot study area. This 1.2-acre depressional, forested wetland likely was contiguous with Wetland 12-1 prior to the construction of I-5. Wetland 23-1 was rated as a Category III wetland because of its moderately low potential to perform water quality and hydrologic functions and limited potential and opportunity to perform habitat functions.

Wetlands at I-5, Star Lake Road, and Military Road Intersection (25-1, 25-2, 25-2a, and 25-4)

Four depressional wetlands (25-1, 25-2, 25-2a, and 25-4) are associated with the intersection of I-5, Star Lake Road, and Military Road (Exhibit 3-2). Three of these wetlands (25-1, 25-2, 25-2a) are located on the west side of I-5. Wetland (25-4) is located on the east side of I-5. These wetlands likely represent a single wetland divided by the construction of Military Road, Star Lake Road, and I-5. The largest wetland (25-4) may drain to an unnamed tributary to Bingaman Pond outside the study area. The wetlands vary in size from 0.1 acre to 14.9 acres. Three wetlands (25-1, 25-2, and 25-4) are dominated by forest habitats. Red alder, salmonberry, soft rush (*Juncus effusus* spp.), and slough sedge were observed in the wetlands. Wetlands 25-1, 25-2a, and 25-4 provide moderate to high functions, with ratings of Category II and III.

Wetland 25-2 is a closed depression that was likely connected to Wetlands 25-1 and 25-4 prior to the construction of Star Lake and Military Road S. Wetland 25-2 is a WSDOT wetland mitigation site. Water currently enters the wetland from a culvert to the southwest, but no outlet was identified. Vegetation consists of a red alder canopy with an understory of salmonberry and sparse cover of unidentified sedges. This wetland provides moderate function and was rated Category III.

Wetland 25-2a is less than 0.1 acre in size and consists of a shallow roadside depression on the south side of Military Road just west of I-5. This wetland is dominated by red alder saplings, and was rated as Category IV due to its limited functional capacity. Wetland 25-2a has some riprap applied near the roadway, indicating it may be part of WSDOT's stormwater collection system for I-5. However, since WSDOT signage at the site indicates this area is a wetland and the feature appears unmaintained, it has been conservatively identified as a wetland.

Wetland 27-1

Wetland 27-1 is a closed depressional wetland approximately 0.3 acre in size located on the west side of the I-5 right-of-way, adjoining the Camelot Trailer Park (Exhibit 3-3). This wetland was likely a much larger wetland prior to the construction of the trailer park, as evidenced by fill along the west side of the wetland abutting the I-5 right-of-way boundary. Currently the wetland supports both forested and scrub-shrub vegetation communities dominated by red alder, black cottonwood, willows, hardhack spirea (*Spirea douglasii*), and slough sedge. Wetland 27-1 received a high score for water quality since it is a closed depression that treats runoff from both the trailer park and I-5. It received low hydrologic and habitat function scores due to its relatively small size, limited habitat structure, isolation in the drainage basin, and lack of connectivity to other habitats. This wetland provides moderate function and was rated Category III.

Lake Dolloff Wetlands (28-1 and 29-2)

Two wetlands are associated with Lake Dolloff (28-1 and 29-2; Exhibit 3-3) on the east side of I-5. These two wetlands total approximately 11.6 acres and are located on the east side of I-5. The largest wetland (28-1) is located on the shores of Lake Dolloff and is approximately 11.6 acres. Wetland 28-1 is a lake fringe wetland that includes multiple vegetation classes and has greater diversity of habitat niches. Vegetation present in Wetland 28-1 includes red alder, various willows, redtwig dogwood, hardhack spirea, reed canarygrass, and common cattail. Wetland 28-1 provides moderate to high water quality and moderate habitat function; this is reflected in a rating of Category II.

Wetland 29-2 is a shallow swale along the south side of Military Road, and is connected to Wetland 29-3 by a culvert under Military Road. This wetland is dominated by reed canarygrass. This wetland has a single habitat type and more limited function, resulting in lower functional scores and a rating of Category III.

South I-5 Corridor Wetland (30-3)

One depressional wetland (Wetland 30-3) is located in the southernmost portion of the I-5 corridor study area (Exhibit 3-3); this wetland may be directly affected by the I-5 alternatives. Wetland 30-3 is approximately 0.1 acre in size and is a forested wetland dominated by red alder. This small, isolated depression appears to be a remnant of a larger wetland that has been filled in from surrounding development. It received a Category III rating for its moderate water quality score and low hydrologic and habitat function scores.

3.1.2 Jurisdictional Determination

Sound Transit may request jurisdictional determinations of those wetlands that are likely to be affected by the Preferred Alternative during the permitting phase of this project.

3.2 Aquatic Species and Habitat

3.2.1 Drainage Basin

The FWLE corridor is primarily within WRIA 9 (Duwamish – Green River Basin), with a small portion of the southern extent of the study area located within WRIA 10 (Puyallup-White). The portion within WRIA 10 is south of Steel Lake in Federal Way and has no surface water streams that intersect the

project alternatives. The main water bodies and drainages in the surrounding area are the Green River to the east and Puget Sound to the west. These water bodies contain Pacific Northwest salmonid species including stocks that are listed under the ESA. The SR 99 and I-5 corridors (up to 300 feet from the alternative footprint) contain headwater streams that drain to both Green River and Puget Sound; stream flows from the project study area travel at least one-half mile before discharging to these major water bodies.

3.2.2 Streams in the Study Area

This section describes the streams that are present in the study area and provides information about fish use, fish habitat quality, and riparian habitat conditions in these streams. Table 3-3 summarizes the streams in the study area and their jurisdictional classifications. Stream classifications according to WAC 222-16-031 are also provided and are provisionally based on definitions where fish use has not been determined. These stream type determinations may change as a result of more detailed surveys that would be conducted in the future, depending on the preferred alternative. The locations of the streams in the study area are shown on Exhibits 3-1 through 3-3.

TABLE 3-3
Streams in the Federal Way Link Extension Study Area

Stream Name	Project Corridor	Stream Type in Study Area[a]	Jurisdiction	Local Jurisdiction Stream Buffer Width (feet)	Stream Type based on WAC 222-16-031[b]	Documented Salmonid Presence in Study Area
Massey Creek	SR 99	Type 3	Kent	40	Type 3	No
McSorley Creek (west of SR 99)	SR 99	F	Des Moines	115	Type 3	No
McSorley Creek (east of SR 99)	SR 99	Type 3	Kent	40	Type 3	No
Redondo Creek (downstream of Dash Point Road)	SR 99	Major Stream	Federal Way	115	Type 3	No
Redondo Creek (east side of SR 99)	SR 99	Minor Stream	Federal Way	65	Type 5	No
Bingaman Creek (north of 288th Street)	I-5	Major Stream	Federal Way	115	Type 3	No
Bingaman Creek (south of 288th Street)	I-5	Major Stream	Federal Way	115	Type 3	No
Unnamed stream in I-5 Right-of-Way (north of S 240th St)[c]	I-5	Type 3	Kent	40	Type 5	No
S 260th Street Ditch[c]	I-5	NA	Kent	NA	NA	No

[a] Stream type terminology varies between jurisdictions, but all are based on the size of the stream and its ability to support fish. Type 3 streams are segments of natural waters within bankfull width of defined channels that are perennial or intermittent streams within the portion of the channel where there is no documented salmonid use. Type F streams are those that are salmonid bearing or (as is the case here) have the potential to support salmonids. Major streams are streams that contain or support resident or migratory fish. Minor streams are any streams that do not meet the definition of "major stream."
[b] Under the WAC 222-16-031 interim water typing system, Type 3 waters are defined as segments of natural waters that have a moderate to slight fish, wildlife, or human use. If fish use has not been determined, stream segments having a defined channel of 2 feet or greater within the bankfull width and having a gradient of 16 percent or less are presumed to have fish. Type 5 waters are defined as natural waters within the bankfull width of defined channels that are seasonal, nonfish habitat streams in which surface flow is not present for at least some portion of the year and are not located downstream from any stream reach that is a Type 4 Water.
[c] The City of Kent does not regulate activities in artificial drainages intentionally created from nonwetland sites, including, but not limited to, grass-lined swales, irrigation and drainage ditches, retention or detention facilities, and landscape features (Kent City Code 11.06.040).
NA = not applicable

Appendix D includes photographs of the streams, and detailed maps of streams in relation to the FWLE alternatives are included in Appendix E. The streams in the study area are described from north to south, and by the project corridor that they intersect.

Four named creeks, one unnamed stream, and an artificial drainage ditch intersect the FWLE alternatives. Massey Creek, McSorley Creek, and Redondo Creek are located along the SR 99 corridor. The streams that are located along the SR 99 corridor all flow westward to Puget Sound. Bingaman Creek and a small drainage on the west side of I-5 south of Kent-Des Moines Road are located along the I-5 corridor and flow eastward into the Green River watershed. No other surface water crossings are known to occur or were observed in either corridor during the field visits. There are mapped drainages along the I-5 corridor that convey stormwater underground along Military Road S and are therefore not fish habitat and do not support fish passage.

Streams in the study area were assigned preliminary classifications based on the systems used by the cities of Kent, Des Moines, and Federal Way. Each city classifies and assigns protective buffers to streams based on the presence of fish and whether water flow is perennial or seasonal. Each system is hierarchical; that is, a stream is assigned to a particular category only if it does not meet the criteria of any higher ranking categories. The purpose of the preliminary assignments in this report was to identify stream buffer areas that could be affected with the light rail alternatives to allow a comparison of the potential impacts of the alternatives. Table 3-3 lists the streams and likely associated buffers for the streams in the study area.

The City of Kent defines Type 3 streams as “nonsalmonid segments of natural waters not classified as Type 1 or 2 Water. These are stream segments within the bankfull width of defined channels that are perennial and intermittent nonsalmonid habitat streams” (Kent City Code 11.06.670). The City of Des Moines classifies streams based on salmonid and potential salmonid use. Type F streams are defined as “streams that are salmonid-bearing or have the potential to support salmonids” (Des Moines Municipal Code 16.10.160). The Federal Way Revised Code defines major streams as “any stream, and the tributaries to any stream, which contains or supports, or under normal circumstances contains or supports, resident or migratory fish. If there exists a natural permanent blockage on the stream course which precludes the upstream movement of anadromous salmonid fish, then that portion of the stream which is downstream of the natural permanent blockage shall be regulated as a major stream” (Federal Way Revised Code 19.05.130). All streams in Federal Way that do not qualify as major streams are considered minor streams.

There is limited biological information available on the small creeks that intersect the study area (described below by corridor). In general, these are low-gradient streams typical of Puget Sound lowland drainages that receive their flow from springs, seeps, lake outlets, rainfall, and groundwater runoff. All of these creeks have experienced the types of habitat degradation associated with industrial development and/or urbanization, and much of the area is currently covered with impervious surfaces (Kerwin and Nelson, 2000).

Riparian species present in the study area include red alder, big-leaf maple (*Acer macrophyllum*), and Douglas-fir (*Pseudotsuga menziesii*), with madrone (*Arbutus menziesii*), spruce (*Picea* spp.), and western red cedar present in smaller quantities. Shrub species present typically include Indian plum (*Oemleria cerasiformis*) and Himalayan blackberry. The limited quantity of riparian area and the lack of large trees can effectively limit the supply of organic matter and terrestrial insects delivered to the stream system (Kerwin and Nelson, 2000).The short- and long-term potential for large woody debris (LWD) recruitment in these small stream drainages is poor because land use activities effectively preclude the maturation of riparian stands. With the exception of McSorley Creek, the riparian habitat in the study area is generally limited and confined by urban development.

Roadways and development in the area have resulted in all of the streams being conveyed through culverts and pipes for at least some portion of their length. This alters flow patterns and natural stream processes, and can pose passage barriers for fish. Impaired passage to larger, more productive streams due to extensive culverts and stormwater connections is another major limiting factor for these small streams in the study area to support fish populations.

The northern extent of the project vicinity is within the Des Moines Creek drainage basin. North of S 204th Street, an unnamed tributary to Des Moines Creek is mapped to the west, outside of the study area. No surface water channels are present within this portion of the project study area north of Kent-Des Moines Road.

SR 99 Corridor

Massey Creek

On the west side of the intersection of SR 99 and Kent-Des Moines Road is a stormwater retention pond that collects runoff from the surrounding roadways and business plaza and is the headwater for Massey Creek (Exhibit 3-1). This small creek flows west from the stormwater pond through a forested depressional area for approximately 500 feet. The creek originates from an 18-inch-diameter pipe culvert near the base of the stormwater pond embankment. At the western end of the reach, the creek flows into a vertical drain structure and into a culvert that conveys it westward under an apartment complex and road. This culvert and drain constitutes a complete passage barrier and isolates the reach within the study area from the rest of Massey Creek downstream.

