SECTION 3 STUDY APPROACH

What is the study area and how was it determined?

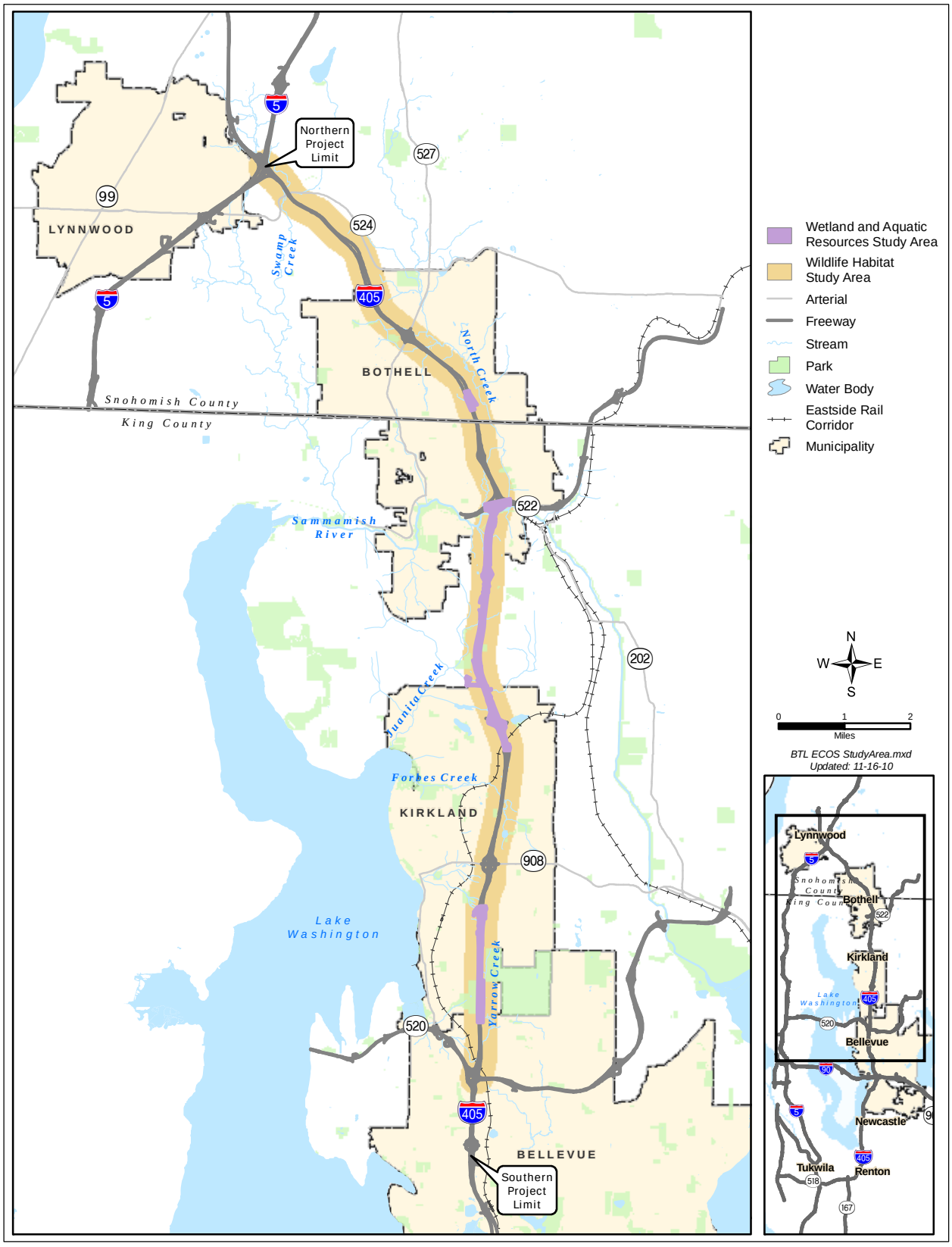
The study area includes areas where temporary or permanent effects to wetlands, aquatic resources, and wildlife habitat from the Bellevue to Lynnwood Improvement Project may occur.

For wetlands and aquatic resources, the study area is limited to areas that road widening or construction of stormwater facilities are proposed (see Exhibit 3-1).

The study area for wildlife habitat differs from the study area for wetlands and aquatic resources. To evaluate wildlife habitat, the I-405 Team identified wildlife and vegetation resources along I-405 between SR 520 and I-5. For wildlife species, the study area extends 1.0 mile from I-405 on either side. For vegetation resources, the study area extends 0.25 miles from I-405 within the project limits, as shown on Exhibit 3-1.

Project-related activities between NE 6th Street and SR 520 are limited to restriping existing pavement and sign installation adjacent to existing pavement. For information on existing conditions between NE 6th Street and SR 520, refer to the I-405, NE 8th Street to SR 520 Improvement Project Ecosystems Discipline Report (WSDOT 2007b).

Exhibit 3-1: Study Area



What policies or regulations are related to effects on ecosystems?

Wetlands, aquatic resources, and wildlife habitat are protected by federal, state, and local laws because of their ecological functions and social value. The laws, regulations, and associated agencies that govern these resources in the study area are detailed in this section.

Wetlands

Numerous federal, state, and local regulations govern development and other activities in or near wetlands. Five agencies have jurisdiction over wetlands in the Bellevue to Lynnwood Improvement Project study area:

- City of Bellevue
- City of Bothell
- City of Kirkland
- King County
- U.S. Army Corps of Engineers (Corps)
- Washington State Department of Ecology (Ecology)

The federal Clean Water Act (CWA) is the principal piece of legislation that regulates activities that may affect wetlands. The CWA grants the Corps and a designated state agency (in this case, Ecology) the authority to regulate certain activities in wetlands and other types of waterbodies. At the city and county level, Washington State's Growth Management Act requires that wetlands be protected under the local zoning code or other regulations that have been specifically developed to manage wetlands and other environmentally critical areas.

In addition to oversight by these agencies, WSDOT and FHWA are obligated to consider wetland protection and to minimize the destruction, loss, or degradation of wetlands as a result of several other orders including:

- Department of Transportation Order 5660.1A (FHWA)
- Federal Executive Order 11990 of 1978
- State of Washington Executive Order 89-10, Protection of Wetlands (WSDOT)

Aquatic Resources

The main federal regulations or statutes regulating activities that govern aquatic resources in the study area are:

- CWA Section 401 (water quality)
- CWA Section 404 (discharge of materials to waters of the United States, including wetlands)
- Coastal Zone Management Act
- Endangered Species Act (ESA)
- Rivers and Harbors Act (Section 10)

State laws that regulate these resources include the State Hydraulic Code (Chapter 77.55, Revised Code of Washington [RCW]), Water Quality Standards for Surface Waters of the State of Washington (Chapter 90.48, RCW), and the Washington State Shoreline Management Act (SMA; Chapter 90.58, RCW) implemented through the Washington Administrative Code (WAC). According to Ecology, projects meeting the Ecology guidelines or equivalent standards such as the *Highway Runoff Manual* (WSDOT 2008b) are presumed to meet federal and state water standards.

Local critical areas ordinances are also in place to regulate effects to aquatic resources. In general, these regulations protect aquatic habitats and the species, both aquatic and terrestrial, that depend on these areas.

Wildlife Habitat

Wildlife habitat is primarily regulated by local critical areas ordinances, with certain species receiving additional protection under state and federal statutes. Bald eagles are protected by the State of Washington's Bald Eagle Protection Rules (WAC Section 232-12-292) and by the federal Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act. Almost all bird species are regulated under the Migratory Bird Treaty Act. Other federally-listed upland plant and animal species are also regulated under the ESA.

How did we collect information on ecosystems for this report?

The I-405 Team collected existing information on wetlands, aquatic resources, and wildlife habitat in the study area by reviewing available literature; by performing Internet

searches; and by conducting interviews with various federal, state, county, and local agencies, and tribal representatives. Tribal governments in the project area include:

- Confederated Tribes and Bands of the Yakama Nation
- Duwamish Tribe
- Muckleshoot Indian Tribe
- Snoqualmie Tribe
- Tulalip Tribe

The I-405 Team sent letters to each tribe in late December 2006 to initiate Section 106 consultation for the Bellevue to Lynnwood Improvement Project. Tribal coordination on cultural resource issues continued through 2010.

The team also reviewed information collected on ecosystem resources from the Kirkland Nickel Project, the I-405/NE 195th Street to SR 527 – Northbound Auxiliary Lane Project, and the NE 8th Street to SR 520 Project. This report relies, in part, on information collected for those three projects.

To determine the quantity and quality of existing ecosystem resources, the team collected field information by conducting wetland delineations and stream surveys, and by identifying vegetation types and wildlife species in the study area. Additional information was collected during a series of interdisciplinary team site visits where experts in the fields of fisheries, wetlands, wildlife, road design, drainage design, and permitting reviewed the natural and manmade features located in the study area.

Wetlands

Prior to proceeding with any wetland fieldwork, the team conducted a review of existing wetland information based on recommendations found in the Corps *Wetland Delineation Manual* (Environmental Laboratory 1987), the *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (Corps 2008), and the *Washington State Wetlands Identification and Delineation Manual* (Ecology 1997). The team reviewed recent aerial photographs of the study area, the National Wetland Inventory (USFWS 1987, 1988), and the 1990 King County Sensitive Areas Map Folio (King County 1990). The team also consulted local government information, including the 2010

publications of the City of Bellevue Land Use Code Critical Areas Overlay District (Bellevue 2010), the City of Kirkland Sensitive Areas Maps (Kirkland 2010b), and the City of Bothell Critical Areas Regulations (Bothell 2010). The team referred to the Washington State Department of Fish and Wildlife (WDFW) Priority Habitats and Species database (WDFW 2006), and obtained additional information about the location of known hydric soils using maps published by the Natural Resources Conservation Service (NRCS) (NRCS 1995, 1998).

The team also reviewed the WSDOT Kirkland Nickel Project Wetlands Discipline Report (WSDOT 2005a) and Wetlands Biology Report (WSDOT 2005b), the WSDOT I-405/NE 195th Street to SR 527 – Northbound Auxiliary Lane Project Wetland Biology Report (WSDOT 2009), and the NE 8th Street to SR 520 Wetland Biology Report (WSDOT 2008a) to evaluate the wetlands delineated for those projects. These delineations were completed between February and December 2004 and the reports were issued in February and May of 2005. In direct coordination with the regulatory agencies, we have determined the wetland delineations and functions information contained in these reports are still relevant for this project.

Wetland Classification

Wetlands were classified in the study area according to the Cowardin classification system. This system, published in 1979 by a team of U.S. Fish and Wildlife Service (USFWS) scientists led by L.M. Cowardin (Cowardin et al. 1979), bases the classification of wetlands on their physical characteristics, such as the general type of vegetation in the wetland (trees, shrubs, grass, etc.). Specifically, the I-405 Team assigned each wetland to one of the following Cowardin classes: palustrine emergent (PEM); palustrine scrub-shrub (PSS); and palustrine forested (PFO).

Wetland Ratings

At the state level, wetlands are categorized by applying the most current version of the Washington State Wetlands Rating System – Western Washington: Revised (Ecology 2004) and the Washington State Wetland Rating Form – Western Washington (Ecology 2006, 2008). Ecology developed this system to differentiate wetlands based on their sensitivity to disturbance, their significance in the watershed, their rarity,

our ability to replace them, and the beneficial functions they provide to society.

The Ecology rating system requires the user to collect specific information about the wetland in a step-by-step process. Three major functions are analyzed: flood and erosion control, water quality improvement, and wildlife habitat. Ratings are based on a point system that assigns points to a wetland if it meets specific criteria related to its potential and opportunity to provide certain benefits. Once the wetland is rated, it is then assigned to a category according to the following criteria:

- **Category I** wetlands represent a unique or rare wetland type, or are more sensitive to disturbance, or are relatively undisturbed and contain ecological attributes that are impossible to replace within a human lifetime.
- **Category II** wetlands are difficult, though not impossible, to replace, and provide high levels of some functions.
- **Category III** wetlands have a moderate level of function. They have been disturbed in some way and are often less diverse or more isolated from other natural resources in the landscape than Category II wetlands.
- **Category IV** wetlands have the lowest levels of functions and are often heavily disturbed.

What are the point totals for scoring wetland categories based on the Ecology rating system?

Category I = Score > 70

Category II = Score 51 - 69

Category III = Score 30 - 50

Category IV = Score < 30

Local jurisdictions within the study area, including the City of Bothell, City of Kirkland, and King County, have critical areas ordinances that allow them to prioritize wetland protection (Bothell 2010; Kirkland 2010a; King County 2010). The Bothell and King County critical areas ordinances directly adopt the state rating system. The Kirkland local wetland rating system considers some criteria specific to that jurisdiction, such as rarity within the local area. The Kirkland wetland rating system is three-tiered, as opposed to the four-tier state rating system.

Local jurisdictions may rate some wetlands differently than Ecology. Such differences typically are the result of the jurisdiction using a different tier system (such as Kirkland), or valuing a wetland differently based on its relative importance within the jurisdiction's area of authority. These rating systems are usually established under the local jurisdiction's critical areas ordinance, which also establishes buffers around

the wetlands to protect them from encroachment that could affect their viability.

What is a wetland hydrogeomorphic classification?

The hydrogeomorphic classification of a wetland is based on the three fundamental factors that influence how wetlands function, including geomorphology, water source, and hydrodynamics. Hydrodynamics is the motion and action of water and other liquids and the study thereof. Geomorphic relates to the structure and development of the earth's physical surface.

Wetland Functions

The functional values of wetlands in the study area were rated according to the most current version of Ecology's Washington State Wetlands Rating System (Ecology 2004) and Washington State Wetland Rating Form (Ecology 2006, 2008). Using Ecology's system, wetland biologists assigned points to each wetland based on three functional value categories: water quality; hydrologic value; and wildlife habitat. To accurately assess a wetland's functional values, we calculated function scores based on entire wetland systems, when applicable, not just the delineated portion of wetlands within the study area. Appendix B includes wetland rating forms for all wetlands in the study area, including the rating forms previously completed for the Kirkland Nickel Project.

As part of Ecology's rating system, Ecology determined the hydrogeomorphic classification of wetlands. Each hydrogeomorphic wetland class has specific rating criteria for water quality and hydrologic functions. Habitat functions rating criteria are the same for each of the hydrogeomorphic wetland classes (see Appendix F for details about wetland function values).

Aquatic Resources

The team conducted surveys on streams in the study area to determine the quantity and quality of existing riparian habitat. During August and September of 2006, the team surveyed and characterized the in-stream and riparian habitats of area streams. Many streams in the study area had been previously evaluated for the Kirkland Nickel Project, and that analysis was presented in the Kirkland Nickel Project Fish and Aquatic Resources Discipline Report (WSDOT 2005c). For the Bellevue to Lynnwood Improvement Project, team members reviewed information on the Kirkland Nickel Project aquatic resources and then conducted surveys only for streams not previously surveyed. However, team members completed reconnaissance-level stream surveys for streams studied for the Kirkland Nickel Project if effects to these streams could occur from this project. Exhibit 3-2 lists, from south to north, all of the streams in the study area, and shows which streams were previously evaluated for the Kirkland Nickel Project.

What is riparian habitat?

Riparian habitat is defined as the aquatic and terrestrial habitat adjacent to streams, lakes, estuaries, or other waterways. Riparian habitat areas are also commonly referred to as riparian buffers.

Exhibit 3-2: Streams in the Study Area

Stream	Stream Studied for the Kirkland Nickel Project?
Yarrow Creek	Yes
C5	Yes
Juanita Creek at NE 124th Street	No
Juanita Creek at NE 132nd Street	Yes
Juanita Creek at NE 145th Street	Yes
C28	Yes
C29	Yes
KL14	Yes
Stream 42	No
Sammamish River	Yes
Stream 64	No
Stream 66	No

The team performed the stream surveys to measure and quantify stream characteristics such as length, width, and depth of the waterbody; the quantity and quality of in-stream habitat; the nature and type of riparian vegetation; substrate composition; the presence and size of large woody debris (LWD); and any observed fish use. The habitat surveys were conducted from 300 feet upstream to 0.25 miles downstream of the project for each stream or river. The stream surveys followed specific methodologies, which are summarized in Appendix A.

The I-405 Team also performed surveys to quantify and qualify LWD recruitment for streams proposed for direct or buffer impacts. The results of these surveys are summarized in Appendix H. The I-405 Team also identified all WSDOT-owned culverts in the study area.

Wildlife Habitat

The I-405 Team used land cover geographic information system (GIS) data received from King County and from the Kirkland Nickel Project to assist in identifying the types and condition of upland vegetation and habitat resources within the study area.

Using aerial photography from 2002 (USGS 2002), an impervious surface GIS dataset (King County 2004), and a land cover GIS dataset (WSDOT 2003), the I-405 Team mapped four land cover types within the study area. This process involved overlaying the impervious surface and land cover datasets on the aerial photography. The team then edited the land cover dataset based on aerial photo interpretation (at a scale of 1:1000 to 1:4000) and vegetation communities observed during reconnaissance-level surveys of the study area.

Additionally, the team collected background information on wildlife and plant species present in the study area by reviewing plant and animal databases, including the following:

- Washington State Department of Natural Resources (WDNR) Natural Heritage Program, which details known records of rare plants and rare plant communities (WDNR 2006b)
- Priority Habitats and Species Program administered by WDFW, which details priority habitats and species information (WDFW 2006)

The I-405 Team worked with local regulators and WDFW and USFWS staff to verify the presence of plant and animal species identified in the state plant and animal databases in the study area.

How did we evaluate effects on ecosystems?

The project has the potential to affect existing wetlands, aquatic resources, and wildlife habitat. Potential effects to these resources could be either temporary or permanent.