The creek flows over several small cascades comprised of spall from the base of the stormwater pond. The creek then levels out to a low gradient of 1 percent or less as it spreads out into several slow-flowing branches within the wetland. The creek channel in the study area is very shallow and poorly defined with some standing water and side channels through the wetland. Wetted depths at the time of the field visit after days of substantial rain ranged from 2 to 4 inches. The eastern half of the reach within the project footprint consists of several braided channels within the wetland interconnecting multiple areas of shallow standing water. The riparian areas are comprised of a small, forested wetland area with red alder, black cottonwood, and salmonberry. There were a few pieces of LWD within the braided reach in the wetland, but the low flow and shallow water do not allow for the creation of scour pools or cover from this structure. The western half of the reach consists of a single channel approximately 4 feet wide, which was also shallow with low, poorly defined banks. The stream bed

consists of sand and organic material. Fish habitat in this reach is poor and the creek would not support salmonids.

McSorley Creek

The South Fork of McSorley Creek flows northwest from its headwaters in a large wetland area (Wetland 12-1) east of SR 99 (Exhibit 3-2). The stream channel through this wetland is approximately 7 feet wide with bank heights around 2 feet. The channel meanders at a low gradient of 1 percent with water depths of a few inches to a foot. The substrate in the wetland portion is composed of silt and fines. At SR 99, the channel turns north to follow the toe of the road embankment. At this point, the channel is straightened and narrows to 4 feet at OHWM and approximately 2 to 3 feet deep at bankfull. The flows increase slightly in this narrower section and the substrate changes to gravel and some cobble. The creek parallels the roadway for approximately 125 feet before making a sharp bend to enter a 4-foot-wide concrete box culvert that conveys the stream under SR 99. This culvert is listed as a partial barrier to fish passage (WDFW, 2014a).

The stream channel within the wetland contains good conditions for fish habitat, with a large riparian area of mixed forest. The riparian buffer vegetation in the overstory averages 20 to 30 feet in height and is dominated by Sitka spruce and black cottonwood, as well as dense stands of young red alder saplings. The shrub layer is dominated by hardhack spirea and sapling Oregon ash (*Fraxinus latifolia*), with common horsetail (*Equisetum arvense*) and creeping buttercup (*Ranunculus repens*) in the herbaceous layer.

On the west side of SR 99 the creek emerges from the culvert into a 20- to 25-foot-wide engineered drainage swale that flows north between a hotel parking lot and SR 99 at a 1 percent gradient. The swale is predominantly vegetated by reed canarygrass and Himalayan blackberry and is bounded to the east and west by paved areas. The stream channel in this reach averages 5 feet in width at the OHWM and has a gravel and cobble substrate (Jones and Stokes, 2001). Flows in this reach were less than a foot deep at the time of the field visit and the water passes over a series of shallow steps of cobble and vegetation debris at a 2 to 3 percent gradient. This segment travels parallel to the highway for approximately 110 feet before passing through an approximately 5-foot-diameter pipe culvert under a gravel drive (Exhibit 3-2 and Appendix E: Sheet 3). Fish habitat conditions in this short reach are poor due to the abundance of vegetation within the channel and the proximity to anthropogenic factors such as impervious surfaces and debris from the roadside and parking lot.

The creek continues north from the exit of the culvert and meanders through a small, forested ravine area between the gravel drive and S 260th Street. A small pool is located at this outflow of the culvert that is likely the result of scouring at high flows. An additional channel enters this drainage near the culvert from the east, carrying stormwater flows from SR 99 and headcutting back into the east slope above the South Fork McSorley Creek. North of the scoured pool, McSorley Creek continues northwest with an OHWM width of approximately 7 to 8 feet, and channel substrate consisting of gravels, cobbles, and sands with a 2 percent gradient. The channel is located at the bottom of a wooded ravine, approximately 30 feet below the elevation of SR 99 and S 260th Street. Stream habitat in this reach

consists of some riffle areas and slower-flowing runs, with water depths of less than a foot in most areas during the time of the field visit.

Riparian vegetation is dominated by red alder, salmonberry, and buttercup. Upland buffer vegetation in the canopy is a mix of mature red alder and big-leaf maple and, in the understory, trailing blackberry (*Rubus ursinus*), Himalayan blackberry, and sword fern (*Polystichum munitum*) (Jones and Stokes, 2001). The mature tree canopy provides shade and LWD recruitment to the stream channel in this reach. However, the proximity of urban development and roadways detracts from the habitat quality of this reach, and trash and human disturbance was evident throughout most of the small ravine.

At S 260th Street, the creek is conveyed through another pipe culvert near the base of the high roadway embankment. The culvert exit on the north side of S 260th Street is hanging approximately 2 feet above the stream bed and is listed as a complete passage barrier to fish (WDFW, 2014a). Beyond this, the South Fork of McSorley Creek continues westward through forested areas and merges with the North Fork to become McSorley Creek, which continues through Saltwater State Park, where it enters Puget Sound. McSorley Creek's riparian corridor is mostly intact and the corridor is the least urbanized of the four streams in the study area. Cutthroat trout (*Oncorhynchus clarki*) and coho salmon (*Oncorhynchus kisutch*) are documented to occur in McSorley Creek from the mouth at Puget Sound upstream to at least 16th Avenue S (WDFW, 2014a, b). The reach of the South Fork of McSorley Creek in the study area is mapped as non-fish-bearing (WDNR, 2014b). However, observations during field visits indicate that although this reach of McSorley Creek is isolated to fish downstream by passage barriers, the reach contains habitat that could support fish.

Redondo Creek

Redondo Creek originates at Steel Lake and passes under S 304th Street and through Wetland 17-2 on the east side of SR 99 (Exhibit 3-3). The stream flows into a 2-foot-diameter pipe culvert at the base of the retaining wall on the east side of SR 99, where it is then conveyed in the stormwater system under SR 99. The stream channel through this wetland and forested area appears to be intermittent since surface water dissipated into the ground in roughly the middle of this reach, and the culvert entrance under the retaining wall was dry during the field visit in January. The presence of a defined channel and vegetation debris deposited by flowing water on the surrounding vegetation and culvert entrance indicates that surface water flows through this channel during wetter months and provides a continuous connection between the outlet of Steel Lake and the culvert system under SR 99. Steel Lake contains largemouth bass and yellow perch, and is stocked each spring with rainbow trout (WDFW, 2013). Due to this intermittent connection with Redondo Creek, it is therefore possible that some of the fish from Steel Lake may make their way downstream into Redondo Creek east of SR 99 during periods of high flows.

Redondo Creek is conveyed underneath SR 99 in the stormwater system for approximately 2,000 feet before emerging from a culvert near the intersection of Dash Point Road (Exhibit 3-3 and Appendix E: 6 and 7). The stream flows down a steep cascade of rip rap and cobble at the bottom of a steep ravine alongside Redondo Way S. The stream channel in this cascade section is approximately 10 feet wide at bankfull and 60 feet in length, after which the stream gradient lessens to a shallow riffle. The stream

bed becomes dominated by gravels and narrows to approximately 6 feet in width. The steep hillsides along both banks of this reach are vegetated with sparse undergrowth and mature conifer trees, and scour along both banks was evident.

Approximately 160 feet downstream of the culvert exit, the stream enters a high-gradient 36-inch-diameter pipe culvert that conveys it under a utility corridor drive. At the culvert exit on the north side of the utility drive, the stream then cascades down rip rap and cobble on the steep road embankment. The hanging exit, high gradient, and undersized configuration of this culvert pose a passage barrier to fish.

The stream continues generally northward along the bottom of a forested ravine parallel to Redondo Way S. The stream in this reach is generally at a 3 to 4 percent gradient and consists mostly of shallow riffle habitat with gravel substrate and steep vegetated banks, with scour present along both banks. The channel is fairly uniform in width at about 7 to 8 feet at OHWM, and a water depth of 4 to 8 inches during the time of the field visit. The lack of habitat complexity including pools and other areas of refuge detract from the quality of potential fish habitat in this reach. The stream roughly follows the toe of the roadway embankment through mixed second-growth Douglas-fir and bigleaf maple forest with shrub understory of Indian plum, red elderberry (*Sambucus racemosa*), sword fern, and salal (*Gaultheria shallon*).

Approximately 600 feet downstream of the culvert under the utility corridor road, Redondo Creek enters another culvert that conveys it under Redondo Way S. This culvert entrance is a vertical drain structure and creates a complete passage barrier to fish. Further downstream, the creek re-emerges on the west side of Redondo Way S and follows the roadway northwest toward Puget Sound. Another passage barrier exists approximately 1,000 feet from the shoreline of Puget Sound where the creek is again conveyed into a vertical drain structure beside a parking area next to Redondo Way S. This last 1,000 feet of the creek is then conveyed through a pipe that emerges on the seawall on the shoreline of Puget Sound.

Available resources indicate coho salmon are or have been present in the lower reach of Redondo Creek downstream of S 291st Place to Puget Sound (WDFW 2014a; StreamNet 2014). A shoreline report for the City of Des Moines states that Redondo Creek has the habitat to support coho salmon and cutthroat trout, although none have been observed (Adolfson Associates, 2004). Habitat within the study reach was observed to be good riffle habitat; however, pools and flow refugia were lacking. The riparian areas surrounding the study reach are of adequate size to provide shade and cover as well as LWD recruitment. The culvert under the utility road provides a complete fish passage barrier and isolates the upper and lower reaches of the stream within the study area.

At the downstream end of the study reach, approximately 750 feet downstream of the culvert under SR 99 and Dash Point Road, Redondo Creek enters a vertical drain structure that poses a complete passage barrier to fish leaving or returning to the study area reach during wet periods. During the field visit in January 2014, the stream reach in the study area was dry and therefore not inhabited by fish species. Field observations also confirmed that Redondo Creek downstream of the study area passes

through several pipe systems and its confluence with Puget Sound is also from within a pipe. The configuration of the vertical drain structures in these piped sections precludes fish passage between the study reach and Puget Sound.

Bingaman Creek

Bingaman Creek flows roughly northeast from wetlands west of Military Road and south of S 288th Street, then bends north along I-5, then passes under the highway to connect to Bingaman Pond further to the east (Exhibits 3-2 and 3-3, and Appendix E: 12). The portion of Bingaman Creek that lies north and south of S 288th Street is within the I-5 and SR 99 to I-5 alternatives long-term footprint and runs parallel to and in proximity to the project alignment. On the north side of S 288th Street, Bingaman Creek flows north out of an inverted siphon culvert exit. The channel substrate is comprised of gravel and cobble. The banks are approximately 18 inches high to the OHWM and are steep and vegetated with some low scour. The water depth at the time of the field visit in March was 4 to 5 inches, but the channel was almost dry during an initial visit in January. The channel is fairly straight and uniform and ranges from 7 to 9 feet wide at the OHWM throughout its length. The stream gradient is low at around 1 percent with some small riffle areas approximately half way along the reach where the slope changes to approximately 2 percent. Approximately 570 feet north of S 288th Street, the creek flows east through a 3-foot-diameter concrete culvert under I-5.

Riparian habitat along this reach consists of mature coniferous forest with some shrub understory and the forested corridor containing the stream is roughly 300 feet wide, covering the property between 30th Avenue S and I-5. This vegetation provides cover and shade to the stream channel, as well as LWD input. The natural gravel stream bed, vegetated banks, and mature riparian cover provide good fish habitat in this reach. The channel is fairly uniform and seems to have been artificially straightened to run alongside the base of the I-5 road prism.

Due to its habitat features and connection to Bingaman Pond, this reach was determined to have the potential to support fish. WDFW PHS data (accessed 2014) shows cutthroat trout presence in Bingaman Creek including the project area. WDFW Salmonscape and Kerwin and Nelson (2000) report Bingaman Creek as having the potential to support coho salmon if barriers downstream of Bingaman Pond connecting to Mill Creek were not present. Potential fish presence is based on available habitat, and other species such as sculpins may also be present, but fish species actually currently inhabiting Bingaman Creek are undocumented (Fisher, 2014).

During the site visit in late January 2014, the stream channel in this reach was nearly completely dry, with only a small amount of water less than a few inches deep near the culvert exit. Although this channel was not visited in the summer, presumably this channel would also be dry during the drier times of year in late summer. During a second field visit in March 2014, the channel contained flowing water roughly 4 to 6 inches deep throughout the length of the reach and no fish were observed. Fish could potentially resume use of this reach during the wetter months of the year. However, sections of steep gradients and small cascades on the east side of I-5 likely preclude small fish from moving west to the culvert under I-5 into the study area. Therefore although cutthroat trout and other resident

species such as sculpin likely inhabit areas of Bingaman Creek, they are not likely to be present in the reach within the project footprint.

The crossing under S 288th Street is an inverted siphon culvert that creates a permanent pool of water within the structure between each vertical entrance and exit. This does not necessarily pose a physical barrier to fish passage, but potentially a behavioral one. Habitat quality on the south side of S 288th Street is much degraded compared to the reach on the north side due to the proximity of a residential mobile home park and eroding banks, frequent human disturbance, and the presence of trash.

Bingaman Creek on the south side of S 288th Street flows through a mobile home park, then north alongside an I-5 sound wall. The channel banks in the area between the mobile home park and the sound wall are eroding. The left bank is vegetated and 10 to 15 feet high, while the right bank was much lower and slopes up to the base of the concrete sound wall. The stream channel is approximately 15 feet wide at its downstream end near the trash rack and culvert entrance, and narrows upstream to 8 to 10 feet wide at bankfull. The substrate of the channel in this reach is comprised of silt and sand with organic debris, and the stream flow is very slow moving at around 1 percent slope or less. The stream flows into a trash rack structure approximately 10 feet wide before crossing under S 288th Street. At the time of the survey there was a lot of garbage piled up in the small pool that formed at the entrance to the trash rack.