Wetlands

The I-405 Team evaluated potential effects to wetlands using wetland information gathered in the field, coupled with an overlay of the project footprint. The I-405 Team surveyed and mapped wetlands in the study area based on the boundaries identified by team members in the field. Project engineers reviewed the wetland mapping, compared it to the project footprint, and calculated wetland loss using computer-aided design (CAD) software. In addition to calculating direct (permanent) wetland losses from the project, areas of

temporary wetland losses during project construction were also calculated. Effects to wetland buffers were calculated by evaluating the project's temporary and permanent construction effects that will occur within the regulated wetland buffers. In addition, the team evaluated each affected wetland to determine whether the extent of the effects will alter the overall function and viability of each wetland.

Aquatic Resources

The I-405 Team evaluated the effects on aquatic resources by reviewing information gathered on aquatic resources in the study area and by assessing project design data and WSDOT construction practices. We reviewed this information to identify potential changes to the study area's aquatic resources' size and function during and following project construction.

Similar to wetlands, team members calculated potential permanent and temporary effects to aquatic resources from the project by overlaying the project footprint with aquatic resources in the study area. Using this information, the I-405 Team determined the aquatic resources and habitat that will likely be affected by the project. Aquatic resource habitat that may be lost was also identified. In addition to permanent and temporary effects, indirect effects from the project were also evaluated, including shading from new structures and increases in stormwater flow.

Wildlife Habitat

The I-405 Team evaluated the effects of the project on wildlife habitat by comparing the project's temporary and permanent construction areas to wildlife and vegetation information collected from the WDNR Natural Heritage Program (WDNR 2006b) and WDFW Priority Habitat and Species Program (WDFW 2006) databases, from resource agency biologists, and from reconnaissance-level field surveys. A GIS-based land cover analysis, including reconnaissance-level surveys to verify the accuracy of the GIS data, was performed to determine the extent of existing upland vegetation and impervious surface in the study area. Data from these sources were converted into a single land cover GIS map.

The team then overlaid the project footprint with the land cover GIS dataset to quantify the amount of upland vegetation

and documented sensitive wildlife species that the project will affect. Additionally, the team identified the extent of any potential effects to wildlife species and habitat as a result of any new noise or stormwater stemming from the project.

SECTION 4 BASELINE CONDITIONS

What ecosystems exist in the study area?

Elements of ecosystems in the study area include wetlands, aquatic resources, and wildlife habitats in which specific plants or animals naturally live, grow, and reproduce. These habitats provide the plants and animals in the study area with adequate food, water, shelter, and living space. A large variety of plants and animals occupy the various habitats found in the study area, but these habitats are typically degraded due to urbanization over the last 150 years.

What are the characteristics of ecosystems located in the study area?

Wetlands

What wetlands occur in the study area?

Project biologists identified 21 wetlands totaling 13.62 acres within the project area. Of these 21 wetlands, 10 were previously delineated and mapped as part of the Kirkland Nickel Project in February, March, and June 2004. Wetland 16.2R was only partially delineated for the Kirkland Nickel Project, but has now been completely delineated and included as part of the study area. Wetland 19.7R was delineated as part of this project to confirm potential impacts to this wetland. The boundaries of five other wetlands delineated as part of the Kirkland Nickel Project (Wetlands 19.9L, 21.4M, 21.5M, 22.5L, and 22.8L) were field verified as part of this project to confirm potential impacts to these wetlands. Based on observations during the field visit, these five wetlands were not delineated again; however, these wetlands were re-evaluated and updated according to the 2006 Ecology rating form (Ecology 2006). The remaining nine wetlands (Wetlands 21.5R, 22.8R, 23.4R, 23.5R, 25.2L, 25.22L, 25.3R, 25.3L, and 25.4R) were identified and delineated specific to this project or the I-405/NE 195th Street to SR 527 – Northbound Auxiliary Lane Project between 2006 and 2009.

What is a wetland delineation?

Delineating a wetland means identifying the boundaries of a wetland based on the presence of three features: vegetation, soils, and hydrology.

Wetland biologists performed delineations in the study area only where widening of the roadways and other associated improvements are proposed. Wetland delineations were not performed within the study area where restriping is proposed.

Upland areas without wetlands were identified for roadside transportation improvements associated with express toll lanes where road widening is not proposed.

Appendix B includes wetland determination data forms for the 21 wetlands identified in the study area.

Wetlands identified in the study area are typically associated with streams, hillside seeps, or drainage ditches that receive road runoff and convey stormwater.

How are wetlands identified in this report?

Wetlands are described in this report by location in sequence from south to north. Each wetland in the study area was assigned a number based on its approximate milepost (MP) location as indicated on project field maps. The wetland number also includes "L" if the wetland is located on the left side (west) or SB lane of I-405, "R" if it is located on the right side (east) or NB lane of I-405, and "M" if the wetland is located within the I-405 median. For example, a wetland found at the midpoint between MP 21.0 and MP 22.0 on the left side (SB lane) of I-405 would be Wetland 21.5L.

Forested Wetland 19.7R

Emergent Wetland 16.2R

Scrub-shrub Wetland 20.4L

Wetland Ratings

State and local resource agencies rate or categorize wetlands according to their relative rarity or importance. Project biologists collected field data on all the wetlands in the study area and categorized them according to the Ecology rating system (Ecology 2004, 2006b), and any local jurisdictional ratings that applied. All local jurisdictional rating systems have been revisited to confirm that the rating system used to rate each wetland is still current. Ecology's wetland rating forms are presented in Appendix B.

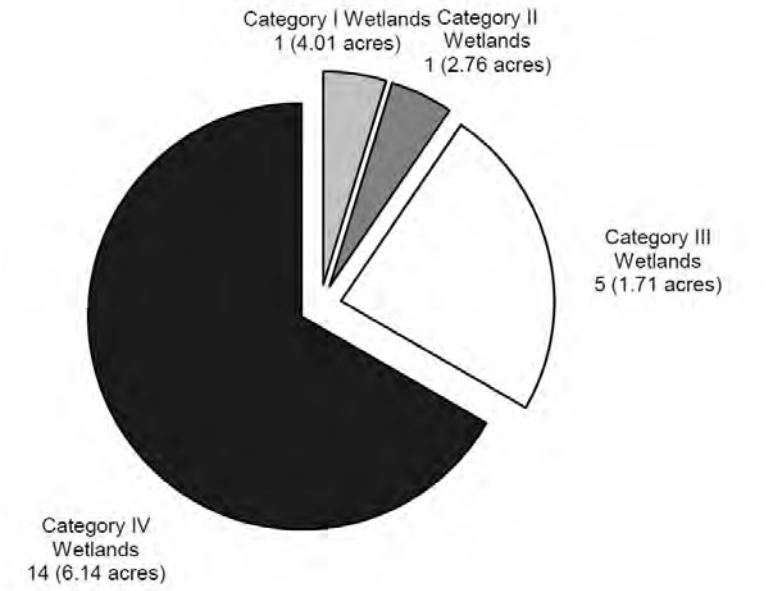
Wetland Classification

Wetlands in the study area were assigned a classification based on the Cowardin classification system (Cowardin 1979) (see Section 3 for details). Within the Cowardin system, each wetland is classified based on its physical characteristics. The wetlands within the project study area were classified as PFO, PEM, or PSS.

Using the Ecology rating system, project biologists categorized 14 of the 21 total wetlands in the study area as Category IV wetlands, the lowest-value class of wetlands described using

the Ecology rating system. Five of the wetlands were ranked as Category III wetlands. One wetland was classified as a Category II wetland, and one wetland was classified as a Category I wetland. Exhibit 4-1 shows the proportion of wetlands assigned to each category and the total wetland area of each category.

Exhibit 4-1: Proportion of Wetlands in the Study Area by Wetland Category and Total Wetland Area for Each Wetland Category



We also used local jurisdiction guidelines to categorize the wetlands in the study area. Of the eight wetlands in the study area occurring in Kirkland, one is considered a Category 1 wetland, one is considered a Category 2 wetland, and six are considered Category 3 wetlands according to the Kirkland City Code (Kirkland 2010a). Of the five wetlands in the study area occurring in unincorporated King County, two are considered Category 3 wetlands and three are considered Category 4 wetlands according to the King County Code (King County 2010). According to the Bothell City Code, of the nine wetlands in the study area within Bothell, two wetlands are Type 3 wetlands and seven are Type 4 wetlands (Bothell 2010). One of the wetlands, Wetland 22.8L, is located within Bothell and unincorporated King County; therefore, both local ratings apply. Wetland 22.8L is a Type 3 wetland under Bothell guidelines and a Category 3 wetland under King County guidelines. As previously noted in Section 3, rating systems

for both King County and the City of Bothell are adopted from the Washington State rating system.

A summary of all wetlands in the study area, their associated local and state ratings, and local jurisdiction buffer widths are in Exhibit 4-2.

Cowardin Classification Summary

Five of the 21 wetlands (24 percent) are dominated by emergent vegetation, two wetlands (10 percent) are dominated by scrub-shrub vegetation, and eight of the wetlands (38 percent) are classified as forested systems. One wetland is dominated by scrub-shrub and emergent (5 percent) vegetation, four of the wetlands (19 percent) include forested and emergent systems. One wetland is classified as forested, scrub-shrub, and emergent (5 percent) systems. In general, the smaller-sized wetland systems are emergent wetlands and the larger wetlands, including the wetlands that extend outside the WSDOT right-of-way, are forested and scrub-shrub systems.

Wetlands Acreage Summary

Seventeen of the 21 wetlands (81 percent) within the study area are relatively small (less than 0.5 acres) and of these 17 wetlands, six are less than 0.1 acres. These small wetlands tend to be located in small, low-lying areas and they receive water from hillside seeps or roadside drainage ditches. The remaining four wetlands (19 percent) in the study area are larger than 1.0 acre. The wetlands larger than 1.0 acre include Wetlands 16.2R, 20.4L, 22.5L, and 22.8L. The study area includes only a portion of each of the larger wetlands, with the majority of their surface area lying outside the study area.

Watersheds in the Study Area

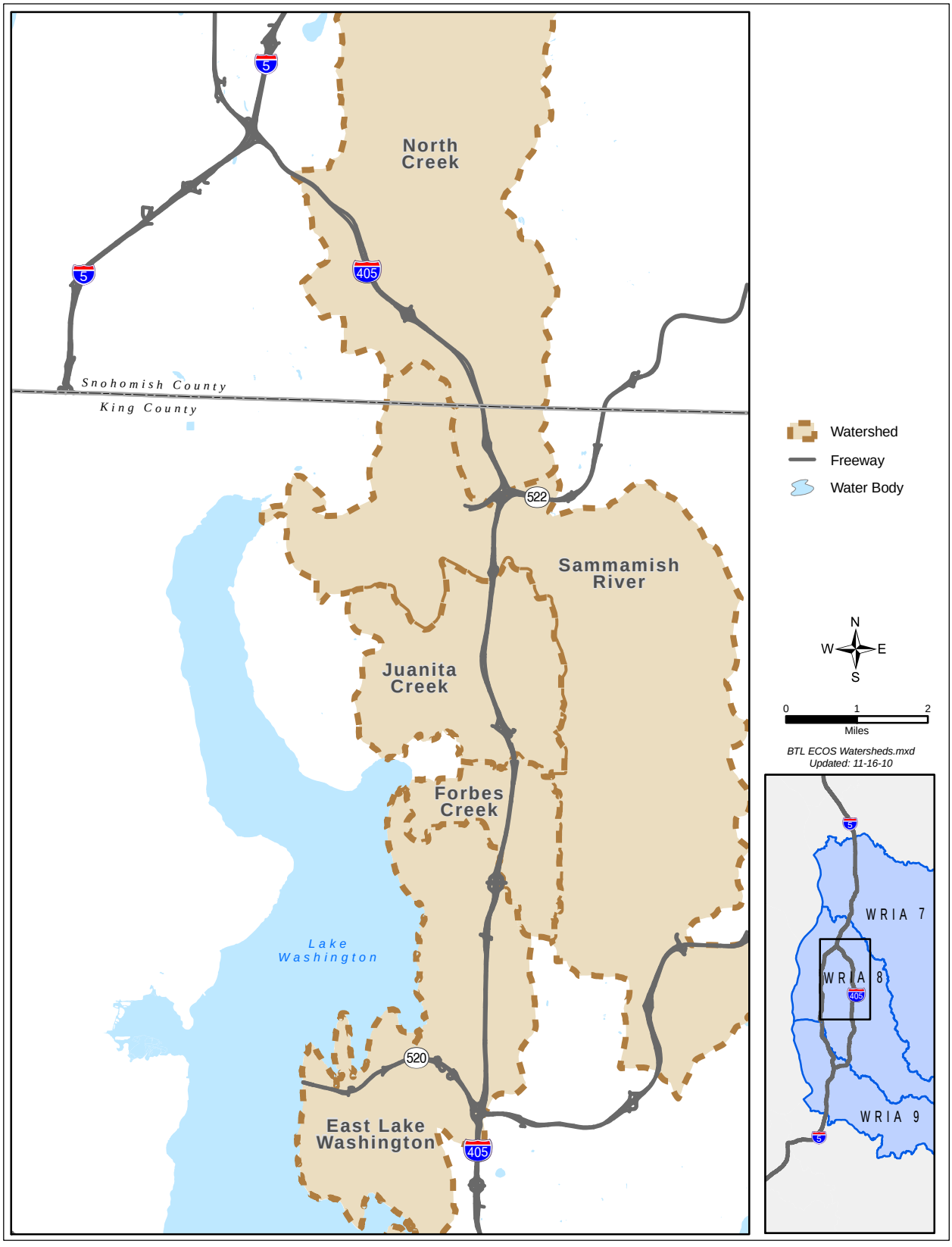
All of the watersheds in the study area are located in the Cedar-Sammamish Water Resource Inventory Area (WRIA) 8. The study area spans five different drainage basins, or watersheds (Exhibit 4-3). A watershed is an identified region of land that drains into a specified body of water, such as a river, lake, sea, or ocean. Since each watershed covers a specific geographic area, grouping wetlands in this manner allows us to present information in an organized way. Wetlands in the study area are described after Exhibit 4-3, grouped by the watersheds in which they are located.

Exhibit 4-2: Summary of Wetlands in the Study Area

Wetland	Size (acres)	Cowardin Classification	State Rating (Ecology)	Local Rating	Local Jurisdiction Buffer Width (feet)
16.2R	3.01	Forested and Emergent	I	Kirkland – 1	100
19.7R	0.14	Scrub-shrub	III	Kirkland – 3	50
19.8L	0.34	Emergent	IV	Kirkland – 3	50
19.9L	0.27	Forested	IV	Kirkland – 3	50
20.0L	0.08	Emergent	IV	Kirkland – 3	50
20.34L	0.28	Emergent	III	Kirkland – 3	50
20.35L	0.17	Emergent	IV	Kirkland – 3	50
20.4L	2.76	Scrub-shrub	II	Kirkland – 2	75
21.4M	0.05	Forested	IV	King County – 4	50
21.5M	0.10	Forested	IV	King County – 3	75
21.5R*	0.23	Forested and Emergent	III	King County – 3	75
22.5L	4.08	Forested	IV	King County – 4	50
22.8L	1.02	Forested	III	Bothell – 3 King County – 3	50
22.8R	0.02	Emergent	IV	Bothell – 4	50
23.4R	0.08	Forested	IV	Bothell – 4	50
23.5R	0.24	Forested and Emergent	IV	Bothell – 4	50
25.2L*	0.30	Forested, Scrub-shrub and Emergent	IV	Bothell – 4	50
25.22L	0.15	Scrub-shrub and Emergent	IV	Bothell – 4	50
25.3R*	0.04	Forested	IV	Bothell – 4	50
25.3L	0.04	Forested and Emergent	III	Bothell – 3	50
25.4R*	0.22	Forested	IV	Bothell – 4	50
TOTAL	13.62				

* *The size of these wetlands were estimated because the majority of their area lies outside the study area. The total wetland acreage includes both the estimates and actual wetland survey data.*

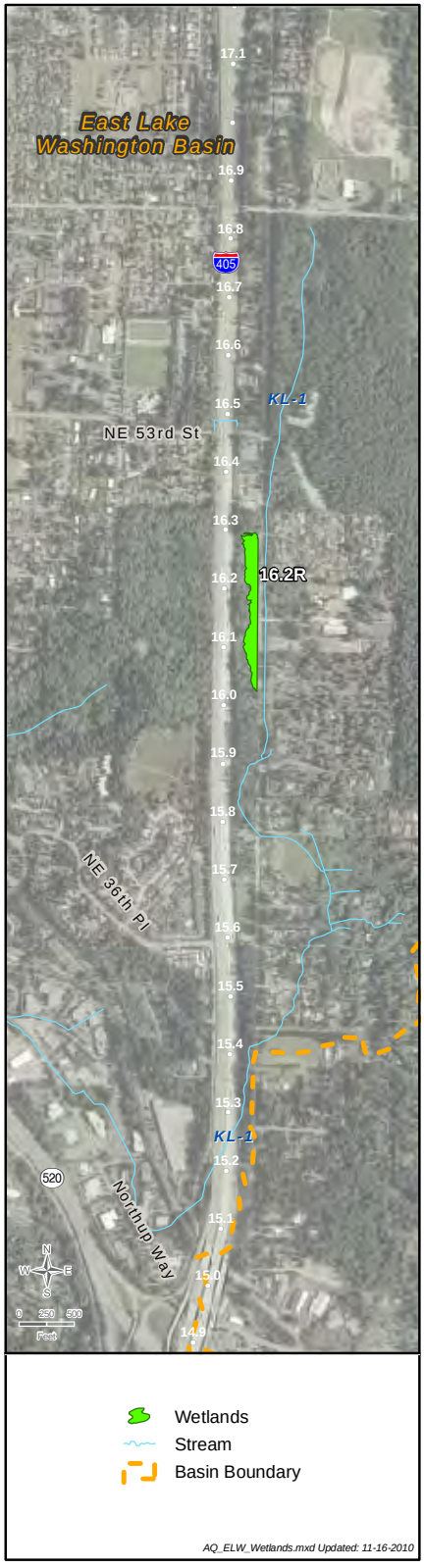
Exhibit 4-3: Watersheds within the Study Area



The watersheds in the study area include (from south to north): East Lake Washington, Forbes Creek, Juanita Creek, Sammamish River, and North Creek. The East Lake Washington basin contains one wetland covering 3.01 acres. The Forbes Creek basin contains one wetland covering approximately 0.14 acre. The Juanita Creek basin contains the highest number of wetlands, with ten wetlands covering 8.36 acres. The Sammamish River basin contains four wetlands covering 1.36 acres. The North Creek basin contains five wetlands covering 0.75 acre. The watershed boundaries within the study area are shown on Exhibit 4-3.