Unnamed Stream in I- 5 Right-of-Way (South of Kent-Des Moines Road)

There is a small stream channel that originates in Wetland 20-2 on the west side of I-5 just south of the Kent-Des Moines Road southbound on-ramp (Exhibit 3-1 and Appendix E: 9). This small channel flows north alongside I-5 for approximately 600 feet, then through a 24-inch-diameter metal culvert that conveys it east under I-5. The channel is low gradient at less than 1 percent, and flow is very slow. There is a small area near the culvert entrance where the gradient slightly increases and the streambed is comprised of small gravel, but the rest of the channel bed is comprised of a thick layer of silt and organic material. This reach is slow moving and some aquatic vegetation is also present throughout the channel. The channel is 5 to 7 feet wide at the OHWM and there was 3 to 8 inches of water in the channel during the field visit. The banks are 6 to 14 inches high and engineered on the east side from the highway embankment materials and where recently cleared of vegetation. This channel has been at least partially excavated and routed to make a 90 degree turn to follow the edge of the I-5 road prism. Two small pipes convey water under a small berm that crosses the channel approximately 75 feet south of the culvert, which impede flow. This channel does not provide suitable habitat for salmonids and other fish and is isolated from streams that are known to contain fish.

S 260th Street Ditch

A drainage ditch is located south of S 260th Street along an old gravel road bed to the west of the I-5 embankment (Exhibit 3-2). This is an artificially constructed channel lined with rip rap and spall that conveys water for approximately 600 feet from a 2-foot-diameter concrete culvert under S 260th Street to where it dissipates in the northern portion of the McSorley Creek Wetland area. The channel is 2 to 3 feet wide and fairly straight and uniform in size along its length. The channel conveys regular flows as indicated by defined bed and banks. It may be considered a USACE jurisdictional ditch because

it connects to Wetland 12-1, which would be considered adjacent to a tributary of a traditional navigable water (McSorley Creek). The upstream end of the channel is heavily overgrown with blackberry and the surrounding area is vegetated with grasses and small shrubs. This channel does not provide suitable habitat for fish, nor is it connected to any fish-inhabitable waters.

3.2.3 Tribal Fishing

Judicial decisions have affirmed that federally recognized tribes have treaty rights that include, but are not limited to, the rights to harvest fish free of state interference (subject to conservation principles) and to co-manage the fishery resource. The Green River and the Puget Sound are among the usual and accustomed fishing areas of the federally recognized Muckleshoot Indian Tribe. Project impacts to tributaries of these water bodies could affect the productivity of tribal fisheries, and thereby harm the fishing interests of the Muckleshoot and other tribes. Sound Transit is therefore addressing potential downstream effects on fish and fish habitat in this report and coordinating with the Muckleshoot Indian Tribe Fisheries Division regarding these potential effects.

3.2.4 Federal and State Threatened, Endangered, and Candidate Species

No ESA-listed or state-listed fish species or critical habitat are known to occur within the study area (WDFW 2014a, b; Kerwin and Nelson 2000). Several species of salmonids such as Puget Sound Chinook (*Oncorhynchus tshawytscha*) and Puget Sound steelhead (*Oncorhynchus mykiss*) are listed as threatened and inhabit the Green River and Puget Sound. These water bodies are well outside the study area, although they are hydrologically connected to the stream reaches within the FWLE study area. Consequently, runoff and stormwater generated by the proposed action could eventually make its way downstream into areas where these listed species and habitats occur. Northwest of the study area, Des Moines Creek is a fish-bearing stream and is used by coho salmon and cutthroat trout (WDNR, 2014b; WDFW, 2014a; Kerwin and Nelson, 2000), but it is situated approximately one half mile to the west, well outside the study area. Coho salmon, a federal species of concern, is known to inhabit the Green River, Des Moines Creek, and the lower reaches of McSorley Creek, outside the study area. Coastal-Puget Sound bull trout (*Salvelinus confluentus*) is a federal threatened/ state candidate species found in the Green River and Puget Sound. Critical habitat is designated for Puget Sound and in the Green River, but there is none designated in the study area.

The Magnuson-Stevens Fishery Conservation and Management Act protects EFH for federally managed species of Pacific salmon, specifically Chinook, pink (*Oncorhynchus gorbuscha*), and coho salmon. EFH includes “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity” (Magnuson-Stevens Act, 2000). These species are not present within the study area; however, EFH also includes historic distribution and waters formerly accessible to salmon. Coho were likely present in Redondo, Bingaman, and McSorley creeks within the study area before development. Consequently, these water bodies are included in EFH.

3.3 Upland Vegetation and Wildlife Resources

3.3.1 Land Cover Types

The FWLE corridor is within the western hemlock (*Tsuga heterophylla*) forest zone (Franklin and Dyrness, 1988). Western hemlock and western red cedar are the dominant forest species in this zone, although Douglas-fir is also very common. Deciduous species occur primarily in disturbed areas and along rivers and streams.

Due to the heavily developed nature of the project corridor, most of the vegetation present in the study area reflects landscaping practices for urban and suburban areas, with remnant tree canopy retained for shade or aesthetics. Within the maintained road rights-of-way, the vegetation includes a mixture of trees at the rights-of-way margins, native and non-native shrubs, landscaped areas, mowed grasses, and disturbance-tolerant forbs.

Most vegetated areas in the project vicinity are on parcels that are either unsuitable or marginal for development for various reasons (for example, open space needs, steep slopes, presence of wetlands). Vegetation in these parcels typically includes a mixture of native and introduced species.

Several notable areas of upland vegetation are present within the study area in the SR 99 corridor (Exhibits 3-1, 3-2, and 3-3). The majority of these areas consist of mixed deciduous and coniferous forest with a disturbed understory (not a native upland classification). Canopy species present in these areas include red alder, big-leaf maple, and Douglas-fir with Pacific madrone, spruce, and western red cedar present in smaller quantities. Shrub species typically include Indian plum and Himalayan blackberry. The largest remnant of native forest in the study area is located in the McSorley Creek riparian corridor to the west of SR 99.

The undeveloped areas west of I-5 and the I-5 right-of-way are predominantly vegetated by non-native species with limited habitat value. The I-5 median is maintained clear of trees and the vegetation consists of mowed areas with mixed domestic and invasive grass species and disturbance-tolerant forbs, and small patches of non-native shrubs. Three larger patches of contiguous forest cover were identified along the west side of I-5: one extending from Military Road/Star Lake Road to S 288th Street; one extending from approximately S 292nd Street to S 301st Street; and one extending from Military Road near S 304th Street to approximately S 311th Street. The stand located north of S 288th Street is dominated by native species, while the remaining stands are predominantly non-native.

East of I-5, non-native upland forest patches are located between S 260th Street and S 265th Street (non-native deciduous forest associated with the headwaters of the South Fork of McSorley Creek, but fragmented by construction of I-5); on the south sides of S 272nd Street; between S 298th Street and S 302nd Street; and adjacent to the northbound on-ramp from S 320th Street to I-5. A fragment of native forest is located north of S 272nd Street.

3.3.2 Terrestrial Wildlife Species

In urban environments such as the FWLE corridor, where natural habitats are fragmented and isolated, habitat reserves consist of designated areas, such as wildlife refuges, and undesignated areas, such as

parks and open spaces. Wildlife habitat corridors may be vegetated slopes, riparian corridors, or fence rows. Patches of native vegetation, such as riparian areas, canyons, cliffs, and lakes, are often left undeveloped within urban zones. Wildlife found in and around these remnant habitats are usually a subset of the wildlife normally expected for each habitat. The species assemblage in these areas is often determined by the size of the remnant patch as well as the degree and amount of urbanization surrounding it (Ferguson et al., 2001).

The study area lies within a mapped medium-density urban habitat zone having 30 to 59 percent impervious surface (Chappell et al., 2001). The study area includes the McSorley Creek wetland complex that contains a relatively large area of established undeveloped habitats that support an array of wildlife species, more than are typically found in highly urbanized areas. Wetland and riparian areas can support reptiles and amphibians such as garter snakes and frogs. No frogs or snakes were observed during the field visit, but the frog species that may inhabit the wetland areas, such as around McSorley Creek, are the Pacific treefrog (*Hyla regilla*), bullfrog (*Rana catesbeiana*), and possibly red-legged frog (*Rana aurora*).

Small mammal species that inhabit medium-density urban habitats include rat (*Rattus* spp.), mouse (*Peromyscus* spp.), vole (*Microtus* spp.), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), Eastern gray squirrel (*Sciurus carolinensis*), and possibly skunk (*Mephitis mephitis*). Several bat species, including big brown bat (*Eptesicus fuscus*), hoary bat (*Lasiurus cinereus*), and little brown bat (*Myotis lucifugus*), are also present and inhabit forested, riparian, as well as urban and suburban areas. No evidence of beaver was observed during the field visit. Some larger mammals that are likely present but were not observed during the field visit include Columbian black-tailed deer (*Odocoileus hemonius columbianus*) and coyote (*Canis latrans*).

The FWLE alternatives lie within the Pacific Flyway, a migratory corridor consisting of the western coastal areas of South, Central, and North America. Wetlands, lakes, and vegetated areas in the project vicinity serve as foraging or resting grounds for migratory and resident bird species. Numerous bird species that are known to use the study area or were observed during the field visit include house sparrow (*Passer domesticus*), white-crowned sparrow (*Zonotichia leucophrys*), song sparrow (*Melospiza melodia*), common yellowthroat (*Geothlypis trichas*), yellow warbler (*Dendroica petechial*), northern flicker (*Colaptes auratus*), American robin (*Turdus migratorius*), American crow (*Corvus brachyrhynchos*), dark-eyed junco (*Junco hyemalis*), black-capped chickadee (*Poecile atricapillus*), and marsh wren (*Cistothorus palustris*). Several species of waterfowl were observed using the stormwater ponds in the project vicinity at Kent-Des Moines Road and alongside McSorley Creek by S 260th Street. These included several pairs of mallards (*Anas platyrhynchos*), a pair of buffleheads (*Bucephala albeola*), and two common goldeneye (*Bucephala clangula*). These species are fairly common throughout the region and are not listed federally or in Washington state. No bald eagle (*Haliaeetus leucocephalus*) were observed during the field visit and suitable nesting habitat was not evident.

The Migratory Bird Treaty Act, administered by the USFWS, makes it unlawful for anyone “at any time, by any means, or in any manner, to pursue, hunt, take, capture, kill, attempt to take, capture, or kill, [or] possess” migratory birds or their nests or eggs except in accordance with regulations of USFWS.”

The law also applies to feathers, eggs, nests and products made from migratory birds. Many bird species that may occur in the study area are protected under the Migratory Bird Treaty Act, and habitats in the study area support migratory birds at some time in their life cycle.

The McSorley Creek area between SR 99 and I-5 has the largest tract of forested habitat in the study area. This area and the larger McSorley Creek basin provide habitat for small mammals, reptiles, amphibians, and birds. The vegetated tracts west and east of McSorley Creek Wetland also provide one of the few potential movement corridors connecting Puget Sound with the Green River valley.

3.3.3 Threatened, Endangered, and Candidate Species

There are no ESA- or state-listed wildlife or plant species known to inhabit the study area. The Oregon spotted frog (*Rana pretiosa*), a federally threatened species, historically occurred in the Green River at Kent; there are no current populations of Oregon spotted frog known to occur in the study area (Hallock, 2013). The western toad (*Bufo boreas*) is a state candidate and federal species of concern that is found in Lake Washington and other water bodies in the area, but is unlikely to occur within the study area for the project. The lack of surface water ponds and the extent of human disturbance and developed areas likely preclude the presence of both species in the study area. The exception is the McSorley Creek Wetland, which may provide suitable habitat for western toad but is unlikely to provide suitable habitat for Oregon spotted frog because the wetland lacks extensive emergent habitat with good sun exposure that would be suitable for egg-laying and is located in a highly urbanized watershed (Germaine and Cosentino, 2004). WDFW has also identified the McSorley Creek Biodiversity Corridor, located approximately 300 feet west of SR 99 at the west edge of the study area, as a priority habitat area (WDFW, 2014b). More detailed biological information on species that inhabit this area would likely be required if the S 260th West Station Option is selected.

4.0 Environmental Consequences

This chapter describes the potential impacts of the FWLE alternatives on wetlands; aquatic species and habitat; vegetation; and terrestrial wildlife and wildlife habitat. The discussion of project impacts assumes that the BMPs described in Appendix F would be implemented and perform as expected to avoid and minimize certain impacts during construction.

During the Final EIS process, Sound Transit will review the Preferred Alternative to ensure ESA compliance. That assessment will also include a review of potential effects on Essential Fish Habitat, as required by the Magnuson-Stevens Fishery Conservation and Management Act. Sound Transit expects that the FWLE would result in no adverse effects on Essential Fish Habitat.