Wetland locations within each watershed are shown on Exhibits 4-5, 4-7, 4-9, 4-11, and 4-13. The wetlands shown represent the wetlands delineated in the study area. Details about each wetland can be found in Appendix C.

Exhibit 4-5: East Lake Washington Basin Wetlands



East Lake Washington Basin

One wetland, designated as 16.2R and totaling 3.01 acres, is located in the East Lake Washington basin within the study area. Along with receiving surface water drainage and groundwater, Wetland 16.2R is also linked by its surface water drainage to Yarrow Creek. Information on the wetland in the East Lake Washington basin is summarized in Exhibit 4-4 and the wetland location is shown on Exhibit 4-5. See Appendix C for details about East Lake Washington basin wetlands.

Exhibit 4-4: Summary of Wetlands Located within the East Lake Washington Basin

Wetland	Size (acres)	Cowardin Classification	Characteristics
16.2R	3.01	Forested and Emergent	Large system associated with Yarrow Creek; dominated by black cottonwood (*Populus balsamifera* spp. *trichocarpa*), red alder (*Alnus rubra*), salmonberry (*Rubus spectabilis*), lady fern (*Athyrium filix-femina*), and skunk cabbage (*Lysichitum americanum*); located adjacent to 116th Avenue NE
TOTAL	3.01		

Forbes Creek Basin

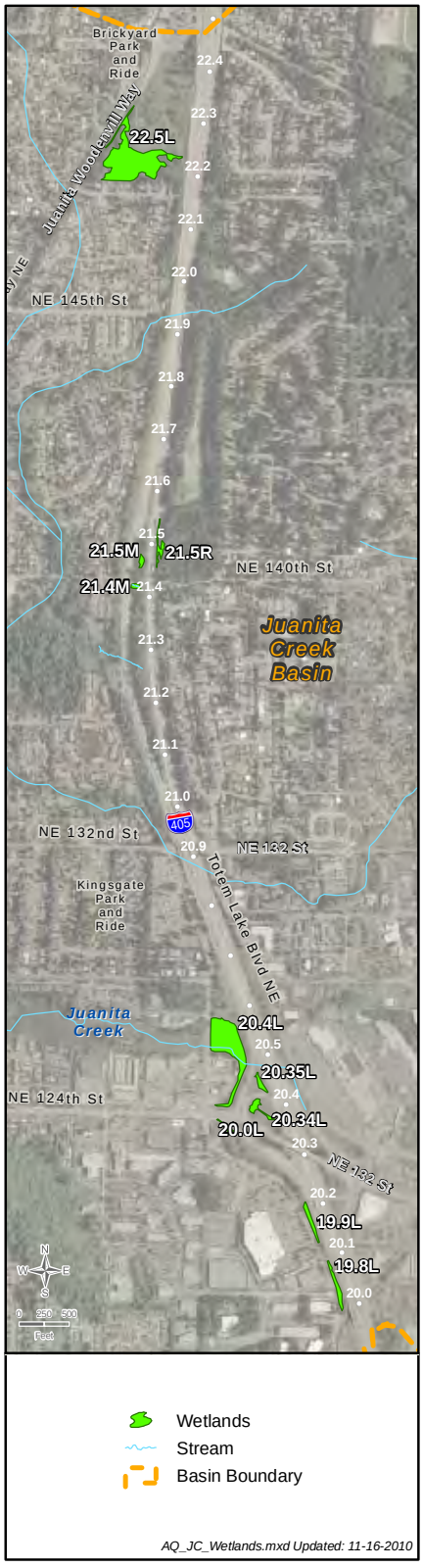
One wetland, designated as 19.7R and totaling 0.14 acre, is located in the Forbes Creek basin within the study area. This wetland is located to the east of NB I-405 near NE 116th. A portion of Wetland 19.7R was disturbed as part of the Kirkland Nickel Project. Information on the wetland in the Forbes Creek basin is summarized in Exhibit 4-6 and the wetland location is shown on Exhibit 4-7. See Appendix C for details about Forbes Creek basin wetlands.

Exhibit 4-6: Summary of Wetlands Located within the Forbes Creek Basin

Wetland	Size (acres)	Cowardin Classification	Characteristics
19.7R	0.14	Scrub-shrub	Depressional wetland draining to a ditch along I-405 dominated by Pacific willow (*Salix lasiandra*), spirea, Himalayan blackberry (*Rubus armeniancus*), reed canarygrass (*Phalaris arundinacea*), and bentgrass (*Agrostis* sp.); located adjacent to NB I-405
TOTAL	0.14		

Exhibit 4-7: Forbes Creek Basin Wetlands

Exhibit 4-9: Juanita Creek Basin Wetlands



Juanita Creek Basin

The Juanita Creek basin contains ten wetlands, the highest number of wetlands within any of the study area watersheds. The wetlands are designated as 19.8L, 19.9L, 20.0L, 20.34L, 20.35L, 20.4L, 21.4M, 21.5M, 21.5R, and 22.5L, with a combined total area of 8.36 acres. Six wetlands (Wetlands 19.8L, 19.9L, 20.0L, 20.34L, 20.35L, and 20.4L) are located next to roads associated with the I-405 and NE 124th Street interchange. Wetlands 21.4M and 21.5M are located in the I-405 median adjacent to the SB lanes and include forested and shrub buffer habitat. Portions of Wetlands 21.4M and 21.5M were disturbed as part of the Kirkland Nickel Project. Wetland 21.5R is located adjacent to the NB lanes of I-405, and includes forested and shrub buffer habitat to the east of the I-405 corridor. Wetlands in the Juanita Creek basin are summarized in Exhibit 4-8 and shown on Exhibit 4-9. See Appendix C for details about Juanita Creek basin wetlands.

Exhibit 4-8: Summary of Wetlands Located within the Juanita Creek Basin

Wetland	Size (acres)	Cowardin Classification	Characteristics
19.8L	0.34	Emergent	Narrow, ditch-associated wetland dominated by reed canarygrass; located adjacent to SB I-405
19.9L	0.27	Forested	Narrow, ditch-associated wetland dominated by red alder, bentgrass, and reed canarygrass; located adjacent to SB I-405 on-ramp
20.0L	0.08	Emergent	Narrow, ditch-associated wetland with associated seep, dominated by reed canarygrass and soft rush (*Juncus effusus*); located adjacent to SB I-405 on-ramp
20.34L	0.28	Emergent	Depression wetland dominated by reed canarygrass, common cattail, and soft rush; located within cloverleaf-shaped SB I-405 on-ramp
20.35L	0.17	Emergent	Depression wetland adjacent to stormwater detention pond, dominated by reed canarygrass and bentgrass; located adjacent to SB I-405

Exhibit 4-8: Summary of Wetlands Located within the Juanita Creek Basin

Wetland	Size (acres)	Cowardin Classification	Characteristics
20.4L	2.76	Scrub-shrub	Large system hydrologically connected to Juanita Creek via culverts; dominated by black cottonwood, Pacific willow, reed canarygrass, and common cattail; located adjacent to SB I-405 off-ramp
21.4M	0.05	Forested	Ditch-associated wetland connected to an unnamed stream that flows through a pipe beneath NB I-405; dominated by red alder, Himalayan blackberry, small-fruited bulrush (*Scirpus microcarpus*), and giant horsetail (*Equisetum telmateia*); located in I-405 median
21.5M	0.10	Forested	Ditch-associated wetland dominated by big-leaf maple (*Acer macrophyllum*) and Himalayan blackberry; located in I-405 median
21.5R	0.23	Forested and Emergent	Ditch-associated wetland dominated by red alder, salmonberry, giant horsetail, and lady fern; 0.17 acres delineated within WSDOT right-of-way; located adjacent to NB I-405
22.5L	4.08	Forested	Large system dominated by red alder, Himalayan blackberry, and willow; 0.03 acres delineated within WSDOT right-of-way; adjacent to SB I-405
TOTAL	8.36		

Exhibit 4-11: Sammamish River Basin Wetlands

Sammamish River Basin

There are four wetlands in the Sammamish River basin within the study area, Wetlands 22.8L, 22.8R, 23.4R and 23.5R, totaling 1.36 acres. All four wetlands receive water from surface water drainage and groundwater, and discharge to ditches, catch basins, or culverts. In addition to receiving surface water drainage and groundwater, Wetland 22.8L is also linked by its surface water drainage to a small unnamed tributary to the Sammamish River. Wetlands in the Sammamish River basin are summarized in Exhibit 4-10 and shown on Exhibit 4-11. See Appendix C for details about Sammamish River basin wetlands.

Exhibit 4-10: Summary of Wetlands Located within the Sammamish River Basin

Wetland	Size (acres)	Cowardin Classification	Characteristics
22.8L	1.02	Forested	Wetland connected to an unnamed tributary to the Sammamish River via a ditch; dominated by Pacific willow, black cottonwood, and salmonberry; located adjacent to SB I-405
22.8R	0.02	Emergent	Ditch-associated wetland; dominated by reed canarygrass and lady fern; located adjacent to NB I-405
23.4R	0.08	Forested	Slope wetland; dominated by red alder, salmonberry, skunk cabbage, and lady fern; located east of NB I-405 and south of the I-405 and SR 522 interchange
23.5R	0.24	Forested and Emergent	Slope wetland; dominated by red alder, salmonberry, skunk cabbage, and lady fern; located east of NB I-405 and south of the I-405 and SR 522 interchange
TOTAL	1.36		

North Creek Basin

Five wetlands, designated as 25.2L, 25.22L, 25.3R, 25.3L, and 25.4R, are located in the North Creek basin. The North Creek basin wetlands total 0.75 acres. Wetlands in the North Creek basin are summarized in Exhibit 4-12 and shown on Exhibit 4-13. See Appendix C for details about North Creek basin wetlands.

Exhibit 4-12: Summary of Wetlands Located within the North Creek Basin

Wetland	Size (acres)	Cowardin Classification	Characteristics
25.2L	0.30	Forested, Scrub-shrub, and Emergent	Located adjacent to SB I-405 and dominated by Himalayan blackberry and salmonberry
25.22L	0.15	Scrub-shrub and Emergent	Located adjacent to SB I-405 and entirely within the WSDOT right-of-way; dominated by salmonberry and piggyback plant (*Tolmiea menziesii*)
25.3R	0.04	Forested	Ditch-associated wetland dominated by red alder, willow, and Himalayan blackberry; located at toe of slope of NB I-405 right-of-way
25.3L	0.04	Forested and Emergent	Located adjacent to SB I-405 entirely within the WSDOT right-of-way; dominated by red alder, skunk cabbage, and piggyback plant
25.4R	0.22	Forested	Ditch-associated wetland dominated by red alder, willow, and salmonberry; located at toe of slope of NB I-405 right-of-way
TOTAL	0.75		

Exhibit 4-13: North Creek Basin Wetlands

Aquatic Resources

What watersheds and streams are in the study area?

What is a Water Resource Inventory Area (WRIA)?

The Washington State Department of Ecology has designated 62 WRIAs for water and aquatic resource management issues. The terms WRIA and watershed are frequently used interchangeably, although a WRIA may include more than one watershed.

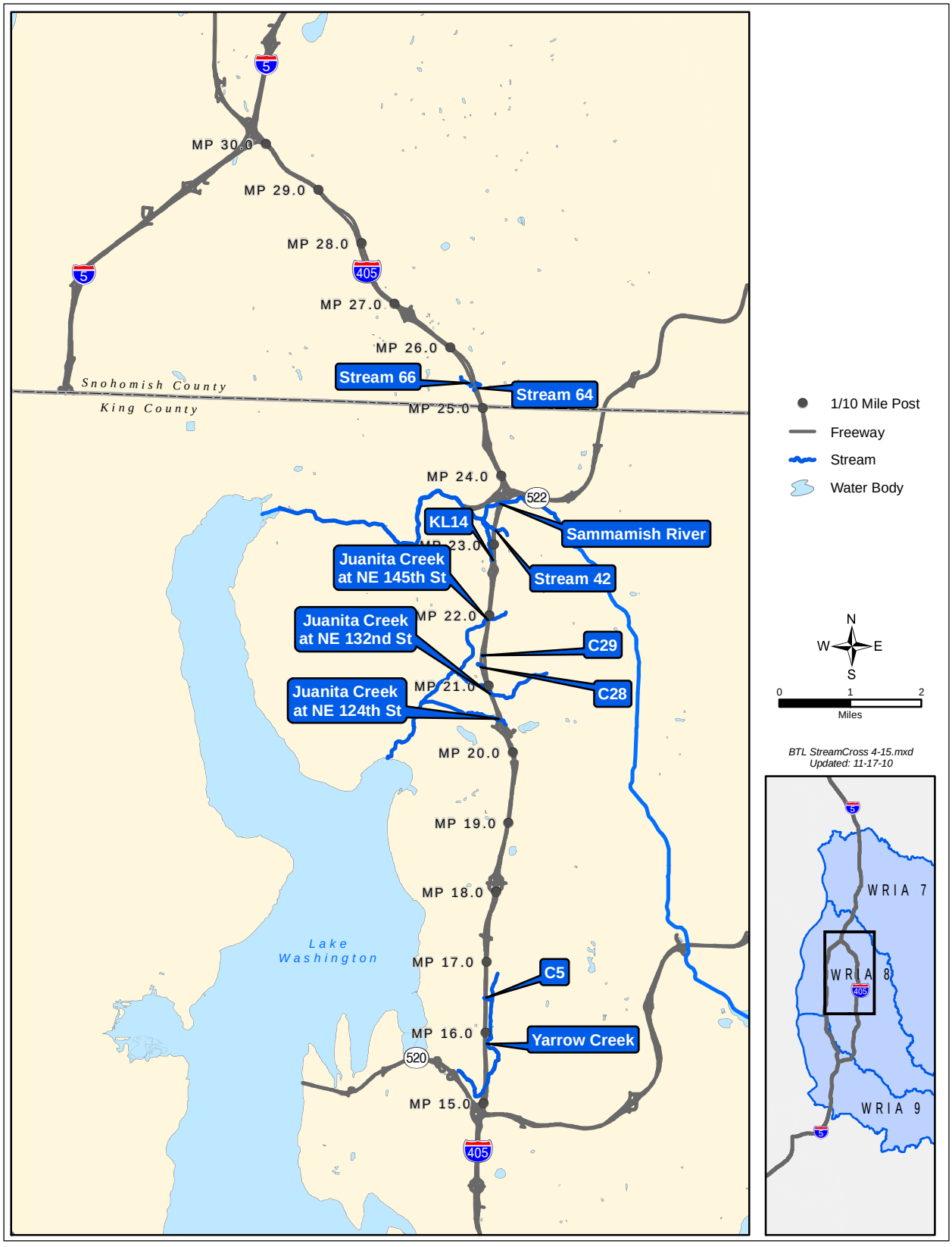
The watersheds and streams in the study area are part of a larger area called the Cedar-Sammamish WRIA 8. WRIA 8 is located predominantly within the borders of King County with 15 percent of the WRIA extending northward into Snohomish County. A series of hilltops, ridges, and plateaus distinguishes WRIA 8 from WRIA 7 (Snohomish/Snoqualmie Watershed) on the northern boundary and WRIA 9 (Green/Duwamish Watershed) on the southern boundary. The eastern boundary of WRIA 8 is defined by the Cascade Range. There are five basins in the study area: East Lake Washington basin, Forbes Creek basin, Juanita Creek basin, Sammamish River basin, and North Creek basin (see Exhibit 4-3).

Streams in the study area are located in four of the five basins. The streams in the study area are categorized by basin in Exhibit 4-14, and are shown in Exhibit 4-15.

Exhibit 4-14: Streams and Basins in the Study Area

Basin	Stream
East Lake Washington	Yarrow Creek C5
Forbes Creek	None
Juanita Creek	Juanita Creek at NE 124th Street Juanita Creek at NE 132nd Street Juanita Creek at NE 145th Street C28 C29
Sammamish River	KL14 Stream 42 Sammamish River
North Creek	Stream 64 Stream 66

Exhibit 4-15: Streams in the Study Area



What are the general characteristics of streams in the study area?

What is hydrology?

Hydrology is the study of the movement, distribution, and quality of water.

Streams in the study area are all part of the Lake Washington hydrologic system that drains 607 square miles. Streams within the Puget Sound lowlands, near Lake Washington, share relatively uniform physical and biological environments. These streams are typically characterized as low-gradient systems that originate in gently sloping upper basins and flow through narrow valleys. The headwaters of these streams, with the exception of the Sammamish River, originate below 1,000 feet in elevation and generally have a gentle stream gradient that begins at approximately 50 feet per mile at the headwaters, and are reduced in gradient to 20 feet per mile near the mouth. However, portions of these streams are substantially sloped.

Stream flows in the study area are fed by two main sources of water. Local rainfall is the primary source of water for these streams. With the exception of the Upper Sammamish River Watershed, these streams do not extend into the Cascades. Since they do not receive flow from snow pack, rainfall is critical to the maintenance of stream flow and to the recharge of the groundwater table. The second source of water for these Lake Washington WRIA 8 streams is groundwater, which discharges from seeps and springs that recharge the water in these creeks. Wetlands in the upper portions of the watershed are also a source of water.