4.1 Wetlands

4.1.1 Long-Term Impacts

4.1.1.1 Impacts Common to All Alternatives

The FWLE build alternatives would have direct, long-term impacts on wetlands where the project footprint would cross wetlands or buffers. Filling or excavating within wetlands for column placement, at-grade guideways, trenched guideways, and retaining or sound walls would result in loss of wetland function through the loss of area, changes to surface or subsurface water flows, or long-term changes to vegetation. Along elevated alignments, grading and filling to install support columns and bridge support structures would result in long-term loss of wetland and wetland buffer area where such structures are placed, resulting in loss of wetland functions, although to a lesser extent than at-grade alignments. Shading effects would occur in areas under the elevated guideway where structures are not placed and would affect the type of vegetation that could be established in these areas. Where possible, Sound Transit would design stormwater systems on guideways over wetlands to not divert stormwater runoff away from the wetlands. At-grade alignments would also result in long-term loss of wetland and buffer acreage due to creation of new at-grade guideways, retaining and sound walls, and stormwater facilities. All of these activities can permanently change the capacity of a wetland to perform particular functions such as detention of stormwater, filtering pollutants, protecting stream banks, and providing habitat for wildlife. As discussed above, elevated alignments would result in a smaller long-term footprint, allowing for retention of more wetland area and regeneration of vegetation under elevated structures, whereas at-grade or trench alignments would permanently convert wetlands to a developed condition.

4.1.1.2 Impacts by Alternative

Table 4-1 summarizes potential direct impacts of the build alternatives on wetlands and wetland buffers because of grading or filling those areas. Impacts are described by alternative. Station or alignment options are described or quantified as an increase or decrease relative to the alternative(s) with which they are associated. See Appendix E for the locations of potential long-term impacts of the build alternatives and options on wetlands and wetland buffers.

TABLE 4-1
Summary of Potential Long-Term Direct Impacts on Wetlands by FWLE Alternative and Option

Alternative	Total Wetland Area (acres)	Wetland Area by Category (acres)	Wetland Buffer Area (acres)	Wetlands Impacted[a]
SR 99 Alternative	**< 0.1**	**Category II: <0.1** **Category III: <0.1**	**0.2**	**11-1, 12-1, 12-2, 12-3, 17-1**
S 216th Station Options				
S 216th West Station Option	--	--	--	--
S 216th East Station Option	--	--	--	--
Kent/Des Moines Station Options				
Kent/Des Moines HC Campus Station Option	+0.2	Category IV: +0.2	+0.2	Also impacts 6-2, 6-3, 6-4
Kent/Des Moines HC from S 216th West Station Option	+0.1	Category IV: +0.1	+0.2	Also impacts: 6-2, 6-3, 6-4
Kent/Des Moines SR 99 Median Station Option	--	--	--	--
Kent/Des Moines SR 99 East Station Option	--	--	--	--
S 260th Station Options				
S 260th West Station Option	+0.1	Category II: +<0.1 Category III: +0.1	+0.3	--
S 260th East Station Option	+0.4	Category II: +0.4	+0.2	Avoids: 12-2 and 12-3
S 272nd Redondo Trench Station Option	+0.4	Category II: +0.4 Category IV: +<0.1	+0.4	Also impacts: 15-1 and 16-1 Avoids: 12-2,12-3, and 17-1
Federal Way Transit Center SR 99 Station Option	--	--	--	--
I-5 Alternative	**1.1**	**Category II: <0.1** **Category III: 1.0** **Category IV: <0.1**	**1.1**	**5-1, 12-1, 20-2, 25-2, 25-2a, 27-1**
Kent/Des Moines Station Options				
Kent/Des Moines At-Grade Station Option	--	--	+1.0	---
Kent/Des Moines SR 99 East Station Option	-0.6	Category III: -0.6	-0.2	Avoids: 20-2
Landfill Median Alignment Option	--	--	--	---
Federal Way City Center Station Options				
Federal Way Transit Center I-5 Station Option	--	--	--	---
Federal Way Transit Center S 320th Park-and-Ride Station Option	+0.1	Category III: +0.1	+0.2	Also impacts: 30-3
SR 99 to I-5 Alternative	**0.5**	**Category II: <0.1** **Category III: 0.4** **Category IV: <0.1**	**0.9**	**12-1, 25-2, 25-2a, 27-1**
S 216th Station Options				
S 216th West Station Option	--	--	--	--
S 216th East Station Option	--	--	--	--
Landfill Median Alignment Option	--	--	--	--
Federal Way City Center Station Options				

TABLE 4-1
Summary of Potential Long-Term Direct Impacts on Wetlands by FWLE Alternative and Option

Alternative	Total Wetland Area (acres)	Wetland Area by Category (acres)	Wetland Buffer Area (acres)	Wetlands Impacted[a]
Federal Way I-5 Station Option	--	--	--	---
Federal Way S 320th Park-and-Ride Station Option	+0.1	Category III: +0.1	+0.2	Also impacts: 30-3
I-5 to SR 99 Alternative	**< 0.1**	**Category II: <0.1** **Category III: <0.1**	**0.3**	**5-1, 11-1, 12-1, 12-2, 12-3, 17-1**
S 260th Station Options				
S 260th West Station Option	+0.1	Category II: +<0.1 Category III: +0.1	+0.3	--
S 260th East Station Option	+0.4	Category II: +0.4	+0.2	Avoids: 12-2 and 12-3
S 272nd Redondo Trench Station Option	+0.4	Category II: +0.4 Category IV: +<0.1	+0.4	Also impacts 15-1 and 16-1 Avoids: 12-2,12-3, and 17-1
Federal Way SR 99 Station Option	--	--	--	--

[a] Long-term footprints would bisect Wetlands 16-1, 20-2, and 27-1. Because of the small size of these wetlands (under one acre) and likely substantial degradation of wetland functions, the entirety of these wetlands were included in impact calculations.

SR 99 Alternative

The SR 99 Alternative would primarily be elevated and located in the SR 99 median, except for crossings of Kent-Des Moines Road and S 272nd Street. Although elevated structures could minimize the amount of permanent ground disturbance, the amount of water and sunlight available to the vegetation underneath may still be reduced.

Elevated guideway structures would be relatively narrow (approximately 40 feet wide) and more than 15 feet above the ground surface in most places; the extent of impacts caused by shading on wetland vegetation would depend on the final elevation of the guideway, the slope aspect of the ground surface, and shade tolerance of existing vegetation that would be retained under the guideway. The SR 99 alternative would result in less than 0.1 acre of long-term impacts on three wetlands and 0.2 acre of long-term impacts on five wetland buffers.

Station Options

The Kent/Des Moines HC Campus Station Option from S 216th West Station Option and the Kent/Des Moines HC Campus Station Option would cross three wetlands in the headwaters of Massey Creek, resulting in an additional 0.1 and 0.2 acre of direct wetland impact, respectively. The S 260th West Station Option would result in an additional 0.1 acre of direct impacts on Wetlands 11-1 and 12-2. The S 260th East Station Option would cross the McSorley Creek Wetland (Wetland 12-1) at several locations along the east side of SR 99, resulting in 0.4 acre of additional wetland impact. The S 272nd Redondo Trench Station Option would have the same impacts on McSorley Creek as the S 260th East Station Option, but would also in additional impacts to Wetland 16-1.

I-5 Alternative

The I-5 Alternative would primarily be at-grade, with the exception of elevated guideway structures at crossings of major arterials. The at-grade profile would permanently convert existing vegetated land cover and wetland types to a developed condition within the area of the project footprint. The I-5 Alternative would result in a total of 1.1 acres of long-term impacts on six wetlands, and 1.1 acres of impacts on five wetland buffers. Direct wetland impacts could be reduced by 0.1 acre at McSorley Creek Wetland (Wetland 12-1) and would slightly reduce impacts on this wetland buffer if the alignment of the I-5 Alternative were to shift closer to I-5. Additional wetland impacts at other locations within the I-5 right-of-way (approximately 0.3 acre to wetlands and 0.3 acre to wetland buffer) could also be reduced. Refer to Appendix H of the Draft EIS for a full discussion of the I-5 western and eastern alignment screening analysis.

Station and Alignment Options

The Kent/Des Moines SR 99 East Station Option would avoid impacts on Wetland 20-2, resulting in 0.6 acre less impact on wetlands. The Federal Way S 320th Park-and-Ride Station Option would result in an additional 0.1 acre of wetland impacts since the alignment would cross an additional wetland (Wetland 30-3) in the south portion of the corridor.

SR 99 to I-5 Alternative

All wetlands impacts from the SR 99 to I-5 Alternative would occur in the I-5 corridor. This alignment would result in a total of 0.5 acre of long-term impacts on four wetlands, and 0.9 acre of long-term impacts on three wetland buffers. South of S 252nd Street, the SR 99 to I-5 Alternative would follow the same alignment as the I-5 Alternative, permanently impacting less than 0.1 acre along the northeast edge of McSorley Creek Wetland (Wetland 12-1) adjoining I-5. Direct wetland impacts could be reduced by 0.1 acre at McSorley Creek Wetland (Wetland 12-1) and would slightly reduce impacts on this wetland buffer if the alignment of the I-5 Alternative were to shift closer to I-5. Additional wetland impacts at other locations within the I-5 right-of-way (approximately 0.3 acre to wetlands and 0.3 acre to wetland buffer) could also be reduced. Refer to Appendix H of the Draft EIS for a full discussion of the I-5 western and eastern alignment screening analysis. Impacts from station and alignment options would be the same as for these options with the SR 99 or I-5 alternatives.

I-5 to SR 99 Alternative

The I-5 to SR 99 Alternative would result in less than 0.1 acre of long-term impacts on two wetlands, and 0.3 acre of long-term impacts on five wetland buffers. The I-5 to SR 99 Alternative follows the same alignment as the I-5 alternative north of Kent-Des Moines Road and would result in long-term impacts on the buffer of one low-quality wetland (Wetland 5-1) in this area. South of Kent-Des Moines Road, the I-5 to SR 99 Alternative would generally follow the same alignment as the SR 99 Alternative, impacting less than 0.1 acre of wetland along the west edge of McSorley Creek Wetland (Wetland 12-1). Impacts from station and alignment options would be the same as for these options with the SR 99 or I-5 alternatives.

4.1.2 Construction Impacts

Although detailed construction limits are not defined at this early phase in the project design, potential project construction limits have been estimated near wetlands and wetland buffers. These impact areas are in addition to the long-term direct impacts described in Section 4.1.1.

4.1.2.1 Impacts Common to All Alternatives

Construction impacts that would result in temporary loss of wetlands or wetland buffers include areas that would be cleared of vegetation or temporarily graded, which may temporarily decrease or alter wetland area, soil, hydrology, vegetation, or type. These activities may result from the use of staging areas, temporary work areas, access roads, stream relocations, cofferdams, clearing, stockpiles, erosion and sediment controls, or other temporary structures necessary to complete construction of the permanent facilities. Wetland and wetland buffer functions could also be impacted by soil compaction, accidental spills of hazardous substances, noise and other human-caused disturbances, sedimentation, and introduction of invasive species. Trench and retained fill construction would require dewatering activities, which could temporarily alter groundwater discharge to wetlands where dewatering would be required. While temporary impacts are not of the same temporal magnitude as long-term impacts, they may result in short-term decline in wetland functions that extends over a period of years. Prior to construction, best management practices for protecting and minimizing impacts on wetland areas would be identified and implemented during construction. Proposed best management practices are discussed in Appendix F.

For this analysis, the vegetation clear zone is considered a temporary impact on wetlands because it would not require permanent fill in wetlands. However, converting forested wetlands to scrub-shrub or emergent wetlands within the vegetation clear zone may be considered a long-term loss of forested wetland habitat by regulatory agencies.

4.1.2.2 Impacts by Alternative

Table 4-2 summarizes temporary impacts on wetlands and wetland buffers that could potentially occur during construction for each build alternative. See Appendix E for the locations of these impacts.

TABLE 4-2
Summary of Temporary Construction Impacts on Wetlands by FWLE Alternative and Option

Alternative	Wetlands Wetland Area (acres)	Wetland Buffer Area (acres)	Wetlands Impacted
SR 99 Alternative	**<0.1**	**0.2**	**11-1, 12-1, 12-2, 12-3, 13-1, 15-1**
S 216th Station Options			
S 216th West Station Option	--	--	--
S 216th East Station Option	--	--	--
Kent/Des Moines Station Options			
Kent/Des Moines HC Campus Station Option	+<0.1	+0.1	Also impacts: 6-2, 6-3, and 6-4
Kent/Des Moines HC from S 216th West Station Option	+.01	+0.1	Also impacts: 6-2, 6-3, and 6-4

TABLE 4-2
Summary of Temporary Construction Impacts on Wetlands by FWLE Alternative and Option

Alternative	Wetlands Wetland Area (acres)	Wetland Buffer Area (acres)	Wetlands Impacted
Kent/Des Moines SR 99 Median Station Option	--	--	--
Kent/Des Moines SR 99 East Station Option	--	--	--
S 260th Station Options			
S 260th West Station Option	+0.1	-<0.1	--
S 260th Station East Option	+0.2	+0.2	Avoids: 12-2, 12-3, 13-1
S 272nd Redondo Trench Station Option	+0.2	+0.1	Avoids: 12-2, 12-3, 13-1
Federal Way SR 99 Station Option	--	--	--
I-5 Alternative	**0.3**	**1.2**	**5-1, 12-1, 25-2, 25-2a, 27-1**
Kent/Des Moines Station Options			
Kent/Des Moines At-Grade Station Option	--	-0.1	--
Kent/Des Moines SR 99 East Station Option	--	-0.3	--
Landfill Median Alignment Option	--	-<0.1	--
Federal Way City Center Station Options			
Federal Way I-5 Station Option	--	--	--
Federal Way S 320th Park-and-Ride Station Option	--	--	--
SR 99 to I-5 Alternative	**0.3**	**0.9**	**12-1, 25-2, 25-2a, 27-1**
S 216th Station Options			
S 216th West Station Option	--	--	--
S 216th East Station Option	--	--	--
Landfill Median Alignment Option	--	-<0.1	--
Federal Way City Center Station Options			
Federal Way I-5 Station Option	--	--	--
Federal Way S 320th Park-and-Ride Station Option	--	--	--
I-5 to SR 99 Alternative	**+<0.1**	**+0.2**	**5-1, 11-1, 12-1, 12-2, 12-3,**
S 260th Station Options			
S 260th West Station Option	+0.1	-<0.1	--
S 260th Station East Option	+0.2	+0.2	Avoids: 12-2, 12-3, 13-1
S 272nd Redondo Trench Station Option	+0.2	+0.1	Avoids: 12-2, 12-3, and 13-1
Federal Way SR 99 Station Option	--	--	--

SR 99 Alternative

The SR 99 alternative would result in a total of less than 0.1 acre of temporary construction impacts on three wetlands and 0.2 acre of temporary impacts on five wetland buffers. The Kent/Des Moines HC Campus Station Option would temporarily impact three wetlands in the headwaters of Massey Creek, resulting in less than 0.1 acre of additional temporary wetland impact. The Kent/Des Moines HC Campus Station Option from S 216th West Station Option would temporarily impact three wetlands in the headwaters of Massey Creek, resulting in 0.1 acre additional impact. The S 260th West Station Option would result in 0.1 acre of additional temporary impacts on Wetlands 11-1 and 12-2. The S 260th East Station Option would temporarily impact McSorley Creek Wetland (Wetland 12-1) at several additional locations along SR 99, resulting in 0.2 acre of additional temporary wetland impact. The S 272nd Redondo Trench Station Option would avoid temporary impacts on four wetlands, but would result in 0.2 acre of additional temporary wetland impacts on one other wetland (Wetland 16-1). Construction of the S 272nd Redondo Trench Station Option may require direct dewatering in small portions of the Wetland 16-1 adjoining the east side of SR 99. However, the effect of dewatering is anticipated to be localized and temporary because the duration of groundwater drawdown would be less than 8 weeks, and groundwater levels are anticipated to recover quickly in the McSorley Creek Wetland, which is a large basin with a high groundwater table throughout the wetland.

I-5 Alternative

The I-5 alternative would result in a total of 0.3 acre of temporary impacts on five wetlands and 1.2 acre of temporary impacts on five wetland buffers. The Kent/Des Moines SR 99 Station Option would avoid Wetland 20-2, resulting in 0.2 acre less temporary impact. All impacts on Wetland 20-2 from the Kent/Des Moines At-Grade Station Option would be permanent and therefore a decrease in temporary impacts is shown in Table 4-2.

SR 99 to I-5 Alternative

The SR 99 to I-5 Alternative alignment would result in a total of 0.3 acre of temporary impacts on four wetlands and 0.9 acre of temporary impacts on three wetland buffers. South of Kent-Des Moines Road, the SR 99 to I-5 Alternative would follow an alignment similar to the I-5 Kent/Des Moines SR 99 East Station Option, temporarily impacting less than 0.1 acre of the northeast edge of McSorley Creek Wetland that adjoins I-5.

I-5 to SR 99 Alternative

The I-5 to SR 99 Alternative alignment would result in less than 0.1 acre of temporary impacts on three wetlands and 0.2 acre of temporary impacts on six wetland buffers. This alignment would result in less than 0.1 acre of temporary impact on a portion of the McSorley Creek Wetland (Wetland 12-1) adjoining SR 99. The S 260th West and East Station Options would affect an additional 0.1 and 0.2 acre of wetland, respectively, whereas the S 272nd Redondo Trench Station Option would result in 0.2 acre additional temporary impacts.

4.2 Aquatic Species and Habitat

4.2.1 Long-Term Impacts

This section describes the long-term impacts from the FWLE alternatives to streams and aquatic habitat in the study area.

4.2.1.1 Impacts Common to All Alternatives

Under most of the light rail alternatives, operation of guideways, stations, and ancillary features would not be expected to have any direct impacts on in-stream habitat. Potential long-term impacts include increases in the amount of impervious surface in the study area, which can increase stormwater runoff rates and volumes and affect stream flows, as well as increase pollutant loads, thereby affecting stream water quality. These, in turn, can lead to higher peak flows and degrade water quality in streams. New impervious areas would include new tracks and guideways, stations, park-and-ride lots, and roads. In general, elevated segments would result in less new impervious area than at-grade segments because the pervious ground would generally be retained underneath the elevated segments.

Streams within the study area are all fairly small and range in width from 4 to 15 feet at the OHWM. In cases where an elevated alignment crosses perpendicular to the stream channel, the structure would span the stream with the support columns placed on either side beyond the stream banks and outside the OHWM of the stream and, therefore, would not directly impact the bed and bank of streams or result in long-term impacts on in-stream habitat. For elevated guideways, columns are generally placed every 100 to 125 feet. The spacing and location of columns on either side of a creek crossing would be designed to maximize the distance between the creek and these columns to the extent practicable. Sound Transit would coordinate with WSDOT during the Final EIS phase to ensure that the Preferred Alternative alignment provides adequate space for any future replacement of culverts that are currently barriers to fish passage.

The exception to this is Bingaman Creek, where the guideway structure runs parallel to and over the existing stream channel. In this case, spanning the stream is not possible, and the stream would need to either be relocated or piped under the guideway structure as described later for the I-5 Alternative.

At all stream crossings the riparian areas would be impacted by the loss of forested vegetation within the long-term footprint, which would preclude forest habitat regeneration and development. However, shrubs could still regenerate under the guideway after construction is completed. The riparian areas within the long-term project footprint would consequently lose functionality by reducing the potential for the recruitment of large woody material, cover, and nutrient inputs to the stream channel within the impacted area. Almost all LWD input to streams from riparian areas is recruited from the areas within a distance approximately equal to half the height of the typical tallest trees in the area (Murphy and Koski, 1989; McDade et al., 1990). Construction of at-grade facilities outside of regulatory buffers, therefore, would likely result in minimal reductions in wood recruitment streams in the study area. Construction of elevated guideways above vegetation would reduce the amount of water the vegetation receives from precipitation and may limit sunlight. In some areas, vegetation

cleared from beneath elevated guideways may not grow back. The presence of elevated guideways would also preclude the development of mature forest riparian habitat within the project footprint.

Under alternatives where the rail alignment would cross perpendicular to the stream channel, impacts would be restricted to the riparian areas within the width of the project footprint and would not directly affect riparian areas upstream and downstream of the project footprint. The streams in the study area are within highly urbanized environments and next to existing transportation corridors, and the addition of the overhead structure and noise impacts would likely be minimal. Operation of the light rail system would not be expected to increase nighttime illumination of fish-bearing waters (which could increase the risk of predation on juvenile salmonids) because the tracks would have no overhead lighting and the train headlights would be directed parallel to the tracks.

4.2.1.2 Impacts by Alternative

This section describes the potential long-term impacts on aquatic resources for each of the FWLE alternatives and options. Calculated impact areas for streams and stream buffers are summarized in Table 4-3.

SR 99 Alternative

Massey, McSorley and Redondo Creeks are the three streams that would intersect the SR 99 Alternative. This alignment would have no impacts on existing stream channels because all three channels are in culverts under SR 99 (Table 4-3). The SR 99 Alternative footprint would have very small impacts on stream buffers along the edges of the existing roadway where the existing roadway would be widened (Appendix E). There would be no impacts on the Massey Creek buffer, less than 0.1 acre on the McSorley Creek stream buffer, and less than 0.1 acre on the Redondo Creek stream buffer.

TABLE 4-3
Summary of Potential Long-Term Impacts on Streams by FWLE Alternative and Option

Alternative	Linear Feet of Stream Channel	Stream Area (acres)	Stream Buffer Area (acres)
SR 99 Alternative	**--**	**--**	**McSorley Creek: <0.1 Redondo Creek: <0.1**
S 216th Station Options			
S 216th West Station Option	--	--	--
S 216th East Station Option	--	--	--
Kent/Des Moines Station Options			
Kent/Des Moines HC Campus Station Option	--	--	Massey Creek +<0.1
Kent/Des Moines SR 99 Median Station Option	--	--	--
Kent/Des Moines SR 99 East Station Option	--	--	--
S 260th Station Options			
S 260th West Station Option	--	--	McSorley Creek: +0.3
S 260th East Station Option	--	--	McSorley Creek: +0.1
S 272nd Redondo Trench Station Option	--	--	McSorley Creek: +0.1 Redondo Creek: +0.4

TABLE 4-3
Summary of Potential Long-Term Impacts on Streams by FWLE Alternative and Option

Alternative	Linear Feet of Stream Channel	Stream Area (acres)	Stream Buffer Area (acres)
Federal Way SR 99 Station Option	--	--	--
I-5 Alternative	**Bingaman Creek: 1055**	**Bingaman Creek: 0.2**	**Bingaman Creek: 2.4 Unnamed stream:<0.1**
Kent/Des Moines Station Options			
Kent/Des Moines At-Grade Station Option	--	--	--
Kent/Des Moines SR 99 East Station Option	--	--	--
Landfill Median Alignment Option	--	--	--
Federal Way City Center Station Options			
Federal Way I-5 Station Option	--	--	--
Federal Way S 320th Park-and-Ride Station Option	--	--	--
SR 99 to I-5 Alternative	**Bingaman Creek: 1055**	**Bingaman Creek: 0.2**	**Bingaman Creek: 2.4 Unnamed stream: <0.1**
S 216th Station Options			
S 216th West Station Option	--	--	-
S 216th East Station Option	--	--	--
Landfill Median Alignment Option	--	--	--
Federal Way City Center Station Options			
Federal Way I-5 Station Option	--	--	--
Federal Way S 320th Park-and-Ride Station Option	--	--	--
I-5 to SR 99 Alternative			**McSorley Creek: <0.1 Redondo Creek: <0.1**
S 260th Station Options			
S 260th West Station Option	--	--	McSorley Creek: +0.3
S 260th East Station Option	--	--	McSorley Creek: +0.1
S 272nd Redondo Trench Station Option	--	--	McSorley Creek: +0.1 Redondo Creek: +0.4
Federal Way SR 99 Station Option	--	--	--

Kent/Des Moines Station Options

The elevated guideway of the Kent/Des Moines HC Campus Station Option would cross the uppermost section of Massey Creek immediately south of Kent-Des Moines Road. The creek channel lies approximately 200 feet south of the foot of the roadway embankment and flows perpendicular to the rail alignment. The guideway structure would span the stream, and the columns would be constructed outside of the channel, avoiding stream impacts. This option would result in less than 0.1 acre of impact on the forested riparian area surrounding Massey Creek in this reach. The riparian and surrounding vegetated area along Massey Creek is within a wetland, so impacts on the riparian area for

this reach are captured in the wetlands analysis (Table 4-1). Other station options for the Kent/Des Moines HC Campus Station Option would not have any additional impacts.

S 260th Station Options

The S 260th West Station Option would span McSorley Creek west of SR 99, where the South Fork of McSorley Creek flows west and then north for approximately 300 feet immediately west of the highway after exiting a culvert under SR 99. Approximately halfway along this segment the stream passes through a culvert under a 40-foot-wide unpaved utility access road (Appendix E). Special guideway spans of 250 feet north of the access road and a second span 160 feet south of the access road would avoid directly impacting the stream channel. However, the riparian vegetation surrounding this reach of the creek would be impacted by the guideway structure. The project footprint would result in a loss of 0.3 acre of this forested riparian corridor between an existing stormwater pond access road and S 260th Street (Table 4-3).

S 260th East Station Option

The S 260th East Station Option would cross the South Fork of McSorley Creek on the east side of SR 99 and would span the creek in this location on an elevated guideway. The guideway columns would be constructed outside the OHWM for the creek, and no direct impacts on the creek channel itself would occur from this option. The project footprint would, however, result in long-term impacts on 0.1 acre of riparian vegetation in the McSorley Creek Wetland that is situated along the east side of SR 99 (captured in the wetlands analysis, Table 4-1).

The only culvert passing under SR 99 that is identified by WSDOT as a potential culvert replacement in the future is the McSorley Creek culvert. The design of either S 260th station option (West or East) would place guideway columns so that a future culvert replacement in this location by WSDOT would not be precluded. If either S 260th station option is identified as part of the Preferred Alternative, additional information would be prepared to further define the space needed for such a replacement.