The function and character of the streams have been altered by the effects of intense urbanization in the WRIA 8 watershed (Booth et al. 2004). Effects of urbanization include channel modification, clearing of riparian vegetation, water withdrawals, introduction of non-native plant species, rerouting of water for stormwater control, and addition of pollutants into streams. These changes affect a stream's habitat structure, flow regime, water quality, and biological interactions. Development activities that have altered the hydrologic landscape include logging, vegetation clearing, the addition of impervious surfaces, construction of buildings, piping of streams, and the addition of new hydrologic features such as ponds or detention and treatment facilities. These various urban developments have had an effect on stream function, which, in turn, has affected aquatic habitat. Removal of native vegetation in and around streams, addition of

impervious surface, and the rerouting of stream channels changes the patterns and quantity of water and nutrients, recharge capabilities, and temperature regulation.

Changes to aquatic habitat in the study area streams and watersheds affect the ability of aquatic species to survive because fish and aquatic species depend upon the stream environment to meet their needs. These changes are known as limiting factors. Limiting factors include adequate nutrients, good flow of oxygenated water, and maintenance of cooler water temperatures. Fish in their various life history stages, and particularly juvenile fish, are uniquely adapted to their environment. Even minor changes in temperature, oxygen, and flow can sometimes severely inhibit survival (LCFRB 2004).

In addition to changing the hydrology of the waterbodies in the study area, development has generally caused changes in other stream habitat conditions. These changes include modifying habitat to accommodate residential, commercial, and industrial land uses such as bank hardening; addition of riprap; channel straightening; and the removal of instream habitat. The riparian vegetation has also changed significantly over the last 150 years of development. The mature conifer-dominated forests native to the area have been replaced with pavement, buildings, and non-native, invasive plants or young deciduous forests.

What is a life history stage for fish?

Fish start life as fertilized eggs and emerge as fry. As they grow and change, they become smolts. Some fish migrate to the ocean to become adults. As adults, they return to their natal stream to spawn.

What fish and aquatic species are present in the study area?

Despite altered habitat conditions, streams in the study area still support various species and life history stages of fish (Streamnet 2006). They also serve as important migration corridors for various resident and anadromous fish. The primary resident fish species using these systems are cutthroat trout, sculpin, three-spine stickleback, and longnose dace. The primary anadromous fish species migrating as well as rearing in these streams is coho salmon (Streamnet 2006). Exhibit 4-16 lists fish species present in the study area.

What are anadromous and resident fish?

An **anadromous fish** is a fish species that spends a part of its life cycle in the sea and returns to freshwater streams to reproduce (for example, salmon, steelhead, and trout).

A **resident fish** is a fish species that does not migrate out to the ocean, but remains in fresh water.

Exhibit 4-16: Summary of Fish Presence in the Study Area

Stream	Milepost	Fish Species	Fish Presence
Yarrow Creek	15.9	coho salmon cutthroat trout longnose dace sculpin three-spine stickleback	Coho are not present in Yarrow Creek at I-405. Cutthroat trout and resident fish species are found throughout the creek.
C5	16.5	None	None
Juanita Creek at NE 124th Street, Juanita Creek at NE 132nd Street, and Juanita Creek at NE 145th Street	20.5, 20.9, 21.9	Chinook salmon coho salmon cutthroat trout river lamprey longnose dace sculpin three-spine stickleback	Coho are present in Juanita Creek at NE 124th Street. and up to NE 145th Street. Coho are not present at NE 132nd Street because of a detention pond located 300 feet west of I-405.
C28 and C29	21.3 21.4	None	None
KL14 and Stream 42	22.8 23.2	None	There are no documented fish species at the mouth of KL14. Species found in the Sammamish River could potentially use portions of KL14 and Stream 42.
Sammamish River	23.6	bull trout Chinook salmon chum salmon coho salmon cutthroat trout kokanee river lamprey large mouth bass largescale sucker longnose dace sculpin sockeye salmon steelhead stickleback three-spine stickleback	Each fish species is present as far east of I-405 as gradient allows.
Streams 64 and 66	25.3	None	None

Yarrow Creek

Yarrow Creek is used by resident cutthroat trout and the lower reaches of Yarrow Creek support coho salmon. Cutthroat trout, sculpin, and three-spine stickleback were observed in Yarrow Creek east and west of I-405 (WSDOT 2005c). The WDFW Priority Habitats and Species database also shows that resident cutthroat trout and coho salmon are

present in Yarrow Creek (WDFW 2006). Lack of good spawning habitat has been noted as a limiting factor for salmonids in Yarrow Creek (King County 2002a).

Juanita Creek and Tributaries

Three I-405 crossings of Juanita Creek occur in the study area. Juanita Creek at NE 145th Street is considered the main stem and the other two crossings are southern tributaries. These crossings are located at NE 124th Street (Juanita Creek at NE 124th Street), NE 132nd Street (Juanita Creek at NE 132nd Street), and NE 145th Street (Juanita Creek at NE 145th Street). Habitat conditions are diverse throughout the three crossings.

Cutthroat trout, sculpin, lamprey (*Lampetra* species), longnose dace, and three-spine stickleback are known to use all three tributaries. Coho salmon are only found west of I-405 because all three I-405 crossings are barriers to fish migration (Kerwin 2001). The WDFW Priority Habitats and Species database (WDFW 2006) indicates that coho only migrate as far as approximately 1,000 feet west of the Juanita Creek at NE 145th Street crossing, while resident fish are present as far as approximately 2,000 feet east of the I-405 crossing.

Sammamish River

The Sammamish River supports various anadromous fish, which use the river primarily for migration. Spawning and rearing occur in its tributaries. Numerous species have been documented using the Sammamish River including cutthroat trout, coho salmon, chum salmon (*Oncorhynchus keta*), Chinook salmon, bull trout (*Salvelinus confluentus)*, sockeye salmon, kokanee (resident form of sockeye salmon), winter steelhead (*O. mykiss*), river lamprey (*Lampetra ayresii*), large mouth bass (*Micropterus salmoides*), largescale sucker (*Catostomus macrocheilus*), longnose dace, sculpin, and three-spine stickleback.

Other Streams

No fish are currently documented present in C5, C28, C29, KL14, Stream 42, or Streams 64 and 66.

C5

As noted in Exhibit 4-16, no fish species are documented using C5 and no fish were observed during the stream habitat surveys. Snails were observed in C5 west of I-405. C5 neither

supports any life history stage of anadromous fish, nor does it provide habitat for resident fish, like cutthroat trout. Although not documented, some portions of C5 could provide rearing habitat for sculpin and small trout (WSDOT 2005c).

C28 and C29

Fish are not present in C28, although snails were observed in the highway median portion of the stream.

As noted in Exhibit 4-16, no fish are present in C29. It is unlikely that any fish could reach C29 because numerous culverts and grates west of I-405 are migration barriers and prevent fish from migrating upstream. Only snails were observed in C29.

KL14 and Stream 42

As noted in Exhibit 4-16, fish are not documented in KL14 (WDFW 2006). A blocked culvert near the mouth of the stream prevents fish from using KL14. There is no known documentation of fish in Stream 42 (see Exhibit 4-16).

Streams 64 and 66

Historically, Streams 64 and 66 may have supported fish populations in their lower reaches, but a steep incline on the east side of I-405 prevents fish from accessing the streams at or west of I-405.

Other aquatic species present in these streams include macroinvertebrates, crayfish, amphibians, freshwater mussels, and clams.

What are the characteristics of streams in the study area?

Yarrow Creek

Yarrow Creek originates in Bridle Trails State Park east of I-405 at an elevation of 400 feet and flows 2.95 miles southwest before entering Lake Washington. Yarrow Creek runs parallel to the east side of I-405, then crosses I-405 at MP 15.09 (see Exhibit 4-17, Map 1). The mouth of Yarrow Creek lies about one-half mile north of SR 520 (WDFW, 1975; King County, 2002a).

Land uses in the Yarrow Creek basin have contributed to the creek's current conditions. Most of the creek has been confined in pipes to accommodate residential, commercial, or industrial development.

C5

C5 originates on the west side of I-405 at MP 16.5 and flows east under I-405 through culvert 5 (see Exhibit 4-17, Map 1). Two small drainage ditches feed into C5 at culvert 5. C5 exits the culvert and flows parallel to I-405, on the east side, for approximately 50 feet. At this point, C5 carries the flow from two other culverts located upstream of culvert 5. The stream travels approximately 50 more feet before entering another culvert, located at NE 53rd Street. C5 flows through a series of pipes between NE 53rd Street and 116th Avenue NE, approximately 500 feet, before entering Yarrow Creek through a wetland complex.

Juanita Creek

The Juanita Creek basin drains approximately 4,000 acres (King County 2002b). Juanita Creek basin was historically heavily forested. Intense timber harvesting in the late 1800s coupled with accelerated residential and commercial development since the 1960s has resulted in a basin characterized by a reduced forest cover (King County 2002b) as evidenced by the basin being approximately 45 percent impervious surface (DEA 2001a). The reduction in vegetative cover has contributed to degraded stream habitat conditions, such as poor water quality and reduced flows (King County 2002b).

As described earlier in this report, three crossings of Juanita Creek occur in the study area. Juanita Creek at NE 145th Street, which is considered the main stem of Juanita Creek, crosses I-405 at MP 21.9. It flows southwest for 5 miles from its headwaters and enters Lake Washington at Juanita Beach Park. The two southern tributaries cross I-405 at MP 20.5 and MP 20.9 (Juanita Creek at NE 124th Street and Juanita Creek at NE 132nd Street, respectively). See Exhibit 4-17, Maps 2 and 4, for locations of the three crossings.

Juanita Creek has two documented fish passage barriers at I-405 that are WSDOT-owned culverts (WDFW 2010). One culvert (culvert 25) occurs on Juanita Creek at NE 132nd Street and the second culvert (culvert 32) occurs on Juanita Creek at NE 145th Street. Details on these and other WSDOT-owned culverts in the project area are provided in Appendix G.

What is scour?

Scour is the erosive action of running water in streams; it carries away material from the streambed and stream banks. Scour may occur in both soil and solid rock material.

C28 and C29

C28, a tributary to Juanita Creek at NE 145th Street, originates east of I-405 at MP 21.3. As shown in Exhibit 4-17, Map 3, the stream flows under the I-405 NB lanes through two culverts into an approximately 115-foot-long open channel in the highway median. The stream then flows through culvert 28 and under SB I-405. West of I-405, C28 flows as an open channel for about 275 feet through a wooded area where it enters a separate culvert that is partially plugged with silt.

C29, another tributary to Juanita Creek at NE 145th Street, flows similar to C28. The stream flows under the I-405 NB lanes through a culvert into an open channel in the highway median. As shown in Exhibit 4-17, Map 3, C29 then flows into culvert 29 located just north of MP 21.4. Culvert 29 carries the stream under the SB lanes of I-405, where it outlets to a series of open and closed culverts. C29 then enters Juanita Creek at NE 145th Street via a culvert at NE 140th Street.

KL14 and Stream 42

KL14 and Stream 42 are tributaries to the Sammamish River. KL14 originates west of I-405 at MP 22.8, as shown in Exhibit 4-17, Map 5. It flows south to north in a steep, relatively undeveloped ravine on the west side of I-405. KL14 receives flow from a series of wetlands, surface water runoff, and culverts east of I-405. At least five culverts convey water across I-405 to KL14.

Stream 42 originates in the area southwest of the I-405 and SR 522 interchange (see Exhibit 4-17, Map 6). A steep ravine carries water and sediment from north and south into the channel from adjacent hillsides and neighborhoods. The stream flows through a steep slope area east of I-405 before it crosses under I-405 through culvert 41 at MP 23.2. Sediment conveyed into the channel has created sand deposits along its banks. Within the channel, there are areas of scour that have created scour pools and small deposition bars. Sediment from the eroding culvert outlet is presumably limiting the aquatic productivity in the stream.

What are deposition bars?

Deposition bars are ridge-like deposits of poorly sorted sediment found near the banks of a stream or in the middle of the stream channel. They are created by the deposition of sediment within a stream.

Sammamish River

The Sammamish River crosses I-405 at MP 23.6, in the southern portion of the I-405 and SR 522 interchange (see Exhibit 4-17, Map 6). The Sammamish River basin drains an area approximately 153,600 acres in size. This river is an

exception in the study area because of its large size and wide floodplain valley. Historically, the Sammamish River was approximately twice as long as it is presently, with abundant marsh areas that were filled with peat and diatomaceous earth (Kerwin 2001).

What is diatomaceous earth?

Diatomaceous earth is a type of naturally occurring, soft, chalk-like soil made up of the fossil deposits of skeletons of diatoms (one-celled marine life forms).

The Sammamish River has changed dramatically over the past 150 years as a result of intense logging, dredging activities, diverting river flows for farming practices, and the lowering of Lake Washington in 1916. All of these activities have contributed to the river's current conditions. Currently, much of the basin is highly urbanized with impervious surfaces near the river, which contributes to sparse vegetative cover along the river banks. The river is separated from its floodplain and its numerous tributaries, its banks are hardened, and often experiences high water temperatures and low amounts of dissolved oxygen.

Streams 64 and 66

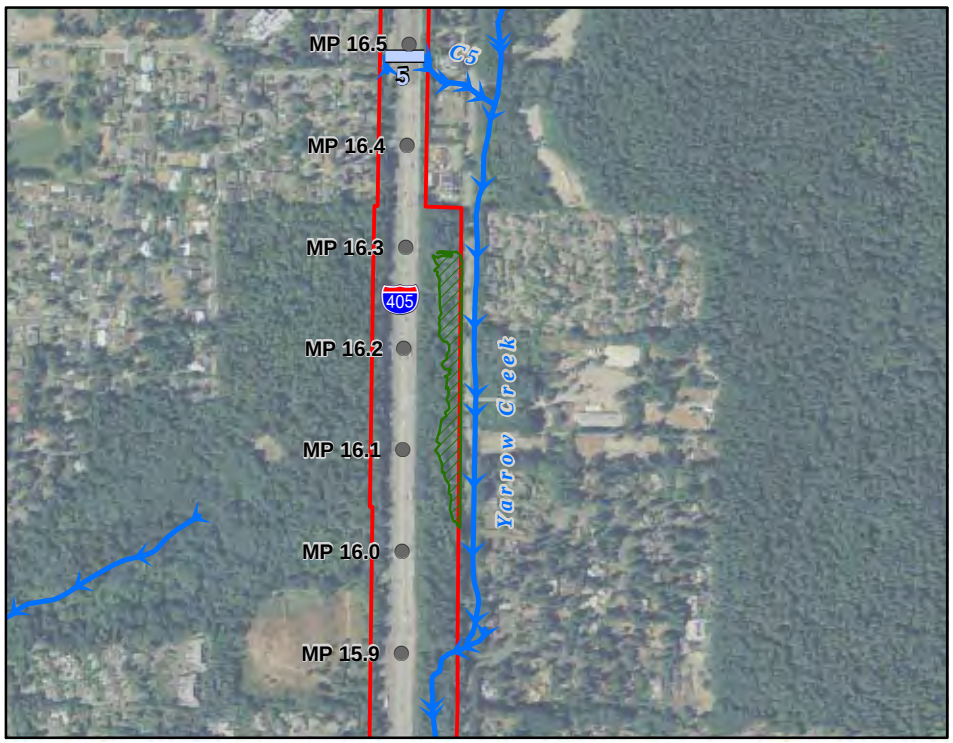
Streams 64 and 66 are both tributaries to North Creek and are located north of the I-405 and SR 522 interchange. These streams cross I-405 at MP 25.3 and flow through culverts 64 and 66, respectively, which convey the streams under the highway median to east of I-405 (see Exhibit 4-17, Map 7). East of I-405, Streams 64 and 66 converge and then flow into North Creek.

Both streams originate from upland areas west of I-405 and travel through steep ravines with gradients between 8 and 20 percent. Stream 64 is an intermittent stream, and Stream 66 has year-round flow. During the stream surveys, stream flow was 1 to 2 cubic feet per second (cfs) and the gradient east of I-405 ranged between 1 and 2 percent.

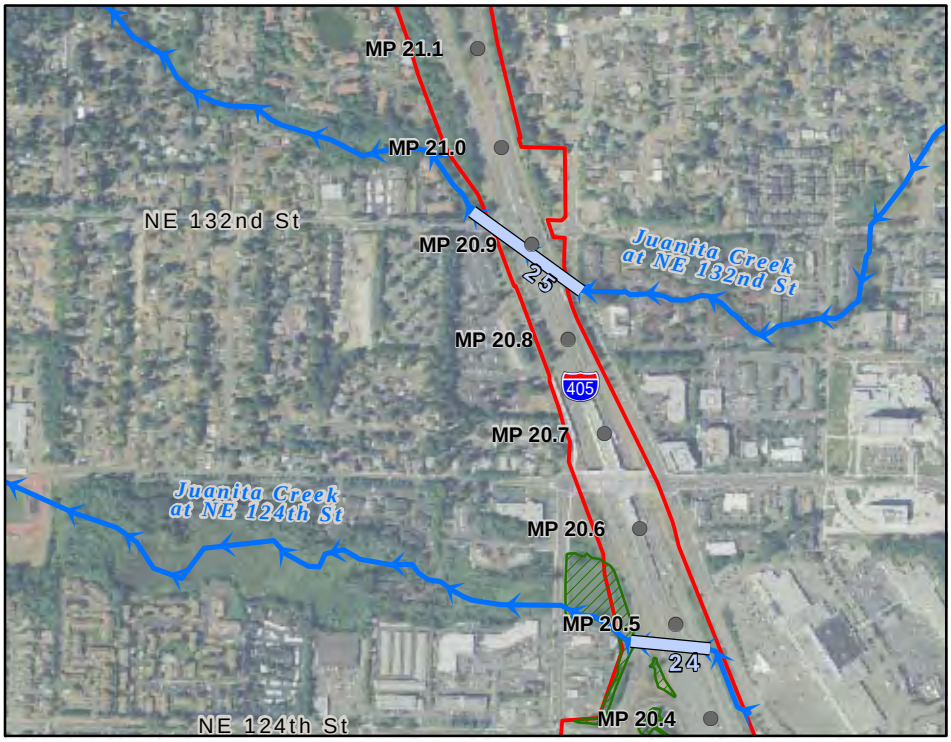
What are the results of the stream habitat surveys?