S 272nd Redondo Trench Station Option

Redondo Creek originates at Steel Lake, but only the portion that emerges from a culvert on the west side of SR 99, just north of Dash Point Road, would be impacted by the SR 99 Alternative. A short distance north of Redondo Way S, this design option would follow an existing dirt road that runs on the east side of the ravine carrying Redondo Creek. However, a portion of the alignment would lie directly above the uppermost section of the creek for a length of approximately 150 feet to where it emerges from the pipe system under SR 99 and Dash Point Road (Appendix E). The stream in this reach consists of a shallow channel with a gravel and cobble stream bed approximately 4 feet wide with steep banks, located at the base of a ravine. Both sides are steep hill slopes with mature mixed forest cover. The alignment is designed to span this area and avoid column placement in or adjacent to the stream channel. The alignment north of the gravel access road would follow the existing utility corridor and would completely avoid the stream channel and minimize impacts on riparian vegetation. Overall, the project footprint would result in a loss of 0.4 acre of the forested riparian corridor in this reach (Table 4-3).

I-5 Alternative

The I-5 Alternative would be located on the west side of I-5 and would be within WSDOT right-of-way south of Kent-Des Moines Road to S 317th Street. The profile would be elevated, trench, or at-grade depending on topography. The various station and alignment options for the I-5 Alternative are all located outside areas where stream channels exist, and would therefore not have any impacts on streams or stream habitat. An engineered drainage ditch on the north side of the McSorley Creek Wetland lies parallel to the corridor, but would be avoided. Bingaman Creek, where it crosses S 288th Street, and a small unnamed channel south of Kent-Des Moines Road are the only stream channels that are directly impacted by the I-5 Alternative.

North of S 288th Street, Bingaman Creek flows north parallel to and west of I-5 within a wooded area. The stream channel is approximately 60 to 70 feet from the shoulder guard rail on I-5 for much of its length. The centerline of the I-5 alignment lies close to and within the creek channel as it nears S 288th Street (Exhibit E: Sheet 12). Consequently, to avoid piping the stream, Bingaman Creek would need to be relocated adjacent to the project footprint. There is undeveloped forested land west of this creek owned by King County Fire District No. 39 that is a potential location for the realigned stream. Changing the physical characteristics of a stream could affect its hydrology and sedimentation downstream, and the impacts were considered long term because the site could not be returned to its previous condition. If a new stream channel were constructed, then it would be done so as to provide habitat complexity such as riffles and pools, and native riparian vegetation would be planted. This could result in a beneficial effect on stream habitat, improving on existing conditions.

At S 288th Street, Bingaman Creek crosses under the road through an inverted siphon culvert. Unlike a conventional culvert, this type of culvert has the portion under the roadway below the elevation of the inlet and outlet, forming a permanent pool of water within the culvert itself. This configuration poses a partial barrier to fish passage. To the south of S 288th Street, the creek lies within a narrow (50-foot-wide) band of forested area lying between an I-5 sound wall and a mobile home park. Given the narrow, steep banks in this location and the at-grade profile of the alternative, placement of the guideway retained fill in this corridor would require relocating or piping Bingaman Creek (Exhibit E: Sheet 12). This section of the creek, which lies within the alterative footprint and would likely be piped, is approximately 520 feet in length from the culvert under S 288th Street to where the channel bends west and lies outside the project footprint.

If the alternative alignment were shifted between 25 and 40 feet closer to I-5, then it might be possible to maintain an open channel south of S 288th Street, although buffer impacts would still occur. Additional design work would be required to determine whether maintaining Bingaman Creek in its current location would be feasible in this situation.

Impacts on the entire length of Bingaman Creek and its riparian buffer within the project footprint would occur both during construction, and remain as long-term impacts because the stream channel would need to be relocated or piped. This would result in long-term impacts on 0.2 acre of the existing stream channel as well as 2.4 acres of the existing forested riparian area along this reach (Table 4-3).

A small unnamed stream on the west side of I-5, just south of the southbound on-ramp from Kent-Des Moines Road, lies just outside the project footprint (Exhibit 3-1). The stream channel would not be impacted by the project beyond where it emerges from Wetland 20-2. The project would affect a small portion of the buffer for this stream amounting to less than 0.1 acre. This stream currently does not provide fish habitat, and the surrounding riparian buffer is not functional as it has been heavily modified and vegetation has been completely removed along the east side of the channel next to I-5. The channel is within the WSDOT right-of-way for I-5 and regular clearing of vegetation on the right bank alongside the grassy shoulder of I-5 was evident.

SR 99 to I-5 Alternative

Like the I-5 alternative, this alternative would avoid most of the stream crossings in the study area. The alignment would head east to I-5 north of Massey Creek, and thus avoids the three main streams that intersect the SR 99 corridor. The only surface water stream crossings are the same as those described above for the I-5 Alternative. The impacts on Bingaman Creek and the unnamed stream south of Kent-Des Moines Road would be identical to those described for the I-5 Alternative. The SR 99 to I-5 Alternative station options would not have any additional impacts on streams or stream buffers.

I-5 to SR 99 Alternative

The I-5 to SR 99 Alternative would avoid impacts on Massey Creek and Bingaman Creek, and would span McSorley Creek and Redondo Creek, similar to the SR 99 Alternative. As described above for the SR 99 Alternative, there would be no direct impacts on in-stream habitat in the stream channels and less than 0.1 acre of impact on stream buffers. Impacts would be greater with station and alignment options, with up to 0.7 acre of impact if both the S 260th West Station Option and the S 272nd Redondo Trench Station Option were chosen (Table 4-3).

4.2.2 Construction Impacts

Although detailed construction limits are not defined at this early phase in the project design, potential project construction limits have been estimated near streams and stream buffers. These impact areas are in addition to the long-term direct impacts described in Section 4.2.1.

4.2.2.1 Impacts Common to All Alternatives

Temporary construction impacts on streams and their associated buffers are listed in Table 4-4. These impact areas account for a small fringe of disturbance along the project corridors outside the long-term footprint. Stream crossings would be elevated and construction activities would be implemented outside the stream channel itself and in-water work would be avoided to the extent possible. The vegetation clear zone extends 15 feet beyond the footprint of the track and is considered a temporary impact on stream buffers. Although small segments of forested stream corridor would not be allowed to regenerate forested vegetation cover in riparian corridors, shrub cover would be allowed to regenerate; therefore, stream buffer functions, such as shading and input of organic material from overhanging and stream margin vegetation to streams, would be allowed to reestablish. However, temporary culverts or pipe bypasses for the stream may be used in order to prevent impacts on the stream and water quality during construction activities. Work over or in any water bodies would require a Hydraulic Project Approval from WDFW, and any in-water work would be required to occur

during preferred "work windows," which are periods of the year when fish would be minimally impacted. After construction is completed, these temporary culverts or bypasses would be removed and the stream restored to its original location.

TABLE 4-4
Summary of Temporary Construction Impacts on Streams by FWLE Alternative and Option

Alternative	Linear Feet of Stream Channel [a]	Stream Area (acres)[a]	Stream Buffer Area (acres)[a]
SR 99 Alternative	**--**	**--**	**McSorley Creek: < 0.1 Redondo Creek: < 0.1**
S 216th Station Options			
S 216th West Station Option	--	--	--
S 216th East Station Option	--	--	--
Kent/Des Moines Station Options			
Kent/Des Moines HC Campus Station Option	Massey Creek: +60	Massey Creek: +<0.1	Massey Creek: + <0.1
Kent/Des Moines SR 99 Median Station Option	--	--	--
Kent/Des Moines SR 99 East Station Option	--	--	--
S 260th Station Options			
S 260th West Station Option	McSorley Creek: +250	McSorley Creek: + <0.1	McSorley Creek: +0.1
S 260th Station East Option	McSorley Creek: +152	McSorley Creek: + <0.1	McSorley Creek: +0.1
S 272nd Redondo Trench Station Option	McSorley Creek: +148 Redondo Creek: +180	McSorley Creek: + <0.1 Redondo Creek: + <0.1	McSorley Creek: +<0.1 Redondo Creek: +0.1
Federal Way SR 99 Station Option	--	--	--
I-5 Alternative	**--**	**--**	**Bingaman Creek 1.0 Unnamed stream <0.1**
Kent/Des Moines Station Options			
Kent/Des Moines At-Grade Station Option	--	--	--
Kent/Des Moines SR 99 East Station Option	--	--	--
Landfill Median Alignment Option	--	--	--
Federal Way City Center Station Options			
Federal Way I-5 Station Option	--	--	--
Federal Way S 320th Park-and-Ride Station Option	--	--	--
SR 99 to I-5 Alternative	**--**	**--**	**Bingaman Creek 1.0**
S 216th Station Options			
S 216th West Station Option	--	--	--
S 216th East Station Option	--	--	--
Landfill Median Alignment Option	--		
Federal Way City Center Station Options			
Federal Way I-5 Station Option	--	--	--
Federal Way S 320th Park-and-Ride Station Option	--	--	--

TABLE 4-4
Summary of Temporary Construction Impacts on Streams by FWLE Alternative and Option

Alternative	Linear Feet of Stream Channel [a]	Stream Area (acres)[a]	Stream Buffer Area (acres)[a]
I-5 to SR 99 Alternative	**--**	**--**	**McSorley Creek <0.1 Redondo Creek <0.1**
S 260th Station Options			
S 260th West Station Option	McSorley Creek: +250	McSorley Creek: + <0.1	McSorley Creek: +0.1
S 260th Station East Option	McSorley Creek: +152	McSorley Creek: + <0.1	McSorley Creek: +0.1
S 272nd Redondo Trench Station Option	McSorley Creek: +148 Redondo Creek: +180	McSorley Creek: + <0.1 Redondo Creek: + <0.1	McSorley Creek: +<0.1 Redondo Creek: +0.1
Federal Way SR 99 Station Option	--	--	--

[a] Work over Redondo Creek and McSorley Creek would require temporary piping of open stream segments to protect stream from temporary construction impacts.

The risk of construction-related impacts on water resources would be controlled by complying with the National Pollutant Discharge Elimination System Construction Stormwater General Permit process and BMPs. Within the construction footprint, aquatic resources would potentially be at risk during construction based largely on the amount of ground-disturbing activity within each basin. Any earthwork conducted within or in proximity to a stream channel has the potential to cause sedimentation that would adversely affect the stream in the watershed downstream of the work. Streams within the study area are in an urbanized environment and connected to local stormwater systems that already degrade water quality in the streams from pollution runoff and sedimentation.

Removal of vegetation along the stream banks during construction would increase the erosion hazard for the stream bank and result in the temporary loss of potential LWD recruitment until vegetation becomes reestablished. Planting of native vegetation and the addition of LWD would improve stream habitat within the impacted areas after construction. For aquatic species and habitat, earthwork and equipment associated with project construction could introduce sediment and contaminants (e.g., fuel or hydraulic fluids) to streams that could also be carried downstream of the project.

Under all alternatives, the potential for adverse impacts on aquatic species and habitat would be minimized by ensuring that work conditions and activities comply with the required project permits and by implementing BMPs designed to avoid or minimize the delivery of construction-related sediment and contaminants to streams. Impacts on water resources and wetlands from construction-related activities would be minimized by the regulations and best management practices required by the National Pollution Discharge Elimination System (NPDES) General Stormwater Construction Permit that would be issued to Sound Transit.

4.2.2.2 Impacts by Alternative

This section describes the potential temporary construction-related impacts on aquatic resources for each of the FWLE alternatives. Impact areas for streams and stream buffers are summarized in Table 4-4.

SR 99 Alternative

Construction activities for the SR 99 Alternative would temporarily impact less than 0.1 acre of stream buffer and are not expected to temporarily impact streams unless the contractor chooses to use temporary culverts. In these cases, the length of the stream channel within the project footprint would be temporarily impacted during construction activities. The linear feet of stream channel impact numbers in Table 4-4 reflect this scenario for all stream crossings. The Kent/Des Moines HC from S 216th West Station Option, Kent/Des Moines HC Campus Station Option, the S 260th Station options, and the S 272nd Redondo Trench Station Option would increase temporary impacts, but total impacts would remain under half an acre (Table 4-4).

I-5 Alternative

Construction activities for the I-5 Alternative would temporarily impact approximately 1.0 acre of Bingaman Creek stream buffer. Because the entirety of the Bingaman Creek channel within the I-5 alignment would need to be relocated or piped, all impacts on the creek channel are considered long-term impacts and are addressed in Section 4.2.1.2. Tree removal would reduce shading of the stream until vegetation becomes reestablished after project completion. The stream channel south of S 288th Street would likely need to be piped underneath the at-grade guideway, and in-stream and riparian impacts are reflected in the long-term impacts quantified in the previous section.

SR 99 to I-5 Alternative

The portion of this alignment along I-5 would also pass through Bingaman Creek north and south of S 288th Street. Construction activities would affect 1.0 acres of the riparian buffer. The stream channel would likely need to be piped and relocated, and thus be a long-term impact as described in Section 4.2.1.2. The station options for this alternative would not change these impacts (Table 4-4).

I-5 to SR 99 Alternative

Construction activities for the I-5 to SR 99 Alternative would temporarily impact less than 0.1 acre of stream buffer and are not expected to temporarily impact streams unless the contractor chooses to use temporary culverts. The S 260th Station options and the S 272nd Redondo Trench Station Option would increase temporary impacts, but total impacts would remain under half an acre (Table 4-4).