In the study area, fish are documented in Yarrow Creek, Juanita Creek at NE 145th Street, and the Sammamish River. Stream survey results indicate that these streams do not contain high quality habitat for fish to rear or spawn. The surveyed streams contain few or no pools, small amounts of LWD, high amounts of fine sediment, and little to no gravel necessary for spawning. Results of the surveys for the Bellevue to Lynnwood Improvement Project are summarized in Appendix D.

Exhibit 4-17: Maps 1 and 2 – Yarrow Creek, C5,Juanita Creek at NE 124th Street, and Juanita Creek at NE 132nd Street



Map 1 - Yarrow Creek and C5



Map 2 - Juanita Creek at NE 124th St and Juanita Creek at NE 132nd St

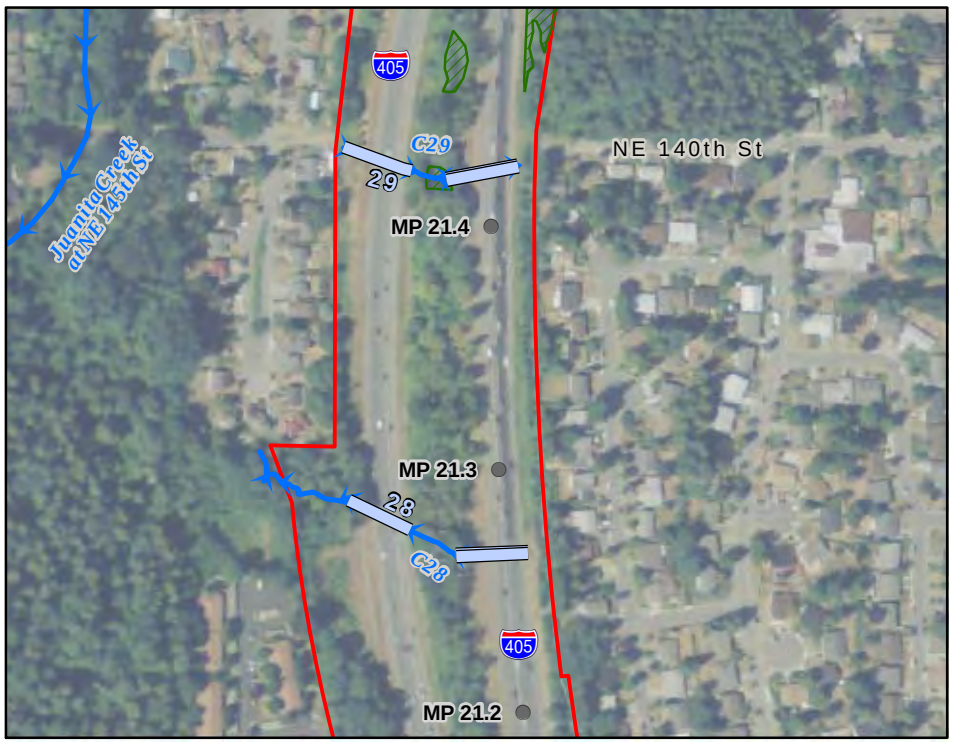
1/10 Mile Post
Stream
Culvert
Existing Right-of-Way
Wetland

N
W E
S

0 500 1,000
Feet

BTL Stream Culverts 1-2.mxd
Updated: 11-18-10

Exhibit 4-17: Maps 3 and 4 – C28, C29, and Juanita Creek at NE 145th Street



Map 3 - C28 and C29

Map 4 - Juanita Creek at NE 145th St

1/10 Mile Post
Stream
Culvert
Existing Right-of-Way
Wetland

N
W E
S

0 125 250
Feet

BTL Stream Culverts 3-4.mxd
Updated: 11-18-10

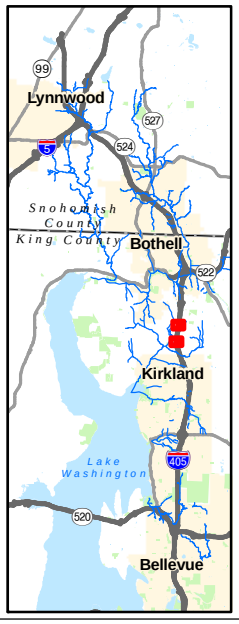


Exhibit 4-17: Maps 5 and 6 – KL14, Stream 42, and Sammamish River

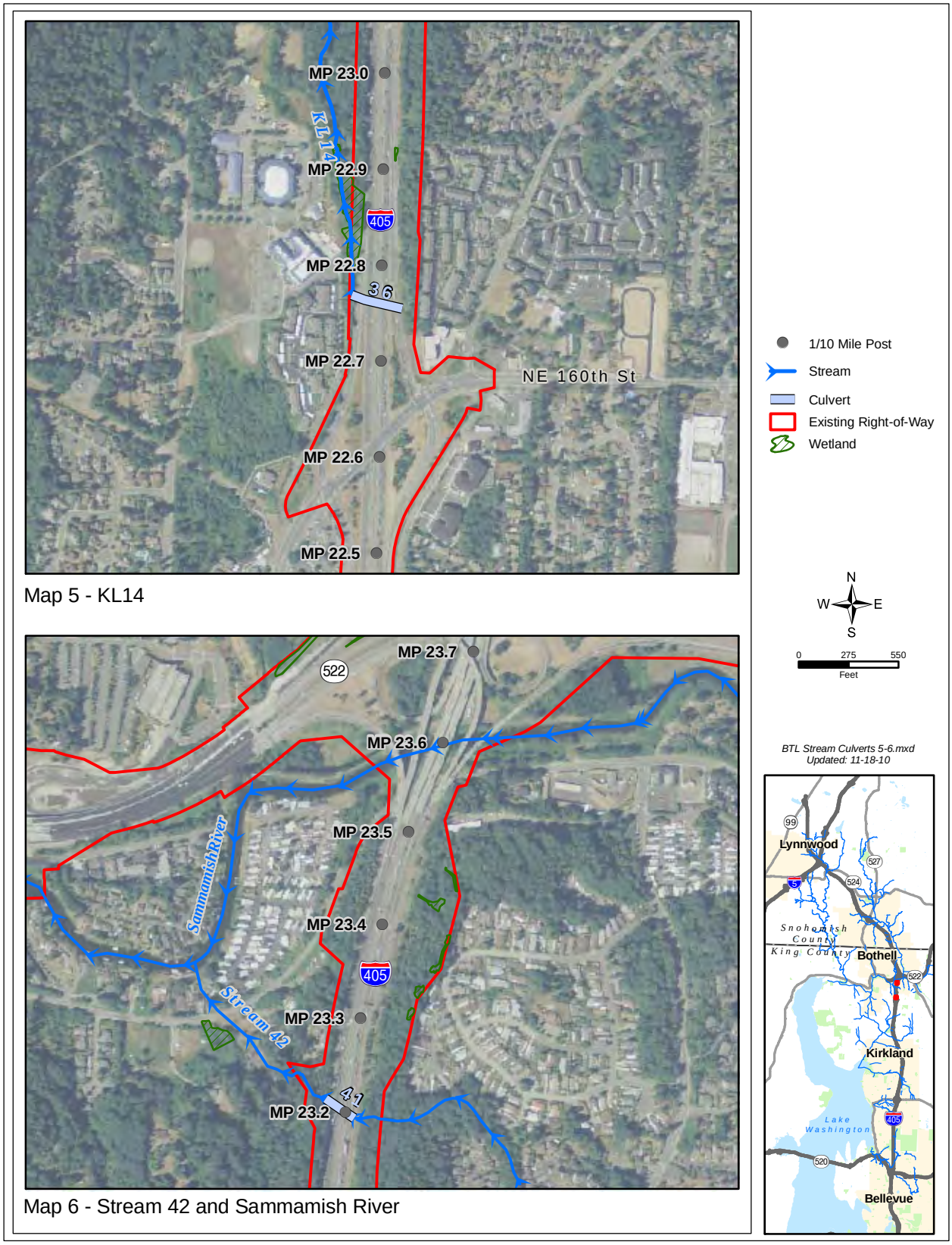
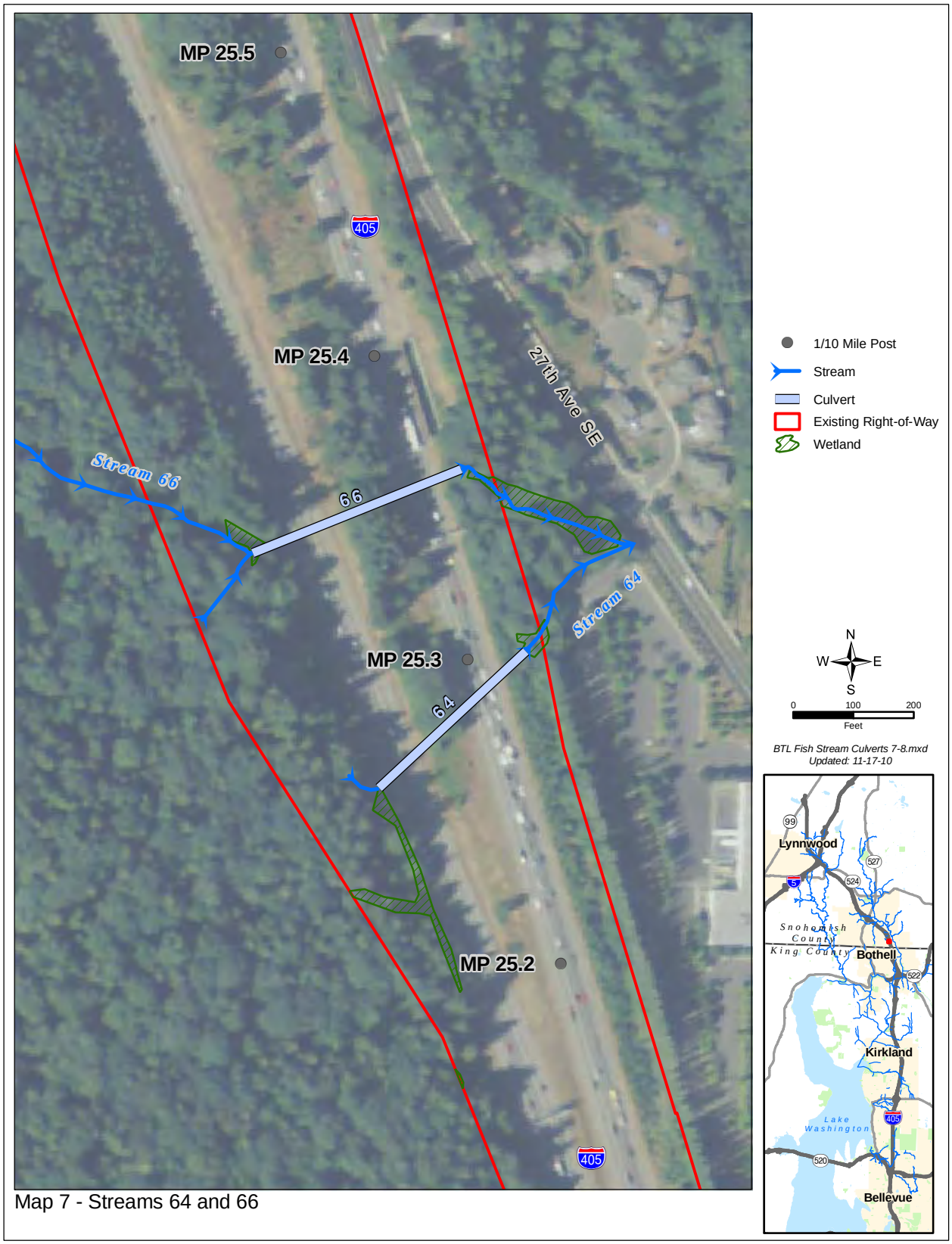


Exhibit 4-17: Map 7 – Streams 64 and 66



Map 7 - Streams 64 and 66

Wildlife Habitat

I-405 biologists identified four categories to describe upland vegetation found in the study area: forested; shrubs and grasses; maintained vegetation; and impervious surface or area. Wetlands are discussed in detail earlier in this report. As shown in Exhibit 3-1, the study area for upland vegetation extends 0.25 miles from I-405 between SR 520 and I-5. Land cover in the study area totals 5,100 acres.

Forested land cover consists of areas where tree species with an average height greater than 20 feet are the predominant vegetation. Forested areas total approximately 1,625 acres in the study area, approximately 32 percent of the total land cover. In general, forested areas in the study area include stands where Douglas-fir (*Pseudotsuga menziesii*), western red cedar (*Thuja plicata*), and western hemlock (*Tsuga heterophylla*) are dominant (WSDOT 2005d). Mixed stands of deciduous trees, such as black cottonwood, red alder, and big-leaf maple, are common in forested areas adjacent to streams in the study area. Plant species common in the understory include vine maple (*Acer circinatum*), Himalayan blackberry, salmonberry, willows (*Salix* species), and sword fern (*Polystichum munitum*).

The shrubs and grasses land cover type includes vegetated areas dominated by woody plants less than 20 feet tall (distinguishable from a tree by their multiple stems and lower height), grasses and grass-like plants, or both. The shrubs and grasses land cover totals approximately 245 acres in the study area, approximately 5 percent of the total land cover.

What is maintained vegetation?

Maintained vegetation consists of areas of roadside vegetation, including roadway medians and shoulders, that are regularly maintained for life, health, and safety purposes, and landscaped areas consisting primarily of plants grown for beauty or ornamental value for residential, commercial, and industrial developments.

Maintained vegetation land cover totals approximately 860 acres in the study area, approximately 17 percent of the total land cover. Plant species observed in this land cover type include Himalayan blackberry, Scot's broom (*Cytisus scoparius*), snowberry (*Symphoricarpos albus*), Oregon grape (*Mahonia nervosa*), and grass species. Maintained vegetation typically provides little to no value as wildlife habitat.

Impervious surface or area includes pavement, roofs, and other compacted or hardened areas that do not allow the passage of rainfall or runoff into the ground. Impervious surface or area totals approximately 2,370 acres in the study area, or 46 percent of the total land cover in the study area.

Exhibit 4-18 presents the total area of the four land cover types in the study area, and Exhibit 4-19 shows their distribution.

Exhibit 4-18: Land Cover Types in the Study Area

Land Cover Type	Acres in Study Area	Percentage of Land Cover Type in Study Area (%)
Forested	1,625	32
Shrubs and Grasses	245	5
Maintained Vegetation	860	17
Impervious Surface or Area	2,370	46
Total	5,100	100

Do any special status plant species occur in the study area?

There are no known occurrences of special status plant species in the study area (WDNR 2006b). The nearest special status plant species is giant golden chinquapin (*Chrysolepis chrysophylla*), located approximately 1.0 mile east of I-405. Giant golden chinquapin is a large shrub or small tree that inhabits dry open sites to fairly thick woodlands in Washington (WDNR 2006a).