4.3 Upland Vegetation and Wildlife Resources

4.3.1 Long-Term Impacts

This section describes the long-term impacts from the FWLE alternatives on vegetation and wildlife resources in the study area. For this analysis, the amount of forest cover impacted by each light rail alternative is used to indicate the potential for long-term adverse impacts on both vegetation and wildlife. Direct long-term impacts would occur where the project limits cross land cover types that support vegetation or other wildlife habitat features.

4.3.1.1 Impacts Common to All Alternatives

The impacts of project operation on vegetation and wildlife habitat would vary, depending on the land cover type within the project limits. The impacts on the medium density urban habitat in the study area, for example, would be minimal. Little or no vegetation is present in areas classified as urban; therefore, the replacement of existing impervious surface and man-made structures with guideways or

other facilities would constitute a minimal change in the characteristics of such areas or their ability to support wildlife.

For this analysis, the vegetation clear zone that extends 15 feet beyond the footprint of the track is considered a long-term impact on forested vegetation and forested wildlife habitat because forest would not be allowed to regenerate in this area. Shrubs and ground vegetation would remain below the level of the guideway. The vegetation clear zone in at-grade sections of track would preclude the growth of shrubs and understory vegetation but could retain grasses and groundcover. The surrounding grass and low-height vegetation along the alignment would provide some habitat for ground-dwelling small mammals, such as mice and voles. These species inhabiting open grassy areas provide foraging opportunities for raptors such as red-tailed hawks.

Removing trees, snags, and understory vegetation for the project would result in the loss of nesting and foraging sites for many species of birds, as well as reduced availability of hiding cover for small mammal, and roosting and forging sites for bats. As with wetland vegetation, elevated structures would have minimal impact on upland vegetation, although forested vegetation would likely be permanently converted to herbaceous and shrub vegetation cover. The portions of the alternatives that would be at-grade or in a trench would result in long-term loss of all vegetation within the project footprint.

Potential adverse impacts of the project alignments that pass through existing forested areas would include habitat loss and disturbance to wildlife. All project alternatives are located near existing highways and urban developed areas and have low habitat value. Any wildlife inhabiting these areas is already living near human disturbance, and project impacts on existing wildlife would consequently be low. In places where the guideway would be built at-grade or in a trench, impacts on vegetation and wildlife would be greater due to vegetated ground cover loss. Where the rail structure is elevated, ground-dwelling animals would be able to pass underneath. The portions of track built at-grade or in a trench through areas of wildlife habitat would be fenced, thereby minimizing the risk of potential collisions with ground-dwelling animals. These fenced portions could however, have the potential to impede movements of animals. The FWLE corridor is highly urbanized and alongside existing roadways and consequently, the potential for further fragmentation of wildlife habitat is minimal to nil for this project.

4.3.1.2 Impacts by Alternative

This section describes the long-term impacts on vegetation and wildlife resources from the FWLE alternatives. The acres of long-term impacts on vegetation were also used to reflect the impacts on wildlife habitat and are presented in Table 4-5.

SR 99 Alternative

There would be 3.0 acres of long-term impacts on existing forested areas from the SR 99 Alternative. Of the SR 99 Alternative station options, the S 272nd Redondo Trench Station Option would have the greatest amount of impact as a result of traversing forested areas on the west side of SR 99 in Federal Way in the vicinity of Redondo Creek. The Kent/Des Moines SR 99 East Station Option would have the least impact on upland forested vegetation and wildlife habitat, although this option would affect

TABLE 4-5
Summary of Potential Long-Term Impacts on Vegetation and Wildlife Resources by FWLE Alternative and Option

Alternative	Long-term Footprint Impacts on Vegetation/ Wildlife Habitat (acres)	Vegetation Clearing Zone Impacts on Vegetation/Wildlife Habitat (acres)
SR 99 Alternative	**3.0**	**0.5**
S 216th Station Options		
S 216th West Station Option	+0.3	+ 0.1
S 216th East Station Option	- <0.1	- <0.1
Kent/Des Moines Station Options		
Kent/Des Moines HC Campus Station Option	-0.4	+0.1
Kent/Des Moines HC from S 216th West Station Option	-0.1	+0.5
Kent/Des Moines SR 99 Median Station Option	-1.1	+0.2
Kent/Des Moines SR 99 East Station Option	-1.5	--
S 260th Station Options		
S 260th West Station Option	+0.3	+0.1
S 260th East Station Option	+0.2	+0.1
S 272nd Redondo Trench Station Option	+2.6	+ 0.7
Federal Way SR 99 Station Option	-0.3	- 0.1
I-5 Alternative	**23.3**	**12.1**
Kent/Des Moines Station Options		
Kent/Des Moines At-Grade Station Option	-2.4	+1.1
Kent/Des Moines SR 99 East Station Option	-3.1	-0.5
Landfill Median Alignment Option	-0.6	+0.1
Federal Way City Center Station Options		
Federal Way I-5 Station Option	-0.1	- <0.1
Federal Way S 320th Park-and-Ride Station Option	+1.3	+0.4
SR 99 to I-5 Alternative	**18.9**	**10.2**
S 216th Station Options		
S 216th West Station Option	+0.3	+ 0.1
S 216th East Station Option	- <0.1	- <0.1
Landfill Median Alignment Option	-0.6	+0.1
Federal Way City Center Station Options		
Federal Way I-5 Station Option	-0.1	- <0.1
Federal Way S 320th Park-and-Ride Station Option	+1.3	+0.4
I-5 to SR 99 Alternative	**3.1**	**2.0**
S 260th Station Options		
S 260th West Station Option	+0.3	+0.1
S 260th East Station Option	+0.2	+0.1
S 272nd Redondo Trench Station Option	+2.6	+ 0.7
Federal Way SR 99 Station Option	-0.3	- 0.1

Notes:
Work over Redondo Creek and McSorley Creek would require temporary piping of open stream segments to protect the stream from temporary construction impacts.
The potential for permanent impacts on vegetation and wildlife is indicated by the acres of construction footprint that overlap with areas classified as Forest land cover.

several forested wetlands surrounding Massey Creek. None of the options would directly impact the McSorley Creek Biodiversity Corridor mapped by WDFW west of SR 99. Therefore, the impact of this alternative on vegetation would be limited.

The vegetation clear zone would affect approximately 0.5 acre of forested cover. The S 216th East Station Option and Federal Way SR 99 Station Option would reduce these impacts up to 0.1 acre. The S 216th West Station Option, Kent/Des Moines HC Campus Station Option, Kent/Des Moines SR 99 Median Station Option, S 260th West Station Option, S 260th East Station Option, and S 272nd Redondo Trench Station Option would increase these impacts from 0.1 to 0.7 acre.

I-5 Alternative

All impacted areas for the I-5 Alternative would be immediately adjacent to the I-5 corridor; loss of trees along the west side of I-5 would reduce forested habitat by 23.3 acres. However, because of the presence of the interstate highway and urban development adjacent to these areas, the existing habitat in this area has relatively low opportunity to provide habitat to wildlife. Much of this alignment would be constructed at-grade or in a trench, and therefore would result in long-term vegetation loss within the footprint of the project. Based on a screening study documented in Appendix H of the Draft EIS, vegetation removal could be reduced by up to 33 percent if the alignment were shifted 25 to 40 feet to the east. All station options except the S 320th Park-and-Ride Station Option would reduce these impacts. The S 320th Park-and-Ride Station Option would increase these impacts.

The vegetation clear zone would affect approximately 12.1 acres of forested cover. The Kent/Des Moines SR 99 Station Option and Federal Way I-5 Station Option would reduce these impacts, while the Kent/Des Moines At-Grade Station Option, Landfill Median Alignment Option, and Federal Way S 320th Park-and-Ride Station Option would increase these impacts. The at-grade sections of track would maintain this buffer zone and would also preclude shrubs and understory vegetation, but could retain grasses and groundcover.

SR 99 to I-5 Alternative

The SR 99 to I-5 Alternative would result in a total of 18.9 acres of long-term impacts on forested cover. The impacts on wildlife for this alternative would be the same as the SR 99 Alternative north of Kent-Des Moines Road and the same as the I-5 Alternative south of S 240th Street. There would be some vegetation lost between Kent-Des Moines Road and S 240th Street. The naturally vegetated areas located in the I-5 corridor north of S 240th Street would be avoided. The vegetation clear zone would affect approximately 10.2 acres of forested cover. Impacts from station and alignment options for the SR 99 to I-5 Alternative would be the same as described above for the SR 99 and I-5 alternatives.

I-5 to SR 99 Alternative

The impacts on vegetation and wildlife habitat for this alternative would be similar to those described above for the SR 99 Alternative, with the exception of north of S 240th Street, where the alternative is located along the I-5 corridor. With this alternative there would not be the vegetation loss associated with the I-5 Alternative in the portion of the alignment south of S 240th Street. The I-5 to SR 99 alternative would result in a total of 3.1 acres of long-term impacts on forested cover. The I-5 to SR 99

vegetation clear zone would affect approximately 2.0 acres of forested cover. Impacts from station options for the I-5 to SR 99 Alternative would be the same as described above for the SR 99 and I-5 alternatives.

4.3.2 Construction Impacts

4.3.2.1 Impacts Common to All Alternatives

Vegetation and wildlife habitat would be temporarily impacted by clearing for the FWLE's permanent facilities as well as for access roads, equipment storage areas, and other necessary construction activities.

Wildlife species near the project corridor could be impacted by construction noise, vibration, dust, dirt, light, and the clearing and grubbing of the landscape along the alignment. There would be a low risk of disturbance to wildlife from contractor access to construction sites, noise, and light during construction because the impacted areas currently have high noise levels and low habitat value. Clearing vegetation for project construction could potentially impact bird nesting sites and could result in the "take" of migratory bird nests and/or their eggs protected under the Migratory Bird Treaty Act if the clearing were conducted during the breeding and nesting season. Vegetation clearing would also increase the risk of introducing or contributing to the spread of noxious or invasive weed species, although the risk would be low and minimized by replanting and by implementing BMPs during project construction to avoid, reduce, and control new infestations of noxious weeds. Vegetation losses due to construction outside the long-term footprints would be temporary, as construction would be followed by site restoration and vegetation reestablishment. Vegetation plantings and restoration would only include native species.

After construction, vegetation would be replanted and would reestablish in areas surrounding the rail structure, although areas within the vegetation clearing zone would be replanted with non-tree species of limited height to maintain proper clearance for guideways and tracks.

4.4 Threatened and Endangered Fish and Wildlife Species, Species of Concern, and WDFW Priority Species

Potential long-term impacts on threatened and endangered species (aquatic and terrestrial) include direct mortality, disturbance and displacement effects, and loss or degradation of habitat. Project effects that may potentially affect threatened and endangered species would most likely occur where stream or other aquatic habitat is temporarily affected by project construction. Following the identification of a preferred alternative, compliance with the ESA would be assessed and documented through a No Effect memorandum, Biological Assessment, or other ESA documentation. The assessment will also include a review of potential effects on ESA, as required by the Magnuson-Stevens Fishery Conservation and Management Act. Sound Transit expects that the FWLE would result in no adverse effects on ESA.

4.5 Indirect Impacts

Operation of the FWLE could result in indirect impacts on ecosystems resources immediately upon completion of construction and over the long term. Indirect impacts from operation of the light rail and stations may result in long-term wetland degradation from stormwater discharges and alterations in wetland hydrology; however, stormwater detention and treatment activities would minimize long-term indirect impacts on wetlands.

For aquatic species and habitat, indirect impacts resulting from any of the build alternatives would be minimal because the surrounding areas are already heavily developed. The FWLE is not expected to interfere with future projects that may provide habitat improvements such as road projects that may improve fish passage, or projects that may enhance vegetated and wetland areas in the project corridor. Once a Preferred Alternative is identified, an evaluation will be conducted to ensure that the project would not preclude future culvert replacement(s) by WSDOT, and preliminary design would consider the potential need by WSDOT to replace culvert(s) in the area that may need replacing, including during construction.

Long-term impacts on vegetation, wildlife, and wildlife habitat may include disturbance due to increased human access or contributions to the spread of noxious or invasive plant species. The introduction of light rail in the area would have minor reductions in vehicular traffic on the roadways in the project vicinity, reducing greenhouse gas emissions and contaminated stormwater runoff from roadways. Indirect impacts from private development that may be induced by the FWLE would be subject to review under applicable federal, state, and local regulations. This review would trigger the implementation of measures and practices aimed at avoiding or minimizing the potential indirect adverse impacts on wetlands, aquatic species and habitat, vegetation, wildlife, and other natural resources.

This page intentionally left blank.

5.0 Potential Mitigation Measures

Appendix F (Best Management Practices for Ecosystems Resources) identifies the typical regulatory requirements for avoidance and minimization of impacts on ecosystems resources during design and construction. Sound Transit may also take additional measures to avoid and minimize impacts on sensitive natural resources as needed. The Biological Assessment or other documentation that is prepared for ESA consultation once a Preferred Alternative has been identified may also outline conservation measures and proposed aquatic habitat improvements that would become conditions of federal approvals for the selected project. Based on this analysis, and the potential mitigation measures described herein, Sound Transit expects that the project would have little to no effect on ESA-listed species and there would not be effects on Essential Fish Habitat under the Magnuson-Stevens Fishery Conservation and Management Act.