Exhibit 4-19: Land Cover in Study Area – Sheet 1 of 2

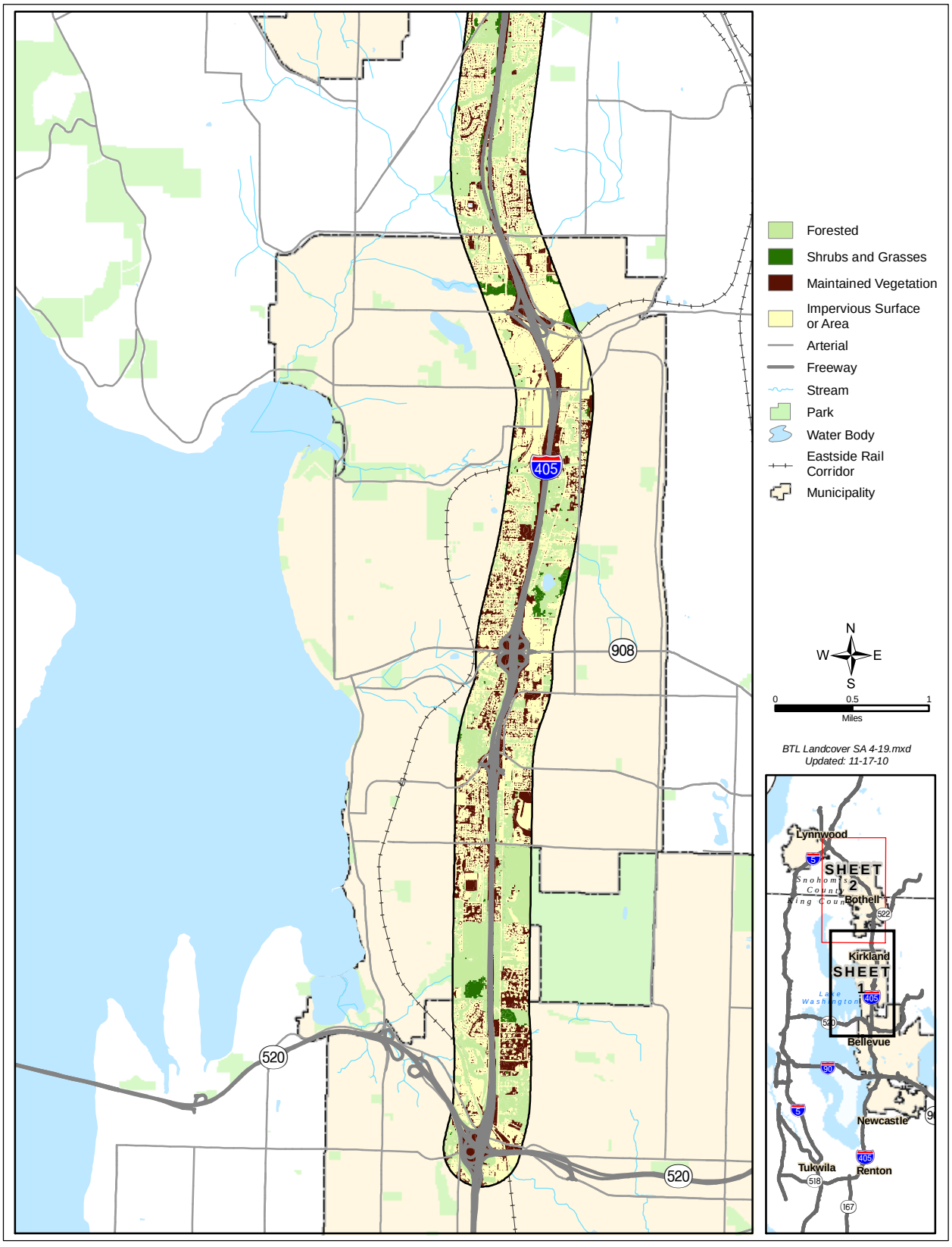
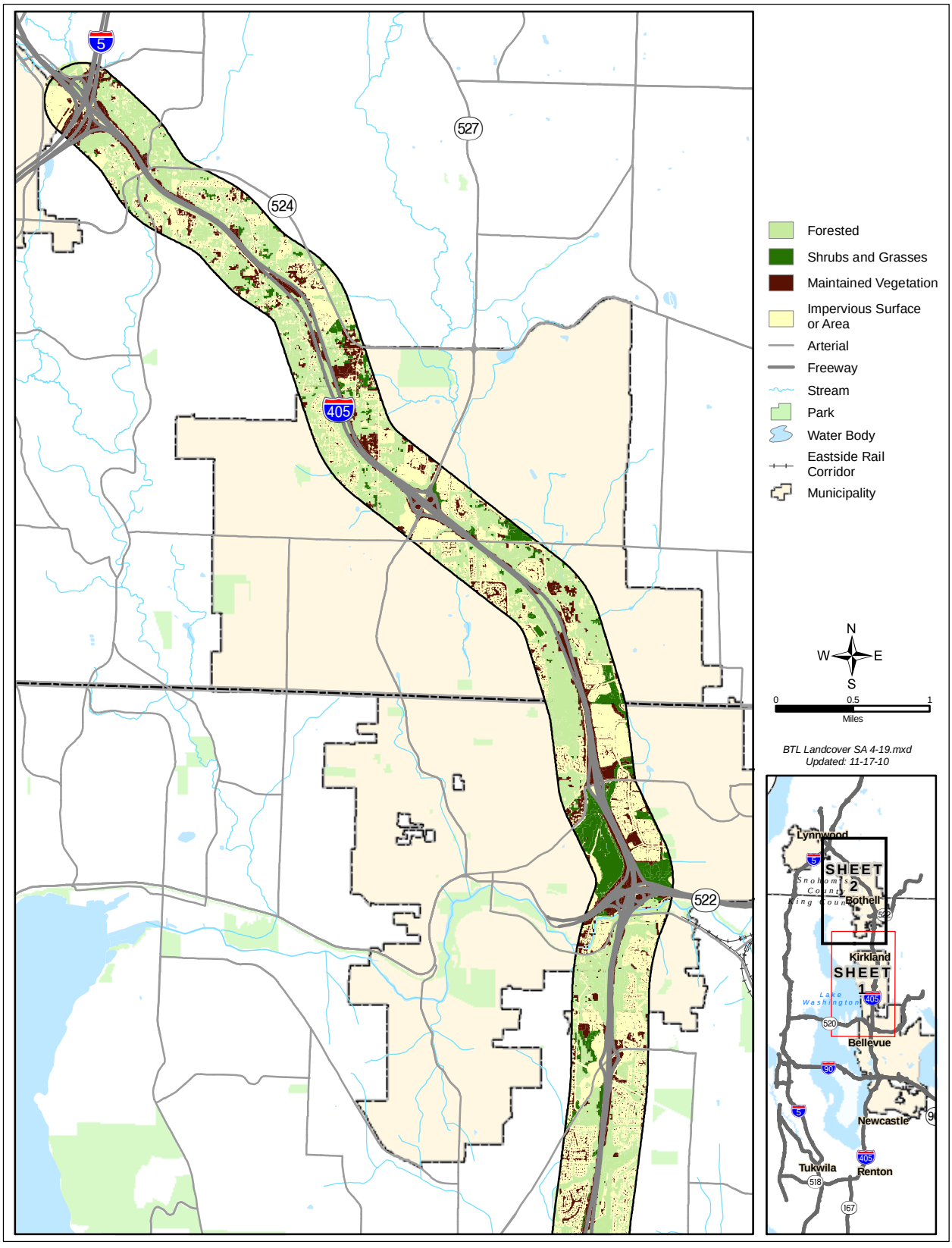


Exhibit 4-19: Land Cover in Study Area – Sheet 2 of 2



What are the common wildlife species in the study area?

Based on the habitat available in the study area, wildlife species in the study area are typical of those found in an urban setting. Wildlife species include, but are not limited to, coyote (*Canis latrans*), opossum (*Didelphus virginianus*), raccoon (*Procyon lotor*), and other small mammals. Domestic and feral wildlife, including dogs (*Canis familiaris*) and cats (*Felis catus*), are also likely to be present. Common bird species include American crow (*Corvus brachyrhynchos*), American robin (*Turdus migratorius*), and red-tailed hawk (*Buteo jamaicensis*).

Do any special status wildlife species occur in the study area?

What are special status wildlife species?

Special status wildlife species include: those listed as endangered or threatened under the Endangered Species Act (ESA); species that are candidates or are proposed for listing under the ESA; species of federal concern; and species listed by the Washington Department of Fish and Wildlife as endangered, threatened, candidate, sensitive, and other priority species.

Based on the WDNR Natural Heritage Program (WDNR 2006b), the WDFW Priority Habitats and Species Program (WDFW 2006), and USFWS databases (USFWS 2006a, USFWS 2006b), biologists identified two special status species within 1 mile of I-405: great blue heron (*Ardea heodias*) and osprey (*Pandion haliaeetus*). Exhibit 4-20 shows these species, their status, and their documented occurrence in the study area.

Exhibit 4-20: Special Status Species Documented in Study Area

Species	Status	Occurrence in Study Area
Great blue heron *(Ardea heodias)*	State monitor species	Two colonies
Osprey *(Pandion haliaeetus)*	State monitor species	Two nests

State monitor species are not considered Species of Concern by WDFW. However, WDFW monitors these species for status and distribution to prevent them from becoming endangered, threatened, or sensitive.

Two active osprey nests are located approximately 0.25 miles from I-405. According to the WDFW Priority Habitats and Species database (WDFW 2006), one nest is located on the east side of I-405 between SR 522 and SR 527. The other osprey nest is located in Hidden Valley Sports Park and is thought to be an alternate nest.

Two great blue heron colonies are within 1 mile of I-405. One colony exists near the I-405/I-5 interchange, near Swamp Creek, and the second colony occurs north of SR 520 near the Yarrow Bay wetland complexes. In 1994, the Swamp Creek colony consisted of eight nests and, in 1996, there were 16 nests with ten great blue herons. As of 2004, the colony was

still active with nine to ten nests observed (WDFW 2006). The great blue heron colony near the Yarrow Bay wetlands occurs in a cottonwood tree, with six nests observed during the 1986 and 1987 King County surveys. This colony is still active.

Does any designated critical habitat occur in the study area?

USFWS (USFWS 2006a, USFWS 2006b), identifies designated critical habitat for marbled murrelet (*Brachyramphus marmoratus*) and northern spotted owl (*Strix occidentalis caurina*) in both King and Snohomish Counties. However, no designated critical habitat occurs in the study area.

Do any listed species or special status species occur in the study area?

Do any state-listed or state priority aquatic species occur in or around the study area?

Priority species include state endangered, threatened, sensitive, and candidate species. Bull trout, Chinook salmon, chum salmon, coho salmon, steelhead, and sockeye salmon all occur in the study area and are state candidate species. Priority species require protective measures for their survival due to their population status; sensitivity to habitat alteration; and/or recreational, commercial, or tribal importance.

What is the Endangered Species Act?

The ESA is an Act of Congress passed in 1973 that governs how animal and plant species whose populations are dangerously in decline or close to extinction will be protected and recovered.

Do any federally listed species or federal species of concern occur in the study area?

Chinook Salmon

Chinook salmon are listed as threatened under the ESA. In the study area, Chinook salmon are documented in the Sammamish River and the lower sections of Juanita Creek and Yarrow Creek. Chinook salmon present in these streams are part of the Puget Sound evolutionarily significant unit (ESU) of Chinook salmon.

What is an evolutionarily significant unit?

An evolutionarily significant unit (ESU) of a fish species is the term used by National Marine Fisheries Service (NMFS) for the population protected by a listing under the ESA.

On September 2, 2005, the National Marine Fisheries Service designated critical habitat for 19 ESUs of Pacific salmon and steelhead in Washington, Oregon, and Idaho, including the Puget Sound ESU of Chinook salmon (Federal Register 2005a). There is no designated Chinook salmon critical habitat in the study area.

Bull Trout

Bull trout are listed as threatened under the ESA. Bull trout populations in the Puget Sound region are part of the Coastal-Puget Sound Distinct Population Segment (DPS). Bull trout and Dolly Varden (*Salvelinus malma*) (USFWS currently lists these species as co-listed where the range overlaps) may occur in the Sammamish River (Streamnet 2006). Bull trout or Dolly Varden have rarely been observed in the Lake Washington system (excluding Chester Morse Lake) in the last 30 years, with only a few specimens recorded (Bradbury and Pfeiffer 1992, as cited in WDFW 2004).

On September 26, 2005, USFWS designated critical habitat for the Coastal-Puget Sound population of bull trout (Federal Register 2005b). There is no designated bull trout critical habitat in the study area.

What is critical habitat?

Critical habitat is an ESA term referring to specific geographic areas that are essential for the conservation of a threatened or endangered species. These species may require special management considerations.

Steelhead Trout

Steelhead trout are listed as threatened under the ESA. In the study area, steelhead are documented in the Sammamish River. Steelhead that occur in the Sammamish River are part of the Puget Sound ESU.

At the time this report was published, NMFS had not designated critical habitat for the Puget Sound ESU of steelhead trout.

Species of Concern

Coho salmon are listed as a federal species of concern by NMFS (NMFS 2011).

Is the project within a recognized tribal fishing area?

The project is located within the tribal treaty rights for usual and accustomed fishing areas of the Muckleshoot Tribe.

What are Treaty Tribes?

Any tribe recognized by the United States government, with usual and accustomed fishing grounds, whose fishing rights were reserved under a treaty and have been affirmed by a federal court.

The Muckleshoot and other tribes may harvest adult salmon from the study area pursuant to judicially-recognized treaty rights, as interpreted by the Boldt Decision of 1974. The Boldt Decision provided the Yakama Tribe "the right to enjoy all of these fisheries as they had beforehand," which requires that they take the fish, "by consent of the tribes in that region," and that consent still applies today. Over the years, judicial decisions have affirmed that treaty tribes have a right to harvest fish free of state interference, subject to conservation

principals, to co-manage the fishery resource with the state, and to harvest up to 50 percent of the harvestable fish.

What functions do study area ecosystems provide?

Wetlands

In general, wetlands provide many functions including water quality improvement, floodwater storage, groundwater recharge, and wildlife habitat. Wetlands in the study area are typically located in low-lying areas adjacent to I-405 or associated access ramps, and all of the wetlands have been disturbed by human influence to some extent. Consequently, these wetlands are compromised in their ability to provide some or all of these functions.

What is a depressional wetland?

Depressional wetlands occur in depressions that allow the accumulation of surface water. Dominant water sources are precipitation, groundwater discharge, and flow from adjacent uplands.

The functional values of wetlands in the project study area were rated for water quality function and hydrologic function according to the most current version of Ecology's Washington State Wetlands Rating System (Ecology 2004, 2006b). Of the 21 wetlands in the project study area, seven were identified as depressional wetlands, 12 were identified as slope wetlands, and two were identified as slope and riverine wetlands. Functional values for the study area depressional and slope wetlands are summarized in Appendix F.

Function of the study area wetlands is further defined by their Cowardin classification (forested, emergent, and scrub-shrub). Eight wetlands were classified as forested systems; two wetlands were classified as scrub-shrub systems; five wetlands were classified as emergent wetlands; four of the wetlands include forested and emergent systems; one wetland includes scrub-shrub and emergent systems; and one wetland includes forested, scrub-shrub, and emergent systems. Wetlands with mixed classifications are generally of higher value than wetlands with a single classification. Forested wetlands are generally considered to be of higher value than emergent or scrub-shrub wetlands because of the functional values they provide.

What is a slope wetland?

Slope wetlands normally are found where there is a discharge of groundwater to the land surface. Slope wetlands are usually incapable of depressional storage because they lack the necessary closed contours. Principal water sources are usually groundwater return flow and flow from surrounding uplands, as well as precipitation.

Wetland acreage also affects function. Four wetlands in the study area are larger than 1.0 acres. Because large wetlands have more capacity for capturing stormwater flows, improving water quality, and providing a variety of habitats for wildlife, they are more likely to provide more beneficial

functions than smaller wetlands. Water quality, hydrologic, and habitat functional values for wetlands in the project study area are described below. The Ecology rating system assigns points to a wetland if it meets specific criteria related to the wetland's potential and opportunity to provide certain benefits. For each function category, the wetland's opportunity to provide that function based on its rating score is described first and the wetland's potential to provide that function is described thereafter (see Appendix F for details on wetland functions values).

Water Quality Functions

All of the wetlands in the study area provide opportunities to improve water quality to varying degrees.

Fifteen of the 21 wetlands have a low potential (less than 34 percent of the possible maximum score) to improve water quality due to their association with roadside drainage ditches with culverts or catch basins that provide unconstricted or slightly constricted surface outlets. Minimal or no seasonal ponding occurs within these wetlands. Three of the 21 wetlands have moderate potential scores (34 percent to 67 percent of the possible maximum score) to improve water quality. Three wetlands, Wetlands 16.2R, 20.34L, and 20.4L, have a high potential to improve water quality (greater than 68 percent of the possible maximum score).

Hydrologic Functions

All of the wetlands in the study area provide the opportunity to reduce flooding and erosion to varying degrees.

What is a hydroperiod?

A hydroperiod is the period of time during which a wetland is covered by water.

Seventeen of the 21 wetlands in the study area have a low potential (less than 34 percent of the possible maximum score) to reduce flooding and erosion, with 15 of the 21 wetlands scoring 25 percent or less of the possible maximum score. The low scores for potential hydrologic functions are due to a lack of natural surface water outlets, ponding features, and the types of vegetation necessary to reduce surface flows; a high presence of ditch-like characteristics; and small contribution of the wetlands to the larger watershed. Three wetlands have moderate potential scores (14 percent to 67 percent of the possible maximum score). One wetland, Wetland 25.3L, has a high function score for the potential to improve hydrologic functions.

Habitat Functions

Ten of the 21 wetlands have a low potential (less than 34 percent of the possible maximum score) to provide habitat for many species. The low score for habitat functions is due to the general lack of vegetative structure, hydroperiods, plant richness, habitat diversity, and special habitat features. Ten of the 21 wetlands have moderate potential scores (34 percent to 67 percent of the possible maximum score). One wetland, 16.2R, has a high function score for the potential to provide habitat (greater than 68 percent of the possible maximum score).

Aquatic Resources

Streams function as ecosystems that contain the following three major elements:

- Stream channel
- Floodplain
- Transitional zone between riparian and upland habitats

These elements allow for movement of water, nutrients, and organisms to meet and interact within these stream systems. This movement is critical to maintaining biological functions, which include:

- Cycling nutrients
- Filtering contaminants from runoff
- Absorbing and gradually releasing floodwaters
- Maintaining fish and wildlife habitats
- Recharging groundwater and maintaining stream flows

Some streams that cross I-405 possess intact habitat including vegetative cover, connectivity with their tributaries and off-channel habitats, and more abundant LWD and log jams. As a result, these streams provide some of the functions described above.

On some streams in the study area, stream functions range from mildly impaired to severely altered. The Sammamish River, for example, provides the function of moving water, cooling water (although inadequate for many of the fish species in the river), and transporting nutrients. However, the level at which the river provides these functions has been

constrained due to channelization, development, and other human activities.

Other streams in the study area, including Yarrow Creek, carry water and nutrients through the Lake Washington basin and then to the lake. Despite these alterations, the streams provide shade for fish populations, serve as migration corridors, and provide refugia habitat. For example, the Sammamish River is a migration corridor for anadromous fish on their way to the sea as juveniles and back again as adults.

Wildlife Habitat

Land cover in the study area provides habitat for a variety of wildlife species. Land cover in the study area has been disturbed by recent development. In particular, habitats provided by the forested and shrubs and grasses land cover have been fragmented, and connectivity between and within these habitats has been reduced. Consequently, the availability, suitability, and functions provided by these habitats are limited.

Forested areas, both intact and disturbed forests, have a high degree of use by wildlife in the study area. Wildlife uses these forests for cover, foraging, nesting, and denning areas. Habitat features, such as downed logs, snags, and well-developed canopy or understory, are important to certain species, such as cavity-nesting birds and some small mammals. Forested habitat in the study area lacks some of these habitat features, and thus, is limited in providing cover or nesting areas for wildlife.