To the extent that impacts cannot be avoided or minimized through BMPs, Sound Transit would implement the potential compensatory mitigation measures discussed in the following sections.

5.1 Wetland Resources Potential Compensatory Mitigation Measures

Long-term impacts on wetlands and wetland buffers would be mitigated by replacing resources using available approved wetland mitigation banks, the King County in-lieu-fee program, advanced mitigation, or through project-specific mitigation developed by Sound Transit. It is noted that, to date, King County is the only local jurisdiction in which the FWLE is located that has codified wetland in-lieu-fee programs as an approved form of off-site compensatory wetland mitigation. Compensatory mitigation would be implemented in accordance with applicable federal, state, and local requirements and guidelines, and to the extent possible, mitigation sites would be identified close to impacts and compensate for lost values in-kind. Potential sites under consideration for project-specific wetland mitigation have not yet been identified; however, publicly owned portions of the McSorley Creek Wetland may provide opportunities for mitigation through enhancement.

5.2 Aquatic Resources Potential Compensatory Mitigation Measures

Sound Transit would also design and construct permanent stormwater treatment facilities and flow-control measures to minimize impacts on stream water quality and flow. Existing stream channels and culverts would be largely avoided by the project alternatives with the exception of Bingaman Creek with the I-5 Alternative. If this alternative were chosen, the stream channel would need to be relocated and a portion potentially conveyed within a new culvert. The loss of open channel in Bingaman Creek could be mitigated by providing improved habitat in the new channel that could be constructed to the west of the I-5 Alternative, north of S 288th Street. Compensatory off-site mitigation may be required for the stream impacts south of S 288th Street. Habitat structures such as large woody debris and pools would improve fish habitat from conditions that exist in the current creek. Sound Transit would design the new culvert crossing at Bingaman Creek and any culvert replacements proposed as part of off-site

compensatory mitigation to comply with federal, state, and local permit conditions and tribal consultation. The USACE (2012) Seattle Regional General Nationwide Permit Conditions for stream crossings require that the permittee provide the rationale behind using specific design methods for the crossing, and, if the WDFW (Barnard et al. 2013) stream simulation design method is not used, provide justification for use of a different method.

Mitigation for unavoidable impacts on streams and stream buffers that are protected under federal, state, and local regulations would also be provided in accordance with requirements. With the exception of Bingaman Creek, the project design avoids impacts on existing streams, but some unavoidable impacts on stream riparian areas would be mitigated by improving stream habitat and riparian function by replanting impacted areas with native vegetation.

5.3 Upland Vegetation and Wildlife Resources Potential Compensatory Mitigation Measures

Project impacts on vegetation, wildlife, and wildlife habitat would be avoided and minimized to the extent practicable by minimizing the footprint of light rail alignments through large blocks of forests and connected riparian corridors. Mitigation measures would be implemented before and during project construction to avoid or minimize impacts on upland vegetation and wildlife resources. Examples of these strategies are minimizing vegetation clearing, restoring temporarily impacted areas, and preparing and implementing a revegetation plan. Sound Transit would also implement a weed control plan to minimize the risk of introduction and spread of noxious and invasive species, including restoring temporarily disturbed areas immediately following construction.

To comply with Migratory Bird Treaty Act regulations, restrictions will be established for when clearing activities can occur. To the extent possible, Contractors will schedule clearing activities to occur outside the bird nesting period. In the event that this is not feasible, Sound Transit will work with qualified staff at the USFWS to conduct pre-construction surveys. Surveys will determine the presence of nesting migratory birds in the corridor. If old nests are present, they will be removed to prevent future use of those nests. If an active nest is found during construction, buffer zones may be established until the birds fledge. If removing an active nest or other action is recommended, Sound Transit will consult with USFWS to perform such activities in accordance with USFWS procedures and appropriate permit conditions. Sound Transit may use contracted staff, permitted by USFWS, to perform additional compliance or management activities.

6.0 References

Adolfson Associates, Inc. 2004. City of Des Moines Shoreline Inventory and Characterization. Public Review Draft. Prepared for the City of Des Moines.

Barnard, R.J., J. Johnson, P. Brooks, K.M. Bates, B. Heiner, J.P. Klavas, D.C. Ponder, P.D. Smith, and P.D. Powers. 2013. *Water Crossings Design Guidelines*, Washington Department of Fish and Wildlife, Olympia, WA. http://wdfw.wa.gov/hab/ahg/culverts.htm.

Brinson, M.M. 1993. *A Hydrogeomorphic Classification for Wetlands*. U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, MS. Wetlands Research Program Technical Report WRP-DE-4.

CH2M HILL. 2014. *Sound Transit Federal Way Link Extension Technical Analysis Methodologies*. Prepared for Sound Transit. March 2014.

Chappell, C.B., R.C. Crawford, C. Barrett, J. Kagan, D.H. Johnson, M. O'Mealy, G.A. Green, H.L. Ferguson, W.D. Edge, E.L. Greda, and T.A. O'Neil. 2001. Wildlife habitats: descriptions, status, trends, and system dynamics. *In* D.H. Johnson and T.A. O'Neil, eds., *Wildlife Habitat Relationships in Oregon and Washington*. Oregon State University Press, Corvallis, OR.

City of Des Moines. 2013. Des Moines Municipal Code, Title 18.86 Environmentally Critical Areas.

City of Des Moines. 2010. City of Des Moines Critical Area Map Series, Wetland and Surface Waters. Available at: http://www.desmoineswa.gov/DocumentCenter/View/41. Accessed March 2013.

City of Federal Way. 2013a. Federal Way Revised Code, Title 19 Division 5, Critical Areas.

City of Federal Way. 2013b. Federal Way Critical Areas Map. Available at: http://wa-federalway.civicplus.com/DocumentCenter/Home/View/460. Accessed March 2013.

City of Kent. 2013. Kent City Code, Title 11.06, Critical Areas.

City of SeaTac. 2013. Critical Areas Ordinance Title 15.30 Environmentally Sensitive Areas. Accessed March 27, 2013.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. U.S. Fish and Wildlife Service, Washington, DC. FWS/OBS-70/31.

Ferguson, H.L., K. Robinette, and K. Stenberg. 2001. In D.H. Johnson and T.A. O'Neil. Ed. Wildlife Habitat Relationships in Oregon and Washington. Oregon State University Press.

Fisher, L. 2014. Washington Department of Fish and Wildlife Area Habitat Biologist. Washington Department of Fish and Wildlife. Issaquah, Washington. Personal communication. October 21, 2014.

Franklin, J.F., and C.T. Dyrness. 1988. *Natural Vegetation of Oregon and Washington.* Oregon State University Press, Corvallis, OR.

Germaine, S. S. and B. L. Cosentino. 2004. Screening Model for Determining Likelihood of Site Occupancy by Oregon Spotted Frogs (Rana pretiosa) in Washington State. Final Report. Washington Department of Fish and Wildlife, Olympia, WA.

Hallock, Lisa. 2013. Draft State of Washington Oregon Spotted Frog Recovery Plan. Washington Department of Fish and Wildlife, Olympia, WA. 93 +v pp.

Hruby, T. 2004. *Washington State Wetland Rating System for Western Washington, Revised.* Washington State Department of Ecology Publication #04-06-025 (includes 2008 revisions). Available at: www.ecy.wa.gov/pubs/0406025.pdf. August 2004.

Jones and Stokes. 2001. *Pacific Highway South HOV lanes Addition Wetland Delineation Report*. Prepared for City of Kent Department of Public Works. January 24.

Kerwin, J., and T.S. Nelson (eds.). 2000. *Habitat Limiting Factors and Reconnaissance Assessment Report, Green/Duwamish and Central Puget Sound Watersheds (WRIA 9 and Vashon Island)*. Washington Conservation Commission and the King County Department of Natural Resources.

King County. 2013. King County Code Title 21A.24, Critical Areas.

King County. 1991. King County Wetlands Inventory, Volumes I through III. King County Department of Parks, Planning and Resources. March 1991.

Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). 2000. 16 U.S.C. § 1855(b)(2).

McDade, M.H., F.J. Swanson, W.A. McKee, J.F. Franklin, and J. Van Sickle. 1990. Source distances for coarse woody debris entering small streams in western Oregon and Washington. *Canadian Journal of Forest Research* (20): 326-330.

Merriam Webster. 2013. Merriam-Webster Online Dictionary. Available at: http://www.merriam-webster.com/dictionary/ecosystem. Accessed August 10, 2013.

Murphy, M.L., and K.V. Koski. 1989. Input and depletion of woody debris in Alaska streams and implications for streamside management. *North American Journal of Fisheries Management* 9(4): 427-436.

NOAA Fisheries. 2013. Species Lists. Available at: http://www.nwr.noaa.gov/protected_species/species_list/species_lists.html. Accessed December 2013.

Natural Resources Conservation Service (NRCS), Soil Survey Staff, United States Department of Agriculture. Web Soil Survey. Available online at http://websoilsurvey.nrcs.usda.gov/. Accessed December 2013.

Sound Transit. 2011. *Sound Transit Sustainability Plan*. Available at: http://www.soundtransit.org/Documents/pdf/about/environment/SustainabilityPlan.pdf. June 2011.

Sound Transit. 2004. Sound Transit Environmental Policy. Available at: www.soundtransit.org/documents/pdf/working/environmentalpolicy.pdf. April 2004.

StreamNet. 2014. Metadata for Pacific Northwest salmonid and critical habitat distribution. StreamNet, Portland, OR. Available at: http://www.streamnet.org/online-data/GISData.html. Accessed January 2014.

U.S. Army Corps of Engineers (USACE). 2012. *User's Guide for Nationwide Permits in Washington State*. June 15, 2012.

U.S. Army Corps of Engineers (USACE). 2010. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (Version 2.0). U.S. Army Corps of Engineers, Research and Development Center, Vicksburg, MS.

U.S. Army Corps of Engineers (USACE). 1987. *Corps of Engineers Wetland Delineation Manual*. Technical Report Y-87-1. U.S. Army Corps of Engineers, Environmental Laboratory, Waterways Experiment Station, Vicksburg, MS.

U.S. Army Corps of Engineers (USACE) and U.S. Environmental Protection Agency (USEPA). 2008. Compensatory Mitigation for Losses of Aquatic Resources: Final Rule (Mitigation Rule). 33 Code of Federal Regulations Parts 325 and 332. April 10, 2008.

U.S. Fish and Wildlife Service (USFWS). 2013. Species by County Report. Available at: http://ecos.fws.gov/tess_public/countySearch!speciesByCountyReport.action?fips=53033. Accessed April, 2013.

Washington Department of Fish and Wildlife (WDFW). 2014a. Salmonscape Species Presence Mapping. Available at: http://wdfw.wa.gov/mapping/salmonscape/index.html. Accessed January 2014.

Washington Department of Fish and Wildlife (WDFW). 2014b. Priority Habitat and Species (PHS) on the Web. Available at: http://wdfw.wa.gov/conservation/phs/list/. Accessed January 2014.

Washington Department of Fish and Wildlife (WDFW). 2013. Fish Washington: Steele Lake. Available at: http://wdfw.wa.gov/fishing/washington/33/.

Washington Department of Natural Resources (WDNR). 2014a. Forest Practice Applications Review System. Stream Typing Online Mapper. Available at: http://fortress.wa.gov/dnr/app1/fpars/viewer.htm. Accessed January 2014.

Washington Department of Natural Resources (WDNR). 2014b. Natural Heritage Information Request Self-Service System. http://www.dnr.wa.gov/Publications/amp_nh_trs.pdf. Data Current as of February 4, 2014.

Washington State Department of Ecology (Ecology), U.S. Army Corps of Engineers Seattle District, and U.S. Environmental Protection Agency Region 10. 2006. *Wetland Mitigation in Washington State – Part 1: Agency Polices and Guidance* (Version 1). Washington State Department of Ecology Publication # 06-06-011a.

GIS

AeroMetric. 2013. Aerial imagery.

City of Des Moines. 2013. Zoning, comprehensive plan, impervious surface, storm sewer, and related infrastructure. Data obtained via ftp: http://www.desmoineswa.gov/index.aspx?nid=140. September 2013.

City of Federal Way. 2013. Zoning, comprehensive plan, impervious surface, storm sewer, and related infrastructure. http://gis.cityoffederalway.com/disclaimer/GIS_DATA_DISCLAIMER.htm. September 2013.

City of Kent. 2013. Zoning, comprehensive plan, impervious surface, storm sewer, and related infrastructure, sanitary sewer, and related infrastructure. http://kentwa.gov/maps/. September 2013.

City of SeaTac. 2013. Zoning, comprehensive plan, and impervious surface. Data obtained via ftp: http://www.ci.seatac.wa.us/index.aspx?page=112. September 2013.

King County. 2013. GIS data for streets, tax parcels, building footprint, zoning, census data, city boundaries, parks and open spaces, transit facilities, slopes, wetlands, wellhead protection areas, and streams. http://www5.kingcounty.gov/gisdataportal/.

Washington State Department of Fish and Wildlife. 2014. Priority Habitats and Species Data (PHS). Data obtained by request at habitatprogram@dfw.wa.gov.