Maintained vegetation in the study area generally provides little to no habitat for most wildlife species. However, some species such as small rodents and birds use these areas and it also attract raptors such as red-tailed hawks or peregrine falcons (*Falco peregrinus*), which have often been observed along I-405.

As noted in the wetlands section, one function of wetlands is providing habitat for wildlife species, including wetland-dependent mammals and wetland-associated birds. Wetlands often have features such as open water and multiple vegetation communities that provide shelter and foraging habitat for small mammals, amphibians, and resident and migratory birds.

SECTION 5 PROJECT EFFECTS

How will project construction affect ecosystems?

Build Alternative 1

Wetlands

Permanent Effects

To build the project, construction will need to occur in and adjacent to wetlands and their buffers.

All of the wetlands that will be disturbed will be partially or wholly filled; the magnitude of filling will depend on the wetland location and proximity to construction activity. Five wetlands will be partially filled and three of the wetlands, Wetlands 21.4M, 21.5M, and 22.8R, will be completely filled. In addition, the project will convert wetland buffer areas into new roadway facilities.

Where feasible, design modifications were made to the project footprint to minimize or avoid effects on wetlands and wetland buffers. When a wetland appeared to be located within the project footprint, engineers changed the footprint to avoid the wetland or, if the wetland could not be avoided, we determined how much direct wetland and buffer area would be affected due to project construction. Once the effects to wetlands and wetland buffers were quantified, this information was used to determine the type and amount of wetland mitigation that will be needed to offset the wetland effects from the project. Filling a portion of a wetland or altering its vegetation can reduce the wetland's capacity to store stormwater, filter pollutants, protect stream banks from erosion, and provide wildlife habitat.

The total acreage of wetlands in the study area is 13.62 acres. Of the 13.62 acres, 0.38 acres will be permanently affected. The affected wetlands are Category III (0.14 acres) and IV wetlands (0.24 acres), which provide moderate to low functions. See Section 3 for details about wetland categories.

Exhibit 5-1 shows the proportion, number, and area of wetlands permanently affected, by wetland category. The permanent effects to wetlands and their associated buffers are detailed in Exhibits 5-2 and 5-3, respectively.

Exhibit 5-1: Proportion of Permanent Wetland Effects by Wetland Category and Number and Area of Affected Wetlands

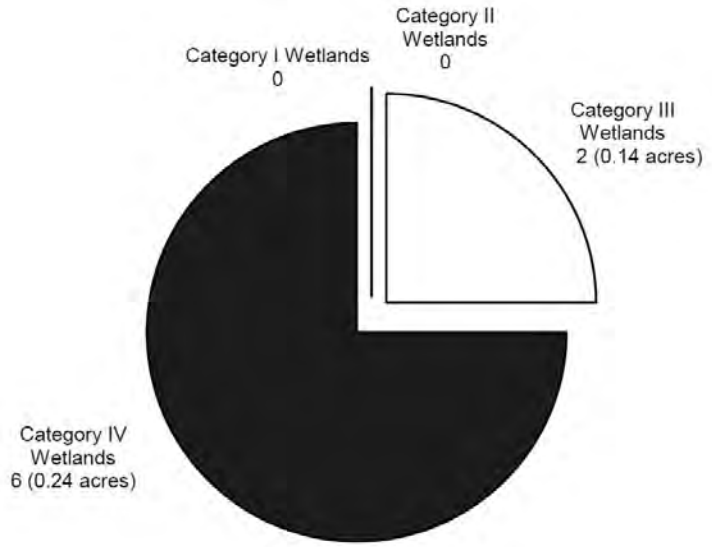


Exhibit 5-2: Summary of Permanent Wetland Effects

Wetland	Wetland Size (acres)	Cowardin Classification	Permanent Wetland Effects (acres)	Percentage of Wetland Incurring Permanent Effects (%)
16.2R	3.01	Forested and Emergent	0.00	0
19.7R	0.14	Scrub-shrub	0.00	0
19.8L	0.34	Emergent	0.00	0
19.9L	0.27	Forested	0.00	0
20.0L	0.08	Emergent	0.00	0
20.34L	0.28	Emergent	0.00	0
20.35L	0.17	Emergent	0.00	0
20.4L	2.76	Scrub-shrub	0.00	0
21.4M	0.05	Forested	0.05	100
21.5M	0.10	Forested	0.10	100
21.5R*	0.23	Forested and Emergent	0.07	30
22.5L	4.08	Forested	0.02	0.5
22.8L	1.02	Forested	0.07	7
22.8R	0.02	Emergent	0.02	100
23.4R	0.08	Forested	0.04	50
23.5R	0.24	Forested and Emergent	0.01	4
25.2L*	0.30	Forested, Scrub-shrub, and Emergent	0.00	0
25.22L	0.15	Scrub-shrub and Emergent	0.00	0
25.3R*	0.04	Forested	0.00	0
25.3L	0.04	Forested and Emergent	0.00	
25.4R*	0.22	Forested	0.00	0
Total	13.62		0.38	3

* *The size of these wetlands were estimated because the majority of their area lies outside the study area. The total wetland acreage includes both the estimates and actual wetland survey data.*

Exhibit 5-3: Summary of Permanent Wetland Buffer Effects

Wetland	Wetland Buffer Size (acres)	Cowardin Classification	Permanent Buffer Effects (acres)	Wetland Buffer Incurring Permanent Effects (%)
16.2R	4.73	Forested and Emergent	0.08	21
19.7R	0.57	Scrub-shrub	0.00	0
19.8L	0.73	Emergent	0.00	0
19.9L	1.96	Forested	0.00	0
20.0L	0.45	Emergent	0.05	11
20.34L	1.11	Emergent	0.00	0
20.35L	0.78	Emergent	0.00	0
20.4L	4.68	Scrub-shrub	0.00	0
21.4M	0.23	Forested	0.00	0
21.5M	0.25	Forested	0.00	0
21.5R*	1.45	Forested and Emergent	0.36	25
22.5L	4.31	Forested	0.06	1
22.8L	1.37	Forested	0.01	1
22.8R	0.20	Emergent	0.00	0
23.4R	0.63	Forested	0.39	62
23.5R	0.75	Forested and Emergent	0.21	28
25.2L*	0.14	Forested, Scrub-shrub, and Emergent	0.00	0
25.22L	0.77	Scrub-shrub and Emergent	0.00	0
25.3R*	0.42	Forested	0.07	17
25.3L	0.23	Forested and Emergent	0.00	0
25.4R*	0.24	Forested	0.00	0
Total	26.00		1.21	5

* *The size of these wetlands were estimated because the majority of their area lies outside the study area. The total wetland acreage includes both the estimates and actual wetland survey data.*

Wetland buffers are areas of land surrounding a wetland boundary. Buffers protect wetlands from the effects of adjacent land use. Buffers help wetlands function by filtering stormwater runoff from surrounding developments, trapping sediment, absorbing nutrients, attenuating high flows, and providing wildlife habitat. Buffers also physically separate wetlands from developed areas to lessen noise, light, chemical pollution, and other associated human-related disturbances. Local jurisdictions specify a regulated buffer size according to the rating of the wetland (see Exhibit 4-2). Due to the interconnectivity between a wetland and the surrounding uplands, effects to the buffer can damage the ecological functions of the wetland. Wetland buffer habitat in the study area is generally of low quality and typically includes fill associated with roads, and shrub, grass, and herbaceous habitat typically associated with highway right-of-way.

Temporary Effects

Some construction activities will need to occur outside of the permanent project footprint, including clearing of wetland and upland vegetation. WSDOT may need to temporarily place fill in wetlands and buffers to allow adequate room for construction activities. These construction disturbances will result in a short-term loss of wetland functions. Erosion and sedimentation caused by construction activities will increase the amount of sediment settling within a wetland and reduce the quality of habitat available for invertebrate life and habitat for plants. Additionally, loose sediment will reduce the potential water quality and quantity benefits provided by those wetlands.

After the project is complete, these temporarily disturbed areas will be restored and replanted with appropriate native vegetation, but habitat functions will be temporarily reduced while the planted trees, shrubs, and emergent plants become established. Wetlands where the vegetation is cleared or trimmed will still retain some water quality and quantity function, although at a diminished level until the wetlands are completely reestablished.

WSDOT will develop a project-specific plan before construction to identify how vegetation restoration will occur. BMPs will be implemented to minimize erosion and

sedimentation during construction as required in the WSDOT *Highway Runoff Manual* (WSDOT 2008b).

The total acreage of wetlands in the study area is 13.62 acres. Of that total, 0.03 acres will be temporarily affected. The total acreage of wetland buffer in the study area is 26.00 acres. Of this total, 0.3 acres of wetland buffer will be temporarily affected. The temporary effects to wetlands and their associated buffers are detailed in Exhibits 5-4 and 5-5, respectively.

Exhibit 5-4: Summary of Temporary Wetland Effects

Wetland	Size (acres)	Cowardin Classification	Temporary Wetland Effects (acres)	Percentage of Wetland Incurring Temporary Effects (%)
16.2R	3.01	Forested and Emergent	0.00	0
19.7R	0.14	Scrub-shrub	0.00	0
19.8L	0.34	Emergent	0.00	0
19.9L	0.27	Forested	0.00	0
20.0L	0.08	Emergent	0.00	0
20.34L	0.28	Emergent	0.00	0
20.35L	0.17	Emergent	0.00	0
20.4L	2.76	Scrub-shrub	0.00	0
21.4M	0.05	Forested	0.00	0
21.5M	0.10	Forested	0.00	0
21.5R*	0.23	Forested and Emergent	0.02	9
22.5L	4.08	Forested	0.01	1
22.8L	1.02	Forested	0.00	0
22.8R	0.02	Emergent	0.00	0
23.4R	0.08	Forested	0.00	0
23.5R	0.24	Forested and Emergent	0.00	0
25.2L*	0.30	Forested, Scrub-shrub, and Emergent	0.00	0
25.22L	0.15	Scrub-shrub and Emergent	0.00	0
25.3R*	0.04	Forested	0.00	0
25.3L	0.04	Forested and Emergent	0.00	0
25.4R*	0.22	Forested	0.00	0
Total	13.62		0.03	1

* *The size of these wetlands were estimated because the majority of their area lies outside the study area. The total wetland acreage includes both the estimates and actual wetland survey data.*

Exhibit 5-5: Summary of Temporary Wetland Buffer Effects

Wetland	Wetland Buffer Size (acres)	Cowardin Classification	Temporary Buffer Effects (acres)	Percentage of Wetland Buffer Incurring Temporary Effects (%)
16.2R	4.73	Forested and Emergent	0.30	6
19.7R	0.57	Scrub-shrub	0.00	0
19.8L	0.73	Emergent	0.00	0
19.9L	1.96	Forested	0.00	0
20.0L	0.45	Emergent	0.00	0
20.34L	1.11	Emergent	0.00	0
20.35L	0.78	Emergent	0.00	0
20.4L	4.68	Scrub-shrub	0.00	0
21.4M	0.23	Forested	0.00	0
21.5M	0.25	Forested	0.00	0
21.5R*	1.45	Forested and Emergent	0.13	9
22.5L	4.31	Forested	0.04	1
22.8L	1.37	Forested	0.00	0
22.8R	0.20	Emergent	0.00	0
23.4R	0.63	Forested	0.00	0
23.5R	0.75	Forested	0.00	0
25.2L8	0.14	Forested, Scrub-shrub, and Emergent	0.00	0
25.22L	0.77	Scrub-shrub and Emergent	0.00	0
25.3R*	0.42	Forested	0.00	0
25.3L	0.23	Forested and Emergent	0.00	0
25.4R*	0.24	Forested	0.00	0
Total	26.00		0.47	2

* *The size of these wetlands were estimated because the majority of their area lies outside the study area. The total wetland acreage includes both the estimates and actual wetland survey data.*

Aquatic Resources

Permanent Effects

Permanent effects to streams result from construction activities occurring below the ordinary high water mark (OHWM) of the waterbody. Local, state, and federal regulations are in place to protect aquatic resources, and any activity occurring below the OHWM of a stream must be approved and permitted per these regulations. Construction activities such as the placement of new structures and extension of culverts are examples of activities that result in permanent effects to streams.

In total, 1,447 square feet of stream below the OHWM will be permanently affected by the project (see Exhibit 5-6). The primary effect to streams is the loss of stream channel habitat. Construction activities will also clear riparian vegetation within the stream buffer, thus removing the vegetation that provides shade and cover to the stream and aquatic species.

Permanent effects from construction do not necessarily compromise stream functions. Small changes to stream riparian zones will not detrimentally affect the stream's ability to support fish and other aquatic life.

Permanent effects to streams and stream buffers are described below and summarized in Exhibit 5-6.

Yarrow Creek – The project will widen the NB lane to the east. This project element will result in no permanent effects to the creek, although 10,105 square feet of Yarrow Creek's buffer will be permanently affected.

Juanita Creek at NE 145th Street – The project will widen both the NB and SB lanes of I-405. This project element will result in permanent effects to 11,230 square feet of the stream buffer.

C28 and C29 – Effects to C28 and C29 result from the widening of the I-405 NB lane through the median and extending the culverts. Permanent effects below the OHWM on C28 and C29 total 470 and 354 square feet, respectively. A total of 260 square feet of C28's stream buffer will be permanently affected by these activities.

KL14 and Stream 42 – The widening of I-405 will permanently affect KL14. The roadway widening will affect 3,537 square

feet of KL14's stream buffer. Effects to Stream 42 will result from roadway widening and extending the culvert. A total of 173 square feet of Stream 42's channel and 9,897 square feet of its buffer will be permanently affected from these activities.

Sammamish River – A total of 450 square feet of the Sammamish River will be permanently affected by the placement of bank stabilization material below the OHWM for two new stormwater outfalls. This project element will also permanently affect 1,775 square feet of the Sammamish River's buffer.

Permanent Effects to Stream Buffers

As described above for the individual streams and shown in Exhibit 5-6, 36,804 square feet of stream buffer will be permanently affected by project construction. Permanent effects to stream buffers include removal of vegetation within the stream buffer and conversion of stream buffer habitat to new impervious surface.

Stream buffers regulate stream temperature through shading, contribute LWD and organic material, and provide bank stabilization. Removing vegetation from the stream buffer can permanently alter some of the stream's functions.

Exhibit 5-6: Summary of Permanent Effects to Streams and Stream Buffers

Stream	Milepost	Local Stream Buffer (ft)	Permanent Effects (sq ft)	Permanent Stream Buffer Effects (sq ft)
Yarrow Creek	15.9	Bellevue -100	0	10,105
Juanita Creek at NE 145th Street (west of I-405)	21.9	Kirkland - 75	0	8,340
Juanita Creek at NE 145th Street (east of I-405)	21.9	Kirkland - 60	0	2,890
C28	21.3	King County - 25	470	260
C29	21.4	King County - 25	354	0
KL14	22.8	Bothell - 75	0	3,537
Stream 42	23.2	Bothell - 50	173	9,897
Sammamish River	23.6	Bothell - 100	450	1,775
Total Stream Effects (sq ft)			1,447	36,804

Exhibit 5-7: Summary of Temporary Effects to Streams and Stream Buffers

Stream	Milepost	Local Stream Buffer (ft)	Temporary Effects (sq ft)	Temporary Stream Buffer Effects (sq ft)
Yarrow Creek	15.9	Bellevue -100	0	4,195
Juanita Creek at NE 145th Street (east of I-405)	21.9	Kirkland - 60	0	650
C28	21.3	King County - 25	0	605
Sammamish River	23.6	Bothell - 100	400	2,280
Total Stream Effects (sq ft)			400	7,730

Temporary Effects

Project elements identified in the previous section that will permanently affect streams and stream buffers will also temporarily affect these resources during construction. Temporary effects to streams and stream buffers are briefly described below, and are summarized in Exhibit 5-7.

Only the Sammamish River will be temporarily affected by project construction. A total of 400 square feet of stream below the OHWM will be affected. Temporary effects include temporary loss of vegetation, soil disturbance, and dewatering.

Temporary Effects to Stream Buffers

As shown in Exhibit 5-7, the buffers of four streams in the study area will be temporarily affected during construction for a total of 7,830 square feet. Temporary effects during project construction include sedimentation and disturbance to stream buffers from vegetation clearing and soil disturbance. Sediments can enter stream systems that are adjacent to construction activities. However, introduction of sediments and pollutants into stream buffers in the study area will be avoided and minimized (see Section 6).

Wildlife Habitat

Permanent Effects

Approximately 17 acres of vegetation will be permanently removed and converted to impervious surface under Build Alternative 1. The loss of 17 acres of vegetation equals less than 2 percent of the total land cover in the study area. Of the

17 acres, 6 acres (or 0.4 percent) of forested habitat and 11 acres (or 1.3 percent) of maintained vegetation will be removed during project construction. Shrubs and grasses will not be permanently affected by project construction. As shown in Exhibit 5-8, the area of land cover permanently affected by project construction is very small (0.6 percent) relative to existing land cover in the study area. Exhibit 5-9 shows representative locations of each land cover type permanently affected by project construction.

The permanent loss of approximately 17 acres of vegetation will affect wildlife species in the study area. The permanent removal of 6 acres of forested land cover and 11 acres of maintained vegetation will eliminate this habitat for wildlife species currently using these habitat types. Some wildlife species using these habitats will disperse elsewhere in the study area to locate available habitat.

Temporary Effects

Approximately 55 acres of vegetation will be temporarily affected during the project by construction activities such as clearing vegetation for construction staging areas and grading activities. These areas will not be converted to impervious surface and will be revegetated with native plant species after project construction. The 55 acres of vegetation temporarily affected during construction equals approximately 2 percent of the total vegetated land cover in the study area. As shown in Exhibit 5-8, 22 acres of forested habitat, 0.4 acres of shrubs and grasses, and 33 acres of maintained vegetation will be temporarily affected. Exhibit 5-9 shows representative locations of each land cover type temporarily affected by project construction.

Temporary effects on wildlife species include noise associated with general and localized construction activities. Although resident wildlife are more adapted to urban environments and associated noise levels, some wildlife species will be affected during localized construction activities when noise levels noticeably increase. Noise can disturb wildlife by disrupting communication, interfering with mating, and reducing the ability to obtain sufficient food, water, and cover.

General construction equipment will generate maximum noise levels between approximately 69 and 106 A-weighted decibels (dBA) within 50 feet of the localized construction activity

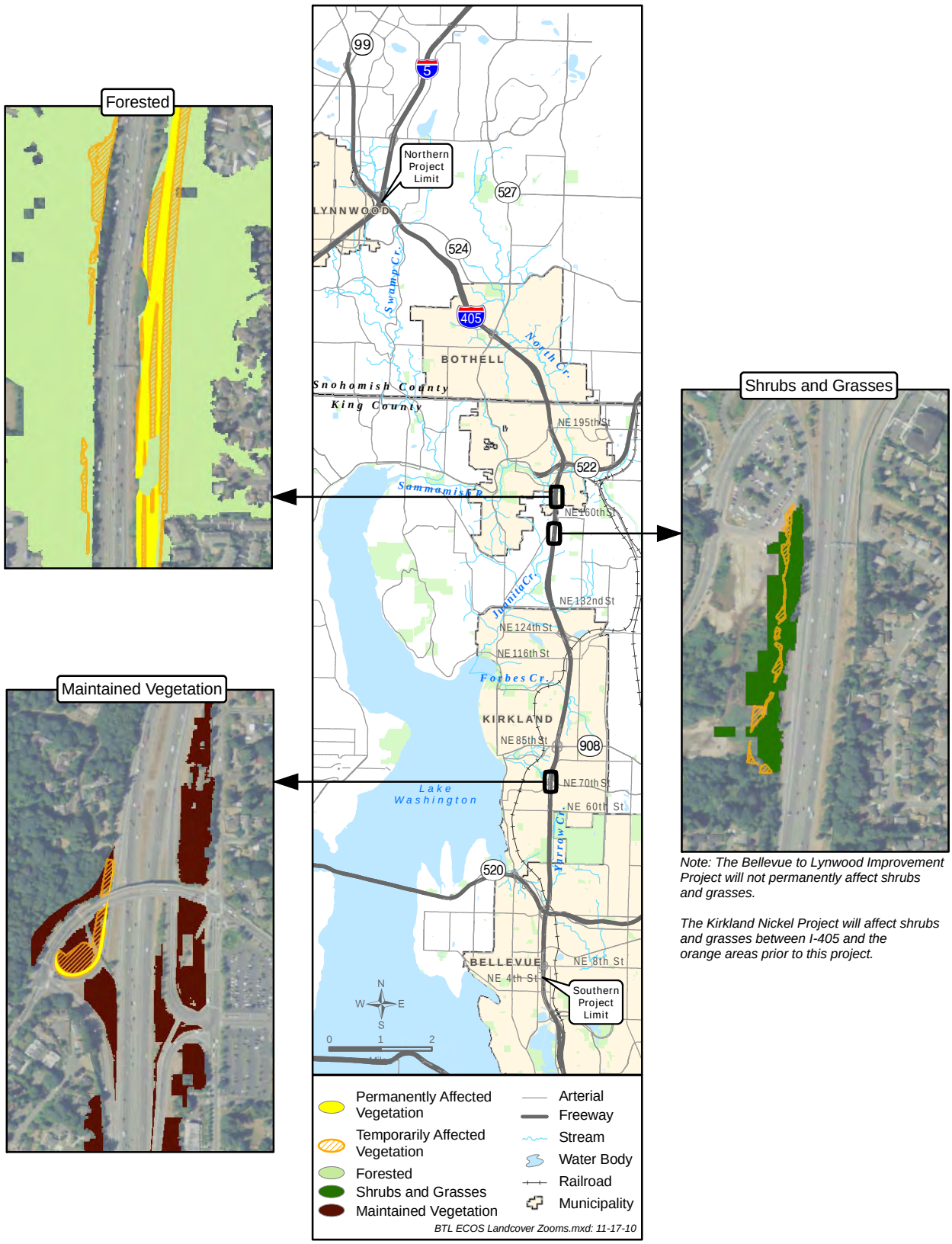
(WSDOT 2007a). Construction noise at locations more than 50 feet from the source will decrease at a rate of 6 dBA per doubling of distance from the construction activity. Based on the maximum noise level (106 dBA), noise levels will decrease to ambient noise levels at approximately 1,600 feet from the localized activity (WSDOT 2007a). Wildlife species within 1,600 feet of the localized construction activity may travel to similar habitats in the study area. More than 1,600 feet from the localized construction areas and activities, the effects of construction-related noise are expected to be minimal.

Due to the localized increases in noise levels, wildlife species are expected to move to other habitats in the study area. Increase in the number of animals moving into currently-inhabited areas may result in animals competing for shelter, resting, or foraging habitat. However, wildlife species will disperse to other areas only during these specific times and will most likely return to the general area upon completion of the construction activity.

Exhibit 5-8: Land Cover Types Affected in the Study Area

Land cover	Existing Land Cover (acres)	Permanent Land Cover Loss (acres)	Existing Land Cover Type Permanently Affected (%)	Temporary Land Cover Loss (acres)	Existing Land Cover Type Temporarily Affected (%)
Forested	1,625	6	0.4	22	1.4
Shrubs and Grasses	245	0	0	0.4	0.2
Maintained Vegetation	860	11	1.3	33	3.8
Total	2,730	17	0.6	55.4	2.0

Exhibit 5-9: Representative Locations of Affected Land Cover



Note: The Bellevue to Lynnwood Improvement Project will not permanently affect shrubs and grasses.

The Kirkland Nickel Project will affect shrubs and grasses between I-405 and the orange areas prior to this project.

Build Alternative 2

The project footprint for Build Alternative 2 is the same as for Build Alternative 1. Effects on wetlands, aquatic resources, and wildlife habitat from Build Alternative 2 will be the same as the effects from Build Alternative 1.

No Build Alternative

Wetlands

Many of the wetlands that occur in the right-of-way are currently affected by the lack of forested upland buffer; mowed vegetation associated with right-of-way maintenance; and the lack of modern stormwater control, conveyance, and management facilities. Wetlands and the water quality functions they provide would likely continue to be affected by untreated runoff entering the wetlands, as well as by sediment transport and erosion.

Aquatic Resources

Similar to wetlands, streams in the study area that currently receive untreated runoff or sediment from erosion would likely continue to be affected by these conditions.

Wildlife Habitat

Routine activities such as road maintenance, repair, and minor safety improvements would occur under the No Build Alternative. Since construction is not anticipated for routine maintenance activities, there would be no additional effects on wildlife habitat under the No Build Alternative.

Will project construction affect listed species?

A Biological Assessment (BA) prepared for this project evaluated the effects of the project on aquatic species protected under the ESA, specifically Chinook salmon, steelhead trout, and bull trout (WSDOT 2007c). The BA determined that the project may affect, but is not likely to adversely affect, Puget Sound Chinook salmon, Puget Sound steelhead, and Coastal-Puget Sound bull trout. USFWS and NMFS concurred with this determination (USFWS 2008; NMFS 2008).

How will project operation affect ecosystems?

Build Alternative 1

Wetlands

Most wetlands in the study area are currently affected by the lack of modern stormwater control, conveyance, and management facilities. Wetlands and the water quality functions they provide would likely continue to be affected by untreated runoff entering the wetlands, as well as by sediment transport and erosion. However, enhanced water quality treatment will improve the quality of water entering some wetlands in the study area.

Aquatic Resources

Effects on aquatic resources will result from the operation of stormwater facilities, including culverts, installed or extended during project construction. Stormwater facilities, which include detention ponds and ecology embankments, will collect runoff from all new impervious surfaces created by the project. The water will be treated for enhanced water quality before discharge to streams or the Sammamish River. Streams in the study area will receive smaller concentrations of metals, such as copper and zinc, from the treated water, which will improve the quality of water entering streams in the study area.

Effects to stream base and peak flows are not anticipated because stormwater flow control facilities will be maintained or improved by the project to maintain existing base and peak flows to streams in the study area.

Wildlife Habitat

Operation of the project is not anticipated to affect wildlife habitat. As noted above in the project construction discussion, wildlife species in the study area are more adapted to urban environments and associated noise levels. Thus, noise levels from the additional vehicle traffic on I-405 are not anticipated to affect wildlife species in the study area.

Maintained vegetation in the right-of-way will be mowed and maintained for safety purposes. This land cover type will still provide poor habitat for wildlife in the study area. No other

operational effects to wildlife habitat are anticipated with Build Alternative 1.

Build Alternative 2

The project footprint for Build Alternative 2 is the same as for Build Alternative 1. Operational effects on wetlands, aquatic resources, and wildlife habitat from Build Alternative 2 will be the same as the effects from Build Alternative 1.

No Build Alternative

Operational effects to wetlands and aquatic resources will occur under the No Build Alternative. Both wetlands and streams in the study area that currently receive untreated runoff would likely continue to be affected by these conditions. Water quality functions provided by wetlands and stream water quality would continue to be affected by sediment transport and erosion. Minor routine roadway safety improvements would continue to take place. Maintained vegetation in the right-of-way would be mowed and maintained for safety purposes. This land cover type would still provide poor habitat for wildlife in the study area. No other operational effects to wildlife habitat are anticipated under the No Build Alternative.

Does the project have other effects that may be delayed or distant from the project area?

Build Alternative 1

Wetlands

Delayed and distant effects were assessed as they relate to the loss of specific wetland functions. Delayed or distant effects from the project may include a reduction in the habitat area available for wetland-dependent wildlife and changes to wetland hydrology resulting from the built project.

Wetlands and buffers permanently affected by the project will not be available for use by wildlife as habitat. As a result, increased competition in the remaining wetlands will likely occur because of the potential influx of displaced wildlife from the affected wetlands. The impact on wildlife populations from increased competition is difficult to predict. The likelihood and severity of delayed or distant effects caused by increased competition among wetland-dependent wildlife will

be highest for wetlands with the largest quantity of wildlife habitat. Similarly, in the wetlands with low wildlife habitat function, the likelihood of delayed or distant effects to wetland-dependent wildlife is low. The severity of those effects is also likely to be low.

Even though new impervious surfaces may not have direct effects to wetlands, new impervious surfaces could change existing drainage patterns. Adding new impervious surfaces may result in changes to stormwater conveyance, which may change the hydrology of wetlands in the study area. These changes will subsequently affect hydrology of nearby wetlands, including wetlands that occur in areas beyond the study area. The majority of wetlands in the study area are associated with ditches that also act as stormwater conveyance systems, and these conveyance systems will continue to be used after the project is complete.

Aquatic Resources

Delayed or distant effects to aquatic resources could occur from the mitigation activities associated with the Sammamish River and C28. A diverse assemblage of native plant species will be planted within the buffer of both waterbodies, which, over time, will improve the overall condition of the stream buffer. Many of the existing riparian buffers in the study area are dominated by non-native or invasive vegetation. Establishing native species in riparian buffers will improve the quantity and quality of riparian habitat in the study area, and over time, result in increased shade and nutrient deposition.

Wildlife Habitat

Delayed or distant effects to wildlife habitat could occur from the loss of upland habitat. Increased competition among wildlife for available upland habitat could occur in the study area. Also, increased use of remaining upland habitat by wildlife species in the study area could occur.

Build Alternative 2

The project footprint for Build Alternative 2 is the same as for Build Alternative 1. Delayed or distant effects on wetlands, aquatic resources, and wildlife habitat from Build Alternative 2 will be the same as the effects from Build Alternative 1.

No Build Alternative

No delayed or distant effects to wetlands, aquatic resources, and wildlife habitat are anticipated under the No Build Alternative.

Were potential cumulative effects for ecosystems considered?

Cumulative effects are not discussed in this report. Please refer to the I-405, Bellevue to Lynnwood Improvement Project Cumulative Effects Analysis Technical Memorandum (WSDOT 2010) for details on cumulative effects of the project.

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SECTION 6 MEASURES TO AVOID OR MINIMIZE EFFECTS

What measures will be taken to mitigate effects during construction?

Mitigation measures established in the I-405 Corridor Environmental Impact Statement (EIS) (FHWA 2002) and Record of Decision (ROD) will be implemented for the Bellevue to Lynnwood Improvement Project. This section generally describes those measures established in the EIS to offset effects to wetlands, aquatic resources, and wildlife habitat from the construction of the Bellevue to Lynnwood Improvement Project.

Wetlands

During construction, WSDOT will minimize project effects by following construction BMPs specified in the *Highway Runoff Manual* (WSDOT 2008b). WSDOT will also develop and implement a Temporary Erosion and Sediment Control (TESC) plan and a Spill Prevention Control and Countermeasures (SPCC) plan to avoid effects to wetlands.

Aquatic Resources

As noted in the wetlands section, WSDOT will minimize effects during construction by following construction BMPs specified in the *Highway Runoff Manual*. WSDOT will also develop and implement a TESC plan and an SPCC plan to prevent sediment from entering streams. Additionally, staging and stockpiling areas will be located at a specified distance away from streams to avoid spills and prevent sediment from entering streams or stream buffers.

Other measures to minimize effects during construction include:

- Lighting for this project, in particular at night, will be limited to the amount necessary to complete the work. The lighting will be directed away from the streams and waterbodies whenever possible.
- WSDOT will adhere to project conditions identified in the BA and agency concurrence letters.
- WSDOT will implement construction BMPs (such as silt fencing or sedimentation ponds) to avoid disturbing sensitive areas during the development and use of staging

areas, access roads, and turnouts associated with resurfacing activities.

- WSDOT will not allow in-water work to occur except during seasonal work windows established to protect fish.

Wildlife Habitat

Measures to minimize effects to wildlife and upland vegetation during construction will include:

- WSDOT will adhere to project conditions identified in the BA and agency concurrence letters.
- WSDOT will minimize the amount of vegetation clearing to retain as many trees as practicable.

What measures will be taken to mitigate effects of operation?

Mitigation measures established in the EIS and ROD will be implemented for the Bellevue to Lynnwood Improvement Project. This section generally describes those measures established in the ROD to offset effects to wetlands, aquatic resources, and wildlife habitat from the operation of the Bellevue to Lynnwood Improvement Project.

Wetlands

As noted in Section 5, wetlands in the study area are currently affected by the lack of modern stormwater control, conveyance, and management facilities. Wetlands and the water quality functions they provide would likely continue to be affected by untreated runoff entering the wetlands, as well as by sediment transport and erosion. However, enhanced water quality treatment will improve the quality of water entering some wetlands in the study area. Wetland buffers in the study area are also affected by routine maintenance activities. To offset effects to wetlands during project operation, WSDOT will conduct ongoing maintenance of stormwater treatment and detention facilities.

Aquatic Resources

Measures to offset effects during project operation include:

- Wherever soil tests and site conditions demonstrate the practicability, infiltration of treated stormwater will be utilized.

- Lighting will be placed away from streams and waterbodies wherever possible.
- Ongoing maintenance of stormwater treatment and detention facilities by WSDOT will not include the application of any unapproved chemical weed control agents (herbicides, for example).

Wildlife Habitat

No measures are necessary to mitigate for operational effects to wildlife habitat.

What measures will be taken to mitigate effects of the constructed project?

Wetlands

WSDOT will mitigate for effects to wetlands from the constructed project at the Kelsey Creek wetland mitigation site. The Kelsey Creek wetland mitigation site is located adjacent to Lake Hills Connector Road in Bellevue. Mitigation includes wetland creation, wetland enhancement, and wetland buffer enhancement. The enhancements include excavation of fill materials, planting of wetland vegetation, and planting of native upland vegetation to increase and enhance wetland buffers.

Aquatic Resources

Effects to streams from the constructed project will be offset at two locations to compensate for the stream functions and values affected by the project. The two sites are located on the Sammamish River and C28.

The Sammamish River mitigation site is located adjacent to the proposed stormwater outfall on the north side of the Sammamish River and will include riparian plantings adjacent to the river. Stream mitigation at C28 will include in-stream and riparian restoration.

Wildlife Habitat

Mitigation measures to offset effects from the constructed project will include the revegetation of all temporarily disturbed soils resulting from construction activities. Planted shrubs and tree species will be maintained for a period to ensure the revegetation of target cover types. Planting will

occur in areas that provide connectivity to existing wildlife habitat but still meet safety and maintenance standards set forth by WSDOT.

SECTION 7 UNAVOIDABLE ADVERSE EFFECTS

Does the project cause any substantial adverse effects that cannot be avoided?

The Bellevue to Lynnwood Improvement Project will be designed to avoid effects to wetlands, aquatic resources, and wildlife habitat to the extent practicable. Project elements, such as locating project features away from these resources, will be incorporated throughout the design of the project. However, the project will result in effects to wetlands, streams and rivers, and upland vegetation that cannot be avoided due to the project design.

The permanent impact to 0.42 acres of streams and wetlands cannot be avoided due to the current roadway design. Wetlands and their buffers will incur effects that will compromise their ability to provide water quality, hydrologic, and habitat functions as detailed in Section 5. Four of the 12 streams in the study area, totaling 1,447 square feet of stream channel, will be permanently affected by roadway widening or culvert extensions. The stream buffers of seven of the streams (a total of 36,804 square feet) will be permanently affected by the project.

The project will result in the permanent loss of 17 acres of upland vegetation (6.0 acres of forested habitat and 11 acres of maintained vegetation). Wildlife habitat will incur effects that will result in habitat fragmentation and reduction of specific habitat types in the study area.

In addition to these direct effects, each of these elements could also experience effects that are delayed or distant from the project area. These effects are described in greater detail in Section 5.

All project effects to ecosystems in the study area will be mitigated in accordance with the requirements of applicable local, state, and federal laws. This mitigation will provide a means to off-set project effects and potentially improve the condition of the overall ecosystem in the study area.

